Advances and Innovations in African Rural Health Care Book Series
Volume 1

Integrated care for human immunodeficiency virus and chronic diseases in South Africa

Edited by
Lufuno Makhado

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Integrated care for human immunodeficiency virus and chronic diseases in South Africa

University of Venda
Creating Future Leaders

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Research justification

This book advances scholarly discourse in public health by developing and empirically grounding an integrated primary health care (IPHC) framework for the concurrent management of human immunodeficiency virus (HIV) and noncommunicable diseases (NCDs). Its central contribution lies not in describing comorbidity trends, but in providing a structured, evidence-based model for integrating HIV and NCD care within primary health care (PHC) systems, particularly in low- and middle-income contexts. The work addresses a clear gap in the literature, where HIV and NCDs are typically examined in isolation, by offering a novel conceptual and applied synthesis that advances understanding of integrated service delivery and health care systems strengthening.

Methodologically, the book applies a mixed-methods research design that systematically integrates quantitative epidemiological analyses, qualitative case studies, systematic literature reviews and comparative policy analyses. Epidemiological data are used to establish the burden and patterns of HIV–NCD comorbidity, while qualitative inquiry captures the experiences of health care providers and patients within PHC settings. Case-based analyses identify best practices in integrated care delivery, and policy comparisons evaluate existing models to inform scalable interventions. This methodological integration underpins the development of original conceptual models and evidence-based recommendations, thereby contributing directly to knowledge production within the field.

Ethical compliance has been strictly maintained throughout the research process. No ethical clearance for studies involving human participants was required or obtained from the relevant institutional review bodies, as all data were collected, analysed and reported from secondary sources, established ethical protocols and standards. These measures ensure the integrity, validity and reliability of the research presented.

The book disseminates original research and new developments in public health, health care systems research and implementation science. It represents a substantially reworked and expanded body of scholarship derived from earlier doctoral research, incorporating new empirical data, interdisciplinary perspectives and additional analytical frameworks.

This scholarly book complies fully with the Department of Higher Education and Training (DHET) standards for originality, as outlined in the *Research Outputs Policy of 2015*. No part of the work has been plagiarised or previously published elsewhere, and all sources are appropriately cited and acknowledged.

This book is intended primarily for scholars and researchers in public health, epidemiology and health care systems research. It contributes to scholarly discourse by offering a rigorous, research-based framework for integrated care, thereby supporting further academic enquiry and theoretical development within the field.

Lufuno Makhado, Department of Public Health, Faculty of Health Sciences, University of Venda, Thohoyandou, South Africa

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List of abbreviations and acronyms

3TC	lamivudine
ABC	abacavir
AU	African Union
AGYW	adolescent girls and young women
AHRI	Africa Health Research Institute [RSA]
AI	artificial intelligence
AIDS	acquired immune deficiency syndrome
ANC	antenatal care
APC	adult primary care
apps	applications
ART	antiretroviral therapy
ARV	antiretroviral
ASCC	anal squamous cell carcinoma
ASSAf	Academy of Science of South Africa
ATV	atazanavir
AZT	zidovudine (azidothymidine)
BMI	body mass index
BP	blood pressure
BRICS	Brazil, Russia, India, China and South Africa
BRICS+	Brazil, Russia, India, China, South Africa plus Saudi Arabia, Egypt, United Arab Emirates, Ethiopia, Indonesia and Iran
CAB-LA	long-acting cabotegravir
CASP	Comprehensive Agricultural Support Programme
CBHTS	community-based human immunodeficiency virus testing services
CBO	community-based organisation
CBOs	community-based organisations
CCM	chronic care model

CCMDD	Central Chronic Medicines Dispensing and Distribution Programme
CD4	cluster of differentiation 4
CDC	Centers for Disease Control and Prevention [USA]
CHC	community health care
CHCWs	community health care workers
CI	confidence interval
CIN	cervical intraepithelial neoplasia
COBI	cobicistat
COVID-19	coronavirus disease 2019
CPD	continuous professional development
CPT	co-trimoxazole preventive therapy
CPUT	Cape Peninsula University of Technology
CQUIN	HIV Coverage, Quality, and Impact Network
CSE	comprehensive sexuality education
CSG	child support grant
CT	computed tomography
CYP3A4	cytochrome P450 3A4 enzyme
D4T	stavudine
DALYs	disability-adjusted life years
DHET	Department of Higher Education and Training [RSA]
DNA	deoxyribonucleic acid
DOT	directly observed therapy
DSD	differentiated service delivery
DTG	dolutegravir
dtic	Department of Trade, Industry and Competition
DRV	darunavir
EAC	enhanced adherence counselling
EBV	Epstein-Barr virus
ECD	early childhood development
ECG	electrocardiogram
EFV	efavirenz
eGFR	estimated glomerular filtration rate
EHR	electronic health record
EHRs	electronic health records
EZE	ezetimibe
FDC	fixed-dose combination
FIT	faecal immunochemical test

FOBT	faecal occult blood test
FTC	emtricitabine
FTIC	fast-track initiation and counselling
FUNDISA	Forum of University Nursing Deans in South Africa [RSA]
GBV	gender-based violence
GBVF	Gender-based Violence Response Fund
GDP	gross domestic product
GERP	GladAfrica Epilepsy Research Project
HbA1c	haemoglobin A1c (glycated haemoglobin)
HBCs	home-based carers
HBV	hepatitis B virus
HCV	hepatitis C virus
HCW	health care worker
HCWs	health care workers
HDL	high-density lipoprotein
HHV-8	human herpesvirus 8
HIMSS	Healthcare Information and Management Systems Society
HIV	human immunodeficiency virus
HIV-1	dominant global form of human immunodeficiency virus
HPV	human papillomavirus
HRH	human resources for health
HRM	human resources management
HRs	health records
HSRC	Human Sciences Research Council [RSA]
HTSs	human immunodeficiency virus testing services
IARC	International Agency for Research on Cancer
ICCM	integrated chronic care model
ICCMs	integrated chronic care models
ICDM	integrated chronic disease management
ICHC	integrated chronic health care
ICT	information and communication technology
ICU	intensive care unit
IEC	information, education and communication
IEG	Independent Evaluation Group
Ig	immunoglobulin
IKSs	indigenous knowledge systems
ILO	International Labour Organization
IMCI	integrated management of childhood illness

IMHS	integrated management of health services
INSTI	integrase strand transfer inhibitor
INSTIs	integrase strand transfer inhibitors
IOM	International Organization for Migration
IPCHS	Integrated People-Centred Health Services
IPHC	integrated primary health care
IPV	intimate partner violence
IRIMS	Integrated Research Integrity Management System
IRIS	immune reconstitution inflammatory syndrome
ISHP	Integrated School Health Programme
IT	information technology
kg	kilogram
KPIs	key performance indicators
KS	Kaposi's sarcoma
KSHV	Kaposi's sarcoma-associated herpesvirus
KZN	KwaZulu-Natal
LBC	liquid-based cytology
LDL	low-density lipoprotein
LDL-C	low-density lipoprotein cholesterol
LGBTQIA+	lesbian, gay, bisexual, transgender, queer (and questioning), intersex, asexual and others
LLMs	lipid-lowering medications
LLT	lipid-lowering treatment
LMIC	low- and middle-income country
LMICs	low- and middle-income countries
LPV	lopinavir
LPV/r	lopinavir co-administered with a low dose of ritonavir
LRM	Labour Relations Management
M&E	monitoring and evaluation
M&F	monitoring and feedback
MDR-TB	multidrug-resistant tuberculosis
MFA	multi-factor authentication
mHealth	mobile health
MSF	Médecins Sans Frontières
MSM	men who have sex with men
MSME	micro, small and medium-sized enterprises
MTCT	mother-to-child transmission
MUAC	mid-upper arm circumference

NAT	nucleic acid test
NCD	noncommunicable disease
NCDA	Noncommunicable Diseases Alliance
NCDs	noncommunicable diseases
NCI	National Cancer Institute [USA]
NCPI	National Commitments and Policy Instrument
NCR	National Cancer Registry [RSA]
NDBE	National Department of Basic Education [RSA]
NDoH	National Department of Health [RSA]
NDoL	National Department of Labour [RSA]
NDSD	National Department of Social Development [RSA]
NDWS	National Department of Water and Sanitation [RSA]
NGO	non-governmental organisation
NGOs	non-governmental organisations
NHI	National Health Insurance [RSA]
NHLS	National Health Laboratory Services [RSA]
NIDS-CRAM	National Income Dynamics Study – Coronavirus Rapid Mobile Survey [RSA]
NIMART	nurse-initiated management of antiretroviral therapy
NNRTI	non-nucleoside reverse transcriptase inhibitor
NPOs	non-profit organisations
NRTI	nucleoside reverse transcriptase inhibitor
NSBPF	National Scholarly Book Publishers Forum
NSNP	National School Nutrition Programme [RSA]
NSP	National Strategic Plan [RSA]
NVP	nevirapine
NWU	North-West University
NWU-HREC	North-West University Health Research Ethics Committee
NYDA	National Youth Development Agency [RSA]
OECD	Organisation for Economic Co-operation and Development
OHCHR	Office of the United Nations High Commissioner for Human Rights
OI	opportunistic infection
OIs	opportunistic infections
OSTP	Office of Science and Technology Policy [USA]
OTC	over the counter
PALSA PLUS	Practical Approach to Lung Health and HIV/AIDS in South Africa (expanded programme)
PCR	polymerase chain reaction

PCSK9	proprotein convertase subtilisin/kexin type 9
PDSA	Plan-Do-Study-Act
PEP	post-exposure prophylaxis
PEPFAR	United States President's Emergency Plan for AIDS Relief
PHC	primary health care
PI	protease inhibitor
PIH	Partners In Health
PIMART	pharmacist-initiated management of antiretroviral therapy
PIs	protease inhibitors
PLHIV	people living with human immunodeficiency virus
PLWNCDs	people living with noncommunicable diseases
PMTCT	prevention of mother-to-child transmission
PoC	point-of-care
PoPIA	Protection of Personal Information Act [RSA]
PPE	personal protective equipment
PrEP	pre-exposure prophylaxis
PSA	prostate-specific antigen
PTSD	post-traumatic stress disorder
QA	quality assurance
QAB	quality assurance body
QABs	quality assurance bodies
QIP	quality improvement plan
QoL	quality of life
QT	Q and T wave intervals (term describing the interval between regions on the electrocardiogram [ECG] wave)
QTc	Q and T wave intervals corrected
RDTs	rapid diagnostic tests
RNA	ribonucleic acid
RSA	Republic of South Africa
RTV	ritonavir
SADC	Southern African Development Community
SAHCS	Southern African HIV Clinicians Society
SAHRC	South African Human Rights Commission
SAMRC	South African Medical Research Council
SANAC	South African National AIDS Council
SANC	South African Nursing Council
SANHANES-1	South African National Health and Nutrition Examination Survey

SARB	South African Reserve Bank
SARIMA	Southern Africa Research Innovation Management Association
SASSA	South African Social Security Agency
SDG	Sustainable Development Goal
SDGs	Sustainable Development Goals
SDoH	social determinants of health
SEDA	South African Small Enterprise Development Agency
SHR	sexual health and reproductive
SIM	simvastatin
SMART	specific, measurable, achievable, relevant and time-bound
SME	small and medium-sized enterprise
SMEs	small and medium-sized enterprises
SOPs	standard operating procedures
SPO	structure–process–outcome
SPRINZ	Sports Performance Research Institute New Zealand
SPSS	Statistical Package for the Social Sciences
SRD	Social Relief of Distress
SRH	sexual and reproductive health
SSA	sub-Saharan Africa
Stats SA	Statistics South Africa
STI	sexually transmitted infection
STIs	sexually transmitted infections
STRETCH	Streamlining Tasks and Roles to Expand Treatment and Care for HIV
TAC	Treatment Action Campaign
TARSC	Training and Research Support Centre
TB	tuberculosis
TDF	tenofovir disoproxil fumarate
TLD	tenofovir disoproxil
TPT	tuberculosis preventive therapy
U=U	undetectable equals untransmissible
UCLA	University of California, Los Angeles
UCSF	University of California, San Francisco
UHC	universal health coverage
UJ	University of Johannesburg
UK	United Kingdom

UN CEPA	United Nations Committee of Experts on Public Administration
UN	United Nations
UNAIDS	Joint United Nations Programme on HIV/AIDS
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
UNIDO	United Nations Industrial Development Organization
Unisa	University of South Africa
UNIVEN	University of Venda
USA	United States of America
USAID	United States Agency for International Development
VL	viral load
VMMC	voluntary medical male circumcision
WASH	water, sanitation and hygiene
WBOTs	ward-based outreach teams
WBPHCOTs	ward-based primary health care outreach teams
WHO	World Health Organization
Wits RHI	University of the Witwatersrand Reproductive Health and HIV Institute
Wits	University of the Witwatersrand
WLHIV	women living with human immunodeficiency virus
ZDV	zidovudine

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Chapter 1

An overview of HIV and noncommunicable diseases

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Abstract

The intersection of human immunodeficiency virus (HIV) and noncommunicable diseases (NCDs) presents a significant challenge to global public health, particularly in sub-Saharan Africa, where both conditions are prevalent. People living with HIV (PLHIV) are at increased risk of developing NCDs, such as cardiovascular diseases, cancers, chronic respiratory conditions, diabetes and mental health disorders. This increased susceptibility is influenced by factors including the ageing population,

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chronic inflammation, side effects of antiretroviral therapy and lifestyle choices. The co-occurrence of HIV and NCDs complicates clinical outcomes, reduces the quality of life and strains health care systems, underscoring the need for integrated health care approaches. Several East African nations have initiated policies to integrate HIV and NCD services, but further research is needed to assess the impact and feasibility of these integration models. This chapter provides a comprehensive overview of the epidemiology, prevalence and challenges posed by the dual burden of HIV and NCDs, emphasising the need for tailored, context-specific interventions that address the unique needs of PLHIV. By exploring the interplay between HIV and NCDs and their implications for health care management, the chapter aims to contribute to the development of effective strategies for improving the health outcomes of individuals affected by these conditions.

Introduction

The human immunodeficiency virus (HIV) and noncommunicable disease (NCD) pandemics and endemics present formidable challenges to global public health, particularly in sub-Saharan Africa (SSA). People living with HIV (PLHIV) face an elevated risk of developing a spectrum of NCDs, including cardiovascular ailments, cancer, chronic respiratory disorders, diabetes and mental health issues. This heightened susceptibility can be attributed to factors such as the ageing cycle, chronic inflammation, side effects associated with antiretroviral therapy (ART), lifestyle choices and habits (FHI 360 2014; Moyo & Musekiwa 2021).

Furthermore, NCDs can compound the clinical outcomes and quality of life (QoL) of PLHIV, thereby burdening health care systems (Adeyemi et al. 2021; Noncommunicable Diseases Alliance [NCDA] 2021). Therefore, a need exists for a comprehensive approach that integrates the delivery of HIV and NCD care. This integration would not only enhance accessibility but also optimise the efficiency and effectiveness of health care services for PLHIV grappling with NCDs or NCD risk factors.

Several East African nations, including Kenya, Rwanda, Tanzania and Uganda, have initiated policies and strategies to merge HIV and NCD services across various levels of health care. This entails incorporating NCD screening, diagnosis and management into existing HIV programmes (Adeyemi et al. 2021; World Health Organization [WHO] 2023c). Nevertheless, the evidence concerning the impact and feasibility of such integration remains limited. Consequently, there is a need for additional research to assess the advantages and challenges of various integration models (HIV Coverage, Quality, and Impact Network [CQUIN] 2021; NCDA 2021).

Furthermore, the integration of HIV and NCD services must be tailor-made to cater to the specific needs and preferences of PLHIV. This approach should also consider the context-specific obstacles and facilitators that affect service delivery (Adeyemi et al. 2021; CQUIN 2021).

Human immunodeficiency virus and NCDs stand as significant global public health concerns. Human immunodeficiency virus causes a viral infection that targets and progressively impairs the immune system, potentially leading to acquired immunodeficiency syndrome (AIDS), a condition characterised by advanced immunosuppression and increased susceptibility to opportunistic infections (OIs) and certain malignancies. In contrast to infectious diseases, NCDs encompass chronic conditions such as cardiovascular diseases, diabetes, chronic respiratory disorders and cancer. Both HIV and NCDs contribute significantly to morbidity, mortality, long-term disability and reduced QoL.

As reported by the United Nations Children's Fund (UNICEF) in 2022, 39.0 million people were living with HIV globally, of whom 2.58 million were children aged 0–19 years (UNICEF 2023). While there was a 38% reduction in global HIV incidence in 2022 compared to 2010, HIV-related mortality remained high, with 630,000 deaths in 2022, including 84,000 children (WHO 2023a). The African region bore the heaviest HIV burden, with 25.6 million PLHIV, 660,000 new infections and 380,000 deaths in 2022 (WHO 2023c).

Noncommunicable diseases, on the other hand, account for a significant share of global mortality, resulting in 41 million deaths annually, which represents 71% of all global deaths (WHO 2018). Among these deaths, 15 million occurred prematurely in individuals aged 30–69 years. Leading risk factors for NCDs include tobacco and tobacco-product use, excessive alcohol consumption, physical inactivity and unhealthy dietary habits. Alarmingly, the African region bears a disproportionate burden of premature NCD-related deaths, with 37% occurring before the age of 70 years (WHO 2018). It is important to note that low- and middle-income countries (LMICs) bear the brunt of NCDs, with more than three-quarters of NCD-related deaths occurring in these regions (WHO 2023d). Additionally, NCDs and HIV interact in intricate ways, increasing the risk of morbidity and mortality among PLHIV (Tran et al. 2022).

People living with HIV face an elevated risk of developing NCDs because of various factors, including chronic inflammation, immune system activation, side effects of ART, the natural ageing process and shared risk factors (Deeks, Lewin & Havlir 2013). Conversely, NCDs can complicate the management of HIV infection and reduce the effectiveness of ART. Hence, a comprehensive and coordinated approach is imperative to prevent and treat HIV and NCDs.

The epidemiology and prevalence of HIV and NCDs exhibit regional and national variation. According to Tran et al. (2022), the global prevalence of HIV among adults aged 15–49 years was 0.8% in 2019, with regional variation ranging from 0.1% in the Eastern Mediterranean to 4.5% in SSA. While this study primarily examined cancer risk factors, it also provided valuable epidemiological data on HIV as a comorbidity and public health concern. In a broader public health context, the global prevalence of NCDs among adults aged 18 years and older was reported as 22.1%, with prevalence rates ranging from 16.6% in the Western Pacific to 28.9% in Europe. Additionally, in 2019, the global burden of HIV and AIDS, measured in disability-adjusted life years (DALYs), was 25.4 million, reflecting a 45.8% decline since 2000. In contrast, the global burden of NCDs was significantly higher, at 1.7 billion DALYs, marking a 14.9% increase over the same period.

Both HIV and NCDs can have significant impacts on the QoL, life expectancy, and social and economic development of individuals and communities. Table 1.1 summarises key epidemiological and prevalence statistics for HIV and NCDs globally and regionally, including South Africa, based on data from the Joint United Nations Programme on HIV/AIDS (UNAIDS) (2020), UNICEF (2023) and WHO (2018).

Human immunodeficiency virus data

According to UNAIDS modelled estimates, approximately 40.8 million people (uncertainty range: 37–45.6 million) were living with HIV globally in 2024, compared with an estimated 27.9 million (uncertainty range: 25.3–31.1 million) in 2000 (UNAIDS 2025). The rise in new HIV infections emphasises the urgent need for a comprehensive strategy to combat the epidemic, despite recent advancements in treatment. Effective prevention efforts should include pre-exposure prophylaxis (PrEP) for high-risk individuals; consistent condom use to mitigate transmission risk, as PrEP does not provide protection from sexually transmitted infections (STIs); regular HIV testing for early diagnosis and treatment, including HIV testing in pregnancy and among newborns and breastfed infants, as critical measures of prevention; and targeted interventions for people who inject illicit and toxic drugs to mitigate transmission. This reinforces the need for primary health care (PHC) service delivery for community-based sexual and reproductive health (SRH) education, awareness campaigns and outreach initiatives. Also, addressing the social determinants of health (SDoH) through structural interventions, such as improving access to sexual health and reproductive (SHR) care, reducing poverty and overcoming societal stigma and discrimination, is vital. Continued capital investment in research to develop effective HIV vaccines and explore potential cures is also critical to combatting HIV infection.

TABLE 1.1: Key statistics on the epidemiology and prevalence of human immunodeficiency virus and noncommunicable diseases globally, regionally and nationally.

Indicator	Global	Africa	South Africa
Number of PLHIV (2022)	39.0 million	25.6 million	7.5 million
Number of new HIV infections (2022)	1.3 million	790,000	180,000
Number of AIDS-related deaths (2022)	630,000	440,000	110,000
Number of people on antiretroviral therapy (2022)	29.8 million	20.7 million	5.1 million
Prevalence of NCDs among adults (2016)	18%	19%	18%
Number of deaths from NCDs (2016)	40.5 million	2.7 million	365,000
Leading causes of death from NCDs (2016)	• Cardiovascular diseases (44%) • Cancers (22%) • Respiratory diseases (10%) • Diabetes (4%)	• Cardiovascular diseases (37%) • Cancers (15%) • Respiratory diseases (9%) • Diabetes (6%)	• Cardiovascular diseases (41%) • Cancers (18%) • Diabetes (6%) • Respiratory diseases (5%)

Source: Tabulation of UNICEF, UNAIDS and WHO data by Lufuno Makhado.
Key: PLHIV, people living with human immunodeficiency virus; HIV, human immunodeficiency virus; AIDS, acquired immunodeficiency syndrome; NCDs, noncommunicable diseases; WHO, World Health Organization; UNICEF, United Nations Children's Fund; UNAIDS, Joint United Nations Programme on HIV/AIDS.

In 2014, UNAIDS introduced the 90–90–90 targets to end AIDS as a public health threat by 2030, aiming for 90% of PLHIV to know their status, 90% of those diagnosed to receive ART and 90% on treatment to achieve viral suppression by 2020. In many regions, progress towards the 'first 90' slowed as attention shifted to other global priorities. To accelerate gains and close remaining gaps along the cascade of care, the 95–95–95 targets were introduced the following year (Beyrer 2025). In contrast to many African nations, Western countries like the United Kingdom (UK) have seen a notable 37% reduction in new HIV diagnoses (UNAIDS 2023). Germany reported only 2,000 new infections and has achieved the United Nations' (UN) 90–90–90 targets, whereas Spain has approximately 150,000 individuals living with HIV (UNAIDS 2025). In Africa, countries with high HIV prevalence, such as Botswana (67%), Kenya (70%), Malawi (54%), Zimbabwe (47%), South Africa (57%) and Zambia (54%), have also recorded significant declines in new infections. These decreases are primarily attributed to ART, prevention programmes and community-driven initiatives (UNAIDS 2023).

Overall, new HIV infections have substantially declined over the past two decades, decreasing from 2.8 million in 2000 to 1.3 million in 2023. This decline encompasses both adults and children, with new HIV infections among children aged 0–14 years falling from 530,000 in 2000 to 120,000 in 2023, reflecting progress in preventing mother-to-child transmission (MTCT) (UNAIDS 2023).

AIDS-related deaths have also decreased sharply, from 1.8 million in 2000 to 630,000 in 2022. This improvement is largely attributed to the expansion of access to ART, which increased from 510,000 people in 2000 to over 30.7 million in 2022 (UNAIDS 2023).

Despite this progress, funding for the HIV response has fluctuated. Joint United Nations Programme on HIV/AIDS financial estimates (July 2024) report that global resources for HIV programmes peaked at US$21.5 billion in 2020 before declining to US$18.7 billion in 2024 (UNAIDS 2025). These figures highlight both the achievements and the ongoing challenges in the global fight against HIV.

Key points

People living with HIV

As of 2023, the global population of individuals living with HIV has reached a staggering 39.9 million, a notable increase from 27.2 million in the year 2000 (UNAIDS 2023). This surge in numbers reflects two significant phenomena: the ongoing transmission of the virus, indicating that despite advancements, HIV remains a persistent threat, and the remarkable improvements in medical treatment and care that have considerably enhanced the survival rates of those infected. Advances in ART have not only extended life expectancy and improved QoL for PLHIV but also transformed HIV from a once-terminal condition into a manageable chronic illness.

New human HIV

The landscape of new HIV infections has shifted positively, with annual global figures declining steadily from 2.8 million in 2000 to 1.3 million in 2023 (UNAIDS 2023). This reflects the effectiveness of targeted prevention strategies, including educational campaigns promoting safer sex practices and expanded access to PrEP, such as administration of oral tablets or injections from comprehensive SRH care services and providers. Despite this decline in infections, new infections persist at substantial levels, highlighting the ongoing demand for additional clinical vigilance and the need to work together to find and implement proactive measures in the health care fight against HIV.

Acquired immunodeficiency syndrome-related deaths

One of the most encouraging statistics in the fight against HIV and AIDS is the significant decline in AIDS-related deaths, which have plummeted from 1.8 million in 2000 to just 630,000 in 2023 (UNAIDS 2023). This remarkable decrease is primarily attributable to the widespread availability and

effectiveness of ART. These life-saving medications have not only reduced viral loads in many patients to undetectable levels, thereby preventing transmission, but also vastly improved QoL for PLHIV. The widespread availability of ART over the past two decades has transformed HIV from a frequently fatal infection into a manageable chronic condition, enabling PLHIV to maintain their health and participate more fully in employment, family life and their communities.

☐ New HIV infections among adolescents and adults aged 15 years and older

When examining the statistics for adolescents and adults aged 15 years and older, there has been a significant decline in new infections, dropping from 2.3 million in 2000 to 1.2 million in 2023 (UNAIDS 2023). This decline highlights the effectiveness of targeted prevention strategies designed specifically for the adolescent and adult population. Comprehensive education, stigma reduction and increased accessibility to testing and treatment have played pivotal roles in this progress. Additionally, community-based initiatives and outreach programmes have empowered individuals to take charge of their SRH, leading to more mindful behaviours regarding HIV prevention.

☐ New HIV infections among children aged 0–14 years

The fight against HIV has also seen remarkable success in protecting younger populations, particularly among children aged 0–14 years. New HIV infections in this age group have dramatically decreased from 530,000 in 2000 to just 120,000 in 2023 (UNAIDS 2023). This substantial reduction can be largely attributed to successful programmes aimed at preventing MTCT. These initiatives, which include routine HIV testing for pregnant women, access to antiretroviral (ARV) medications during pregnancy and breastfeeding, and continuous support and PHC for mothers, have played a crucial role in ensuring that fewer infants (children) are born with HIV, thereby safeguarding their health and securing their future.

☐ People accessing antiretroviral therapy

The landscape of HIV treatment has transformed significantly, with the number of individuals accessing ART soaring from a mere 510,000 in 2000 to an astonishing 30.7 million in 2023 (UNAIDS 2023). This dramatic increase highlights the critical importance of expanding access to ART as a cornerstone of effective HIV treatment and prevention. The widespread availability of ART has been instrumental in reducing AIDS-related deaths and has greatly enhanced the QoL for those living with HIV. By

facilitating adherence to treatment regimens, providing continuous PHC and medical support, and advancing health care systems and technologies, individuals are being empowered to maintain their health and remain actively engaged in their lives and communities. The health care journey towards an AIDS-free generation continues, with ongoing commitment to prevention, treatment and stigma reduction at its core.

Noncommunicable disease data

As the global landscape of health continues to evolve, NCDs have emerged as a critical public health concern, particularly in regions grappling with high burdens of infectious diseases such as HIV. With advancements in ART improving the life expectancy of PLHIV, there has been a marked epidemiological transition from OIs to chronic, noncommunicable conditions as the leading causes of morbidity and mortality.

This dual burden presents new and complex challenges for health care systems and providers, especially in LMICs, where resources are limited and integrated care models are underdeveloped. The growing prevalence of hypertension, diabetes, cardiovascular disease and certain cancers among PLHIV reflects the interplay of biological, behavioural and systemic risk factors, including ART side effects, chronic immune activation and socioeconomic determinants of health. This section examines the rising burden of NCDs among PLHIV, the shifting mortality trends and the urgent need for holistic, integrated health care strategies that address this syndemic intersection. It also considers the broader global burden of NCDs and underscores the importance of addressing modifiable risk factors and strengthening surveillance to inform effective policy and clinical interventions.

Prevalence of noncommunicable diseases among people living with HIV

People living with HIV are experiencing a shift in mortality and morbidity patterns, with an increasing proportion of NCDs or chronic conditions rather than OIs. In South Africa, NCD prevalence in the general adult population includes hypertension (20.1%), diabetes (5.4%–6.1%), and overweight or obesity (32.2%), as well as cervical cancer (1.5%), hypercholesterolemia (30.4%) and depression (Statistics South Africa [Stats SA] 2021). Although these figures are population-level estimates and not specific to PLHIV, they are highly relevant given the growing overlap between HIV and NCDs. Various studies and global reports from the WHO and UNAIDS highlight increasing concern regarding the rising burden of NCDs among PLHIV. This epidemiological transition indicates

the need for comprehensive PHC that addresses both HIV-specific needs and broader health concerns through integrated HIV and NCD prevention and management models, in order to reduce the overall burden of disease.

Studies show that PLHIV are at higher risk of developing NCDs, such as cardiovascular disease, diabetes and certain cancers because of a combination of factors, including ART side effects, chronic inflammation and lifestyle factors, especially in LMICs or resource-limited settings like Africa.

Noncommunicable diseases are a significant global health concern, responsible for a substantial burden of illness and death. Noncommunicable diseases account for 74% of all deaths globally, affecting individuals across all age groups and regions but disproportionately impacting LMICs (WHO 2023d). Each year, 41 million people die from NCDs, demonstrating the widespread prevalence of these conditions among adults.

Number of deaths from noncommunicable diseases

Globally, NCDs claim the lives of 41 million people annually. Alarmingly, 17 million of these deaths occur before the age of 70 years, with 86% of these premature deaths taking place in LMICs (WHO 2023d). The high mortality rate associated with NCDs highlights the urgent need for effective prevention and management strategies, especially in resource-limited settings.

Research has also documented a shift in the cause of death among PLHIV, with NCDs becoming more prominent, whereas OIs-related deaths have declined because of effective ART. The WHO (2023d) defines the underlying cause of death as either (1) the disease or injury that triggers the sequence of events leading directly to death or (2) the circumstances surrounding an accident or violence that resulted in the fatal injury.

From 2019 to 2021, diseases of the circulatory system were the leading cause of death in South Africa, accounting for 17.5%, 17.8% and 15% of deaths, respectively. This category includes diabetes, which is ranked the leading cause of death in South Africa, followed by hypertension and cardiovascular or heart diseases. The fourth leading cause of death is HIV and AIDS. Despite the COVID-19 pandemic, which claimed 7.0% of lives in 2020 and 15.1% in 2021, including unclassified symptoms and signs. However, circulatory system diseases persisted as a significant health concern (Stats SA 2021). Besides NCDs, tuberculosis (TB) is a significant cause of death among PLHIV, ranking as the seventh leading cause of death in South Africa. From 2019 to 2021, TB mortality rates decreased, from 5.5% in 2019 to 4.0% in 2020 and 2.9% in 2021 (Stats SA 2021).

Four major global disease groups dominate the leading causes of death from NCDs (WHO 2023d):

- Cardiovascular diseases, which are responsible for the highest number of NCD-related deaths, claim 17.9 million lives each year
- Cancers are the second leading cause, resulting in 9.3 million deaths annually
- Chronic respiratory diseases account for 4.1 million deaths every year
- Diabetes mellitus contributes to 2.0 million deaths annually, including deaths from kidney disease caused by diabetes.

Together, these four major NCD groups not only account for the vast majority of premature NCD-related deaths but also highlight the urgent need for targeted prevention, early detection and effective management strategies to reduce their global burden.

Risk factors and response to noncommunicable diseases

Several modifiable risk factors significantly increase the likelihood of developing and dying from NCDs (WHO 2023c, 2023d, 2025):

- Tobacco use
- Physical inactivity
- Harmful use of alcohol
- Unhealthy diets, encompassing both undernutrition (including inadequate energy and micronutrient intake leading to wasting, stunting and micronutrient deficiencies) and overnutrition (diets high in salt, sugar and unhealthy fats that contribute to overweight and obesity)
- Air pollution (external factors).

In the African context, unhealthy diets represent a critical and complex risk factor because of the dual burden of malnutrition, where undernutrition and obesity coexist within the same populations, households and even individuals. Children continue to die from hunger and severe acute malnutrition in conflict-affected and humanitarian crisis settings across Africa, including Sudan, South Sudan, the Central African Republic, northern Nigeria, the Lake Chad Basin, eastern Democratic Republic of Congo and Tigray in Ethiopia (UNICEF 2025; WHO 2024). South Africa faces a different challenge, with persistent child undernutrition and stunting, particularly in the Eastern Cape, occurring alongside rising adult obesity and diet-related NCDs (Hall et al. 2024).

Addressing these risk factors through public health initiatives is therefore crucial for mitigating the effects of NCDs. In addition to prevention, early

detection, screening and treatment of NCDs, appropriate palliative care is an essential component of a holistic health care system response. Effective management of NCDs requires a multifaceted, life-course approach that integrates nutrition security, health promotion, timely diagnosis and sustained treatment to reduce morbidity and mortality.

Navigating the dual burden of HIV and noncommunicable diseases in South Africa: Challenges and strategies in health management

The confluence of HIV and NCDs in South Africa presents a complex health care landscape as a representative of a larger global health issue. While South Africa grapples with one of the world's highest HIV burdens, it also contends with the escalating prevalence of NCDs. This dual health burden mirrors a global trend where HIV, once a dominant cause of mortality, coexists with the surging tide of NCDs, underscoring the complexity of health care management in these contexts.

Noncommunicable diseases, as defined by the WHO, include conditions that are not transmissible from person to person and are typically not caused by infectious agents. As PLHIV survive longer on lifelong ART with sustained viral suppression, they are increasingly diagnosed with classical NCDs, such as cardiovascular disease, diabetes and other metabolic disorders. It is important, however, to distinguish these conditions from malignancies that are causally linked to chronic viral infections. Certain cancers, including cervical cancer and Kaposi's sarcoma (KS), arise from oncogenic viral infections (oncoviruses) and therefore fall outside conventional NCD classifications, despite occurring frequently in PLHIV. Their occurrence reflects complex interactions between persistent viral infection, immune dysregulation, inflammation and ageing rather than NCDs processes *per se*. Clear conceptual separation between NCDs and infection-associated malignancies is essential to avoid misclassification and ensure conceptual clarity in HIV and chronic disease discourse.

The NCDs group includes heart disease, cancer, chronic respiratory disorders and diabetes. Noncommunicable diseases are particularly insidious because many risk factors are modifiable, such as smoking, poor diet, physical inactivity and excessive alcohol consumption. Nevertheless, they can also be influenced by immutable biological factors, such as age and genetics, highlighting the intricate web of determinants at play (Olufemi et al. 2024). For PLHIV in South Africa, the burden of NCDs looms large, driven by a multifaceted interplay of factors. Firstly, HIV itself, when

uncontrolled, can incite chronic inflammation and immune activation, resulting in the inadvertent damage of various organs and tissues, which elevates the risk of NCDs, including cardiovascular diseases, cancers and diabetes (Olufemi et al. 2024).

Within the context of navigating the dual burden of HIV and NCDs in South Africa, long-term ART has transformed HIV into a manageable chronic condition but has also introduced new clinical management considerations. Certain ARVs are associated with metabolic and organ-related adverse effects, including dyslipidaemia, impaired glucose regulation, reduced bone mineral density and renal dysfunction, which may contribute to an increased risk of NCDs among PLHIV (Olufemi et al. 2024). In South Africa, however, these risks are well-recognised and proactively addressed through health care system strategies. Clinicians and nurses trained under the nurse-initiated management of anti-retroviral therapy (NIMART) programme and guided by the South African National Department of Health (NDoH) ART guidelines are able to screen for treatment-related complications routinely, prioritise regimens with improved safety profiles and implement timely regimen switches when required. These practices exemplify a strategic, guideline-driven care-based approach to managing HIV alongside NCD risk, highlighting both the challenges and adaptive responses within South Africa's health care system.

Additionally, the risk factors for NCDs are not exclusive to either HIV or these chronic conditions but often overlap. People living with HIV may share common risk behaviours with NCDs, including tobacco and related products use, alcohol consumption and abuse, poor nutritional status and physical inactivity (Oni et al. 2015; WHO 2022, pp. 22–30, 40–45, 2023b, pp. 9–15). This convergence of risk factors shows the need for holistic, patient-centred care that addresses the full spectrum of health challenges PLHIV face (UNAIDS 2021, pp. 38–44, 50–54).

In this intricate landscape, comorbidities between HIV and NCDs emerge as a stark reality. Cardiovascular diseases, including coronary heart disease, stroke, peripheral arterial disease and heart failure, disproportionately affect PLHIV. These conditions result from a combination of HIV-related factors, such as chronic inflammation and immune activation, alongside traditional risk factors like smoking, hypertension, dyslipidaemia and diabetes (Oni et al. 2015).

Both AIDS-defining and non-AIDS-defining cancers pose a formidable challenge to PLHIV. The weakened immune system characteristic of HIV infection renders individuals more susceptible to certain cancers, such as KS, non-Hodgkin lymphoma and cervical cancer. These three cancers are associated with concomitant oncogenic viral infections, including Kaposi's sarcoma-associated herpesvirus (KSHV/HHV-8), Epstein-Barr virus (EBV)

and human papillomavirus (HPV). However, PLHIV are also at risk of non-AIDS-defining cancers, such as lung, liver and anal cancers, because of a complex interplay of HIV-related factors and traditional risk factors, such as smoking and alcohol consumption (Oni et al. 2015).

Additionally, the risk of developing type 2 diabetes is elevated among PLHIV because of a combination of HIV-related chronic inflammation, long-term ART exposure, natural ageing cycle and traditional risk factors such as obesity, physical inactivity and genetic predisposition (Oni et al. 2015).

Addressing the complex interplay between HIV and NCDs requires a multifaceted approach. It involves not only effective management of HIV infection but also proactive prevention and treatment of NCDs in PLHIV. Key components include regular monitoring, early detection, lifestyle interventions and targeted therapies tailored to the unique needs and challenges of PLHIV. Moreover, it highlights the need for health care policies and systems that are equipped to address this dual burden comprehensively.

In South Africa, where health care resources are often stretched, identifying effective strategies to manage both HIV and NCDs is essential. Evidence from a cohort of adults aged 40 years and older who were virologically suppressed on ART in the Limpopo province of South Africa shows a high prevalence of chronic comorbid conditions. Specifically, 32% were living with hypertension and 5% were living with diabetes, and substantial proportions had NCD risk-aggravating factors, such as overweight, obesity, tobacco and tobacco-product smoking and unhealthy diets. This burden of NCDs and associated risk behaviours among PLHIV underscores the need for integrated health care responses that address both infectious and chronic conditions (Lebina et al. 2023). By acknowledging these interconnections, South Africa and other countries facing similar dual burdens can develop more effective and integrated health care systems that improve overall population health. Key strategies include optimising prevention through vaccination and systematic screening for cancers, hypertension and diabetes, which are major contributors to NCD-related mortality.

Economic and health care impacts of HIV and noncommunicable disease coexistence in South Africa

The coexistence of HIV and NCDs in South Africa has profound implications for both the health care system and the nation's economy. This dual burden presents multifaceted challenges with far-reaching consequences.

The combined burden of HIV and NCDs creates a reinforcing cycle of strain across health care systems, households and the broader economy. Increased demand for PHC services places pressure on already constrained systems, which can compromise the efficiency and quality of care and, in turn, contribute to poorer health outcomes and greater service demand. At the same time, rising direct health care costs for patients and providers further deplete household and public resources, limiting the capacity for effective prevention and long-term sustainable management. These pressures are compounded by indirect costs to the health care system arising from reduced productivity, including absenteeism, presenteeism, labour force withdrawal (early retirement or resignations without filling the vacant positions in time, or at all) and premature mortality. Collectively, these dynamics suppress household income and savings while also weakening national capacity, productivity and economic growth, thereby reducing the overall capacity to respond effectively and perpetuating the cycle of disease burden and resource constraint.

To contextualise the economic implications, it is necessary to consider the impacts of HIV and NCDs individually. Various studies have assessed these impacts through different methods and assumptions. Using a neoclassical growth model, Haacker (2002) estimated that the HIV epidemic reduced per capita income growth by approximately 0.3–0.4 percentage points annually between 1990 and 2000 in South Africa. Similarly, employing a macroeconomic model to project the impact of HIV on gross domestic product (GDP) growth, Whiteside (2016) found a decline of 0.9–1.3 percentage points annually between 2000 and 2010, primarily because of the erosion of human capital and the supply of experienced workers. Despite the expansion of ART, HIV continues to have adverse economic consequences through its effects on labour productivity and human capital. Evidence from South Africa indicates that ART mitigates the negative relationship between HIV and real GDP per capita by improving worker productivity, although it does not eliminate the broader economic effects of the epidemic (Bidzha, Ngepah & Greyling 2024). Investment in ART, however, yields substantial economic returns and mitigates further losses (Simelela et al. 2015), highlighting the critical interplay between health interventions and economic resilience.

Although studied less extensively, NCDs also impose a substantial economic burden. World Health Organization (2019) used a computable general equilibrium model to estimate that NCDs reduced South Africa's GDP by 6.8% in 2015, with projections suggesting a potential decline of up to 17% by 2030 if no interventions are implemented. Labour productivity losses were identified as the primary driver, reflecting the impact of chronic illness on sufficient labour supply.

In summary, the intersection of HIV and NCDs poses significant health and economic challenges for South Africa. Their frequent co-occurrence adds complexity to clinical management, increases health care costs and exerts substantial adverse effects on economic growth through reductions in human capital and labour productivity. These realities draw attention to the urgent need for integrated, coordinated interventions that simultaneously prevent, screen for and manage HIV and NCDs, thereby mitigating their profound social and economic consequences and strengthening national development.

The imperative for comprehensive care within primary health care facilities in South Africa

South Africa grapples with a formidable health care challenge characterised by the dual burden of chronic communicable diseases and NCDs, which profoundly impact the health care system and the QoL of its citizens. Within chronic communicable diseases, HIV remains a prominent public health concern, with an estimated 7.5 million South Africans living with HIV in 2019 (UNAIDS 2020). Conversely, NCDs, including cardiovascular diseases, diabetes, cancers and chronic respiratory diseases, have ascended as the leading causes of morbidity and mortality, collectively contributing to 43% of all deaths in 2016 in South Africa (WHO 2018). The coexistence of HIV and NCDs further complicates care delivery, escalating the demand for integrated management at the PHC level.

Integrated management of HIV and NCDs involves the provision of comprehensive and well-coordinated care for individuals facing multiple chronic conditions. This approach follows a patient-centric philosophy that addresses not only physical health issues but also psychological and social needs (WHO 2018). The potential benefits of integrated management are manifold, ranging from improved clinical outcomes and enhanced QoL for patients to reduced costs and increased operational efficiency for the PHC system (Mayosi et al. 2009).

Nonetheless, the implementation of integrated management of HIV and NCDs in South Africa encounters a multitude of challenges, especially in underserved, hard-to-reach and rural areas. While national bodies, such as the South African NDoH and the Southern African HIV Clinicians Society (SAHCS), regularly publish updated HIV management guidelines on their website[1] and related subspecialties issue condition-specific protocols (e.g. for hypertension and diabetes), the core issue often lies in the inconsistent

1. Refer to https://www.sahivsoc.org/subheader/index/sahcs-guidelines

dissemination, access and practical application of these guidelines at the PHC level, particularly in poorly resourced or rural clinics (Murudi-Manganye, Makhado & Sehularo 2020).

Nurses, who form the backbone of PHC delivery, frequently lack context-specific integrated guidelines, standardised training and ongoing mentorship to apply HIV and NCD protocols concurrently. To support the case for integration, multiple streams of evidence must converge, including epidemiological data showing an increasing NCD burden among PLHIV, economic analyses revealing inefficiencies in parallel systems and implementation studies from LMICs confirming the feasibility of integrated care (Adeyemi et al. 2021). While HIV and NCD guidelines exist separately and are regularly published by the South African NDoH and relevant specialist societies, the primary issue lies in operational translation and equitable access at the PHC level (Adeyemi et al. 2021; Oni et al. 2015). This is especially true in rural and under-resourced clinics, where community health care workers (CHCWs) face challenges in applying guidelines holistically. Alignment with strategy frameworks, such as WHO PEN-Plus and the UNAIDS' Global AIDS Strategy, supports the development of integrated, cost-effective models tailored for resource-limited contexts (Bukhman et al. 2023). Additionally, the upward referral process to access NCD expertise often results in fragmented care, further exacerbating challenges for patients in rural settings. Addressing this gap requires not only the creation of guidelines but also ensuring operational integration, capacity-building and equitable access.

As such, there is a pressing need to develop evidence-based policies and frameworks, as well as to establish localised implementation models, mechanisms for monitoring and feedback (M&F) and continuous professional development (CPD), especially targeting nurses and frontline health care workers (HCWs) (Murudi-Manganye, Makhado & Sehularo 2021).

Conclusion

The convergence of HIV and NCDs represents a complex and multifaceted PHC challenge, particularly in regions like SSA, where both conditions are highly prevalent. The co-occurrence of these diseases not only exacerbates clinical outcomes for individuals but also places an immense strain on already burdened PHC systems. The evidence underscores the urgent need for integrated and comprehensive health care approaches that address both HIV and NCDs simultaneously, recognising the intricate interplay of factors such as chronic inflammation, the side effects of ART and shared lifestyle risk factors.

To manage the dual burden of HIV and NCDs effectively, health care strategies must be patient-centred and context-specific, taking into account the unique needs and challenges faced by PLHIV. This includes regular monitoring, early detection, lifestyle interventions and the development of targeted therapies. Furthermore, PHC systems in affected regions must be strengthened to accommodate the increased demand for services, with a focus on improving accessibility, efficiency and quality of care.

Integrating HIV and NCD care into PHC is crucial for improving health outcomes and QoL in affected regions. Researchers, policymakers, health care providers and support staff, such as CHCWs, must work collaboratively to develop and implement evidence-based strategies that address this dual burden, ensuring that health care systems are equipped to meet the complex needs of the populations they serve. Through sustained efforts and innovative approaches, it is possible to mitigate the impact of HIV and NCDs, leading to better health outcomes and a more resilient public health infrastructure.

Additionally, the economic justification for integration is substantial. Studies estimate that HIV alone has reduced South Africa's GDP growth by 0.6%–1.0% annually post-2015 (Masyuko 2020; Phalane et al. 2019) and NCDs could cause losses up to 17% of GDP by 2030 if left unaddressed (WHO 2019). Integration is not just a health imperative but a fiscal one, ensuring continuity of care for PLHIV while reducing long-term costs associated with service duplication, absenteeism and premature mortality.

Moving forward, health care systems must transition from siloed programming to people-centred integrated models, guided by WHO's PEN-Plus and national policy alignment. Priorities should include developing localised training packages for nurses, integrating digital systems into patient records, and establishing monitoring frameworks to evaluate real-world implementation. By investing in integrated HIV–NCD care at the PHC level, South Africa can mitigate dual disease burdens and enhance long-term population health, economic productivity and public trust in the PHC system.

Declarations

Ethical considerations

This chapter is based on secondary analysis of published literature and policy documents. No human or animal participants were involved.

Consent

Not applicable.

Authors' contributions

Conceptualisation, L Makhado and TG Makhado; *data curation*, L Makhado; *formal analysis*, L Makhado; *investigation*, L Makhado; *methodology*, L Makhado and TG Makhado; *project administration*, L Makhado; *resources*, L Makhado; *validation*, TG Makhado; *writing – original draft*, L Makhado and TG Makhado; and *writing – review and editing*, L Makhado and TG Makhado.

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Data availability

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Disclaimer

The views expressed in this chapter are those of the authors and do not necessarily represent the official views of their affiliated institutions or those of the publisher.

Chapter 2

The impact of social determinants of health on HIV and noncommunicable disease epidemics in South Africa

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Abstract

This chapter considers the profound influence of social determinants of health (SDoH) on the human immunodeficiency virus (HIV) and noncommunicable disease (NCD) epidemics in South Africa. Social determinants of health describe the conditions in which individuals are born, grow, work, live and age. They encompass a wide array of societal forces and systems that shape daily life. This chapter comprehensively explores key SDoH factors contributing to the ongoing health challenges in South Africa, a nation marked by high poverty levels, inequality and

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violence. The multifaceted nature of these determinants is examined, with a specific focus on poverty, education, social inequality, environmental factors and challenges in the health care system. Furthermore, the chapter emphasises the need for a holistic, multisectoral approach to address SDoH and mitigate their impact on the HIV and NCD epidemics in South Africa.

Introduction

The social determinants of health (SDoH) are pivotal forces that intricately shape the health and wellbeing of populations worldwide. As defined by the World Health Organization (WHO), SDoH encompasses the multifaceted conditions in which individuals are born, grow up, work, live and age, along with the wider forces, systems and structures that mould the circumstances of daily life (WHO 2025b). South Africa, a nation grappling with stark socioeconomic disparities, presents a case study demonstrating the profound impact of SDoH on two pressing public health challenges: the human immunodeficiency virus (HIV) epidemic and the rising prevalence of noncommunicable diseases (NCDs). This chapter embarks on an extensive exploration of these determinants, underpinned by a robust academic foundation.

The burden of disease in South Africa

South Africa stands at the intersection of numerous public health care challenges. The nation has been marked by apartheid, colonialism and socioeconomic inequalities, which have affected the population's health (Coovadia 2009; Mayosi et al. 2012). Amid these complexities, the country grapples with a high burden of HIV, with an estimated 7.5 million people living with HIV (PLHIV) in 2019 (Joint United Nations Programme on HIV/AIDS [UNAIDS] 2020). Noncommunicable diseases, including cardiovascular diseases, diabetes, cancers and chronic lower respiratory diseases, increased by 58.76% in the 21-year period from 103,428 in 1997 to 164,205 in 2018 (Statistics South Africa [Stats SA] 2023).

The role of social determinants of health in shaping health outcomes

Understanding the profound influence of SDoH is fundamental to deciphering the dynamics of the HIV and NCD epidemics in South Africa. These determinants are woven into the fabric of health disparities. Poverty remains a principal driver of poor health. According to the National Strategic Plan on HIV, TB [tuberculosis] and STIs [sexually transmitted infections] 2023–2028, over 14 million South Africans live in extreme poverty, which

severely compromises access to nutritious food, stable housing and health care (South African National AIDS Council [SANAC] 2023). A study by Militao et al. (2024) further illustrates that food insecurity, a direct manifestation of poverty, correlates strongly with poor HIV and NCD outcomes among youth, especially in households with low socioeconomic status. For adolescents living with HIV in urban informal settings, food insecurity undermines antiretroviral therapy (ART) adherence and increases vulnerability to chronic illness.

Education is another critical protective factor. Lower levels of education are associated with heightened HIV risk, especially among adolescent girls and young women (AGYW). The UNAIDS (2024) reports that AGYW with secondary education are significantly less likely to acquire HIV than those with incomplete schooling. Education enhances health literacy, employment potential and social agency, contributing to healthier decision-making and reduced exposure to NCD risk factors, such as tobacco, alcohol and poor diets. Nevertheless, South Africa grapples with multifarious challenges in providing equitable access to quality education, including infrastructure deficits, resource scarcities, teacher absenteeism, violence and corruption (Spaull & Kotze 2015).

Health care access and service quality vary significantly across regions. In 2023, 73.1% of South African households indicated that they would first consult a public clinic, hospital or other public institution when a household member became ill or was injured. In contrast, only 15.7% of individuals were covered by a medical aid scheme (Stats SA 2024). Access remains unequal, with affordability, transport costs and distance to facilities affecting disadvantaged households, while public-sector users also report long waiting times, absent health care workers and inadequate medical supplies (Gordon, Booysen & Mbonigaba 2020). Although ART services are widely available, Sahu et al. (2025) highlight that PLHIV in the KwaZulu-Natal (KZN) province also face high rates of untreated NCDs, such as hypertension and obesity. The lack of integration between HIV and NCD services in primary health care (PHC) settings results in missed opportunities for early intervention.

Housing and infrastructure inequalities also heighten health risks. Statistics South Africa (2021) notes that a significant portion of the population still lives in informal settlements lacking clean water and sanitation, conditions that fuel both communicable diseases and hinder chronic care. Environmental stressors, including climate-related changes, also exacerbate food insecurity and vector-borne infections.

As we explore the complex landscape of SDoH, it becomes evident that these interconnected factors significantly influence the health outcomes of individuals and populations. This chapter will examine the multifaceted

dimensions of social inequality, environmental influences and challenges within the PHC system, each uniquely impacting the HIV and NCD epidemics in South Africa. Addressing these intricate challenges requires a comprehensive, multisectoral approach that extends beyond the health care sector, engaging education, social development, justice and finance. The primary objective is to reduce poverty and inequality, enhance access to and the quality of care, advocate for human rights and social justice, and empower communities to participate in decision-making and advocacy actively (WHO 2020).

Central to this strategy are policies such as the *National Health Insurance Act 20 of 2023* (Republic of South Africa [RSA] 2024) and the SANAC (2023) National Strategic Plan on HIV, TB and STIs 2023–2028. These initiatives aim to bridge health inequities by targeting upstream determinants, including education, infrastructure, food systems and health care delivery. The convergence of these efforts is vital for alleviating the compounded burden of HIV and NCDs, underscoring the necessity of a coordinated response that addresses the complex web of factors influencing health in the region.

Key social determinants of health

Understanding the SDoH is essential for addressing the intersecting epidemics of HIV and NCDs in South Africa. These determinants, ranging from poverty, education and unemployment to housing, food security and cultural beliefs, are not peripheral factors but central, structural forces that shape health outcomes, access to PHC and disease trajectories. In a country marked by stark inequalities, historical injustices and an overburdened health care system, the social environment exerts a powerful influence on both the risk of acquiring disease and the capacity to manage it. For PLHIV and those affected by NCDs, these factors often converge in ways that amplify vulnerability, hinder treatment adherence and widen health disparities. This section critically examines the most salient SDoH within the South African context. It emphasises how they contribute to the syndemic nature of HIV and NCDs and why any effective public health strategy must engage with these root causes to achieve equity and sustainability in care.

Poverty

Poverty is both a foundational cause and a consequence of health disparities, profoundly influencing the course of the HIV and NCD epidemics in South Africa. The stark divide between socioeconomic strata shapes individuals' access to essential resources and opportunities. Those living in

poverty often face many barriers, including limited access to health care, education, adequate nutrition, and basic sanitation (Noncommunicable Diseases Alliance [NCDA] 2022; WHO 2020). As a result, their vulnerability to infections and chronic diseases is markedly elevated. Moreover, the economic hardships associated with poverty further undermine individuals' ability to adhere to treatment regimens and cope with the complex economic and social ramifications of illness (NCDA 2022; WHO 2020).

While poverty is a powerful structural determinant of health, it is not a deterministic predictor of HIV infection. It is important to recognise that not all individuals living in poverty acquire HIV, suggesting the presence of protective factors and mediating influences that shape individual and community-level vulnerability. These may include access to information, strong social support networks, community health initiatives, individual agency and culturally embedded protective norms (SANAC 2023; UNAIDS 2024). For instance, research in KZN indicates that even among socioeconomically disadvantaged populations, individuals who had completed secondary education and engaged with peer-driven health care services exhibited significantly lower HIV incidence (Sahu et al. 2025).

Additionally, gender, geography, age and behavioural patterns interact with poverty to determine risk exposure. Socioeconomic disadvantage and unequal gender relations contribute to adverse reproductive health outcomes among AGYW, while poverty, urban residence and geographical location may increase exposure to intimate partner violence (IPV) (Keetile & Setshegetso 2025; Malisha & Tsawe 2025). In sub-Saharan Africa, HIV prevalence among AGYW aged 15–24 years is more than three times that among their male counterparts, reflecting the influence of poverty, gender inequality and constrained sexual autonomy (UNAIDS 2024). Evidence from South Africa further shows that transactional and other forms of exchange sex in informal settlements are associated with socioeconomic and behavioural vulnerabilities relevant to HIV risk, and that IPV and unequal relationship power increase young women's risk of acquiring HIV (Jewkes et al. 2010; Stoebenau et al. 2023). In contrast, some poor households may benefit from targeted social interventions, such as conditional cash transfers or mobile health (mHealth) outreach, which reduce risk despite material deprivation.

Thus, while poverty significantly amplifies HIV vulnerability by limiting access to prevention and care, the pathway from poverty to HIV is neither uniform nor inevitable. Recognising this heterogeneity is essential for designing nuanced interventions that target structural risks and bolster protective factors.

Education

Education significantly influences health outcomes by shaping individuals' knowledge, attitudes, behaviours and life opportunities. In the context of the HIV epidemic, it is crucial for reducing transmission rates through increased awareness, condom use and regular testing (Hogan, Galai & Davis 2021; WHO 2020). Additionally, education helps combat NCDs by promoting healthier lifestyles and reducing exposure to risk factors, such as tobacco use, alcohol consumption and abuse, and unhealthy dietary habits (Hogan et al. 2021; WHO 2020). However, South Africa must improve equitable access to quality education, as challenges such as inadequate infrastructure, resource shortages, teacher absenteeism, school violence and corruption obstruct many South Africans from fully realising education's potential (Spaull & Kotze 2015).

These educational disparities are particularly stark in rural and underserved areas of South Africa, where access to quality schooling remains limited. According to the South African National Health and Nutrition Examination Survey (SANHANES-1), individuals in rural provinces such as the Eastern Cape and Limpopo report lower average years of education and simultaneously face a higher prevalence of both HIV and NCDs, including hypertension and obesity (Shisana et al. 2014). This overlap suggests a strong spatial correlation between poor educational access and adverse health outcomes.

Furthermore, data from the Stats SA General Household Survey of 2023 indicate that rural residents are significantly less likely to have completed secondary education and more likely to report barriers to health care access, including long distances to facilities and limited staff availability (Stats SA 2024). This double burden of educational deprivation and health care service inaccessibility contributes to heightened vulnerability to both infectious and chronic diseases in rural communities.

The National Strategic Plan for HIV, TB and STIs also identifies adolescents and youth in rural provinces as a high-risk group for HIV acquisition, citing lower education levels, poor sexual health knowledge, and reduced access to prevention services (National Department of Health [NDoH] 2023). These findings show the importance of strengthening educational infrastructure and community-based health interventions in rural areas, not only as a social imperative but also as a public health priority.

Social inequality

Social inequality, manifesting as disparities in access to resources, power and opportunities, plays a critical role in shaping health outcomes in

South Africa. These inequalities create structural barriers to health care access and quality, exacerbate social stigma and discrimination, and heighten exposure to violence and marginalisation. South Africa's enduring legacy of apartheid, colonialism and patriarchy has etched deep racial, gendered and class-based disparities into the health care system (Samodien et al. 2021).

For example, black African populations bear a disproportionate burden of both HIV and NCDs, reflecting the long-standing racial inequities in social and health indicators (SANAC 2023; UNAIDS 2024). According to the SANAC National Strategic Plan (2023–2028), HIV prevalence remains highest among African AGYW aged 15–24 years, particularly in rural and informal settlements where both health care and educational opportunities are scarce (SANAC 2023). Similarly, a study by Sahu et al. (2025) highlights the intersection of race, poverty and comorbid NCDs among PLHIV in the KZN province, where hypertension and obesity frequently co-occur with HIV, disproportionately affecting economically disadvantaged groups.

Gender inequality further compounds this vulnerability, with women experiencing higher rates of HIV acquisition because of biological, economic and sociocultural factors, including gender-based violence (GBV), unequal power in relationships that may, for example, lead to IPV and limited access to education (UNAIDS 2024; WHO 2020). Moreover, sexual and gender minorities, including lesbian, gay, bisexual, transgender, queer and/or questioning, intersex and asexual and other individuals (LGBTQIA+), continue to experience systemic exclusion and discrimination within PHC settings. These structural barriers are associated with disproportionate mental health burdens and heightened vulnerability to both infectious and chronic diseases (Samodien et al. 2021).

These dynamics illustrate how poverty, limited educational attainment and deep-seated social inequality are not merely background conditions but active, structural drivers of South Africa's syndemic of HIV and NCDs (Militao 2024). Their effects are interlinked and cumulative, amplifying risk exposure, undermining health-seeking behaviours and impeding treatment adherence and long-term disease management.

Addressing these disparities demands a nuanced understanding of how overlapping identities, such as race, gender, sexual orientation and class, interact to shape health vulnerabilities. Therefore, policies and interventions must go beyond medical access and address the broader socioeconomic and political determinants that perpetuate poor health. Recognising the interconnected nature of these SDoH is essential in designing integrated, equitable and sustainable PHC strategies to mitigate the dual burden of HIV and NCDs in South Africa.

Unemployment

High unemployment rates contribute significantly to health disparities in South Africa. A lack of employment opportunities leads to financial instability, which negatively impacts individuals' mental health and overall wellbeing. South Africa's official unemployment rate was 32.7% in the fourth quarter of 2022 (Stats SA 2023). During the same period, approximately 15.8% of individuals were covered by medical aid, while 73.0% of households reported first consulting public-sector facilities when a household member became ill or injured (Stats SA 2024).

Importantly, Stats SA's data also show that more than half the population lived below the upper-bound poverty line in 2015, highlighting the entrenched nature of economic deprivation in the country (Stats SA 2017). Together, poverty and unemployment form a reinforcing cycle that sustains and deepens health inequalities, particularly among historically marginalised communities.

Gender-based violence

South Africa continues to grapple with endemic levels of GBV, which present severe and multifaceted health consequences. Gender-based violence is not only a violation of human rights but also a significant social determinant of health, particularly influencing the prevalence and progression of HIV and NCDs. Survivors of GBV often suffer from physical injuries, chronic pain and sexual and reproductive health (SRH) complications, but the impact extends well beyond the immediate trauma.

There is robust evidence from South Africa linking GBV to elevated HIV risk. Jewkes et al. (2010, 2015) found that women who experience IPV are approximately 50% more likely to acquire HIV than those who do not. This increased risk operates through both direct pathways, including forced or coerced sex, inability to negotiate condom use, reproductive coercion and exposure to partner infidelity, and indirect psychosocial pathways, such as trauma-related mental distress, depression, reduced self-efficacy, diminished agency in sexual decision-making, substance use as a coping mechanism and sustained engagement in high-risk relationships (Malisha & Tsawe 2025). This risk is further exacerbated among AGYW, who face both age-disparate partnerships and structural vulnerabilities such as poverty and education inequality (SANAC 2023).

In relation to NCDs, GBV has been associated with a higher prevalence of chronic illnesses such as hypertension, diabetes and cardiovascular disease, primarily because of prolonged stress exposure, psychological trauma and behavioural coping mechanisms like smoking and alcohol use.

A South African study by Jewkes et al. (2021) using population-based data found a significant association between IPV and elevated depressive symptoms, which are strongly linked to poor NCD outcomes and low adherence to treatment regimens.

Moreover, the intersection of GBV, HIV and NCDs is increasingly recognised as a syndemic, a set of interrelated health problems that interact to exacerbate the burden of disease among vulnerable populations. Chronic stress and trauma caused by violence affect immune function and increase the likelihood of developing or worsening NCDs, while also making it harder for HIV-positive individuals to maintain ART adherence, ultimately worsening health outcomes (Cluver et al. 2019).

Access to clean water and sanitation

Access to clean drinking water and proper sanitation is a critical SDoH that directly impacts the health outcomes of individuals and communities. In South Africa, many households, particularly in rural, peri-urban and informal settlements, continue to face inadequate water and sanitation infrastructure, exacerbating vulnerabilities to both infectious diseases and NCDs.

The General Household Survey 2022 by Stats SA revealed that nearly 13.4% of households still rely on off-site water sources, requiring travel to access basic water services, and 10.2% lack access to improved sanitation facilities (Stats SA 2022). These gaps create an opportune environment conducive to poor hygiene, bacterial, viral and diarrhoeal infections and an increased burden on already overstretched PHC systems (Stats SA 2023).

In relation to HIV outcomes, inadequate sanitation indirectly affects ART adherence. Inadequate access to safe water and sanitation can increase exposure to diarrhoeal and other water-related infections, with potentially serious consequences for immunocompromised populations, including PLHIV. Difficulties accessing clean water may also complicate food preparation, hygiene and the consistent management of chronic medication.

For NCDs, especially renal disorders, hypertension and gastrointestinal cancers, poor water quality and exposure to environmental toxins have long been recognised as risk factors. Contaminated water sources may contain chemical pollutants or pathogens, thereby increasing the burden of NCDs in low-resource settings. The compounding effect of poor nutrition, often seen in communities with limited sanitation, further increases metabolic stress and risk of chronic diseases (Militao et al. 2024).

Furthermore, the United Nations Children's Fund (UNICEF) South Africa Water, Sanitation and Hygiene (WASH) Fact Sheet identifies the lack of

gender-sensitive sanitation facilities as a contributor to school absenteeism among adolescent girls and a driver of gender-based vulnerability, which in the South African context also relates to increased risk of early sexual debut, transactional sex and HIV exposure because of socioeconomic marginalisation (Mampane 2018; UNICEF South Africa 2020).

Community and social support

The presence or absence of community and social support networks significantly influences the management and outcomes of both HIV and NCDs in South Africa. Social support plays a protective role by fostering emotional resilience, reducing psychological distress and enhancing individuals' ability to navigate complex PHC systems. In particular, strong support from family, peers and community health care workers (CHCWs) can enhance adherence to treatment regimens and foster sustained engagement in care, both crucial for effective chronic disease management.

Recent evidence from KZN underscores the value of community-based service models in this context. A randomised trial by Sahu et al. (2025) demonstrated that PLHIV who accessed differentiated service delivery (DSD) at the community level, with social support integrated into care, exhibited improved clinical outcomes, including better management of hypertension and type 1 diabetes, compared with those receiving standard facility-based services. This study highlights that community support mechanisms do not merely supplement medical care; they are integral to its success, particularly in regions where health services are under-resourced or geographically inaccessible. The presence of community-led support groups and peer navigators was particularly effective in improving ART adherence and mitigating the social isolation that often accompanies HIV and NCD diagnoses.

Furthermore, Van Pinxteren et al. (2024) explored the experiences of informal caregivers in households affected by HIV and NCD multimorbidity. Their findings revealed that individuals were more likely to report positive health-seeking behaviours and lower levels of emotional distress when strong informal care networks were present. Conversely, a lack of social support often resulted in PHC delays, increased caregiver burden and poorer treatment continuity. These insights reinforce the understanding that social support is not simply a background variable but a core SDoH, with tangible implications for the progression and control of HIV and NCDs.

Taken together, these studies affirm that social networks, both formal (such as community health structures) and informal (including familial or peer support), play a vital role in shaping health trajectories. Particularly in South Africa's context of systemic inequality, stigma and fragmented care delivery, the cultivation and integration of social support networks are

essential for improving health outcomes among vulnerable populations managing multiple chronic conditions.

Access to health care services

Access to reliable and contemporary health care services is a core pillar of the PHC system and also a crucial determinant of health outcomes in South Africa, particularly in the dual context of HIV and NCDs. While health care services are embedded within the SDoH framework, their accessibility and quality remain central to mitigating disease burden and reducing inequities. South Africa continues to grapple with fragmented PHC systems and infrastructure, workforce shortages, inconsistent medicine supply and resource deficits, all of which hinder the effective delivery of quality care for PLHIV and NCDs. These challenges are most pronounced in rural and peri-urban areas, where resource constraints and staff attrition limit continuity of care and timely access to treatment.

Importantly, access to modern and integrated HIV services, including same-day ART initiation, DSD and viral load (VL) monitoring, is vital for ensuring sustained viral suppression and reducing transmission. However, while ART coverage has expanded significantly, recent evaluations highlight that gaps in-service quality, follow-up and care coordination persist. The NDoH (2022) Annual Report for 2021/22 noted that only 53% of PHC facilities met the minimum infrastructure standards, and over one-third lacked uninterrupted access to essential chronic disease medications, directly affecting both ART and NCD treatment pathways.

This inadequacy extends beyond HIV to encompass the growing burden of NCDs such as type 1 diabetes, hypertension and cardiovascular disease, which require consistent monitoring, access to diagnostics and long-term care, all often lacking in overstretched PHC systems. As Van Pinxteren et al. (2024) show, individuals managing HIV–NCD multimorbidity experience significant care disruption because of fragmented services and poor referral linkages. In such contexts, the absence of integrated, reliable PHC undermines disease management and fosters patient distrust in the PHC system.

Therefore, to address the interlinked epidemics of HIV and NCDs, South Africa must prioritise the equitable expansion of high-quality, integrated health care services. This includes investments in digital health infrastructure, the health workforce, supply chain reform and health information systems, all aimed at improving service reliability and bridging rural–urban disparities. In short, contemporary, well-functioning PHC services are not optional; they are foundational to the country's public health care resilience and equity goals, such as universal health coverage (UHC), as outlined in the *National Health Insurance Act 20 of 2023* (RSA 2024).

Food security

Food security, or its absence, plays a crucial role in shaping both HIV and NCD outcomes in South Africa. Limited access to nutritious and affordable food can lead to malnutrition, which not only exacerbates chronic conditions such as hypertension and diabetes but also compromises the immune system, thereby increasing vulnerability to infections, including HIV. Furthermore, food insecurity significantly undermines adherence to ART and chronic disease medication regimens, as many patients are reluctant to take their drug treatment on an empty stomach due to side effects or drug toxicity.

The South African National Food and Nutrition Security Survey found that 63.5% of households were food insecure, with 17.5% experiencing severe food insecurity (Simelane et al. 2024). The findings also demonstrate substantial geographical and socioeconomic differences in household food security.

Moreover, the SANHANES-1 reported that one in four children under the age of 5 years are stunted, a key indicator of chronic malnutrition, while micronutrient deficiencies such as iron and vitamin A remain prevalent among both children and adults (Shisana et al. 2014). For individuals living with HIV, malnutrition can impair viral suppression through compromised immune function, reduced adherence and altered absorption or metabolism of ART, thereby increasing susceptibility to opportunistic infections (OIs). Similarly, among individuals with NCDs, poor dietary diversity, often characterised by low intake of fresh fruits and vegetables and micronutrients and high reliance on refined carbohydrates, has been shown to worsen glycaemic control and blood pressure (BP) regulation.

The coronavirus disease 2019 (COVID-19) pandemic further deepened food insecurity. The National Income Dynamics Study – Coronavirus Rapid Mobile Survey (NIDS-CRAM) Wave 5 Survey (2021) found that 41% of households ran out of money for food, with informal workers and PLHIV among the most severely affected (Spaull et al. 2021). These statistics highlight that food insecurity is both a driver and a consequence of poor health conditions, especially for those managing complex chronic conditions such as HIV and NCDs.

Housing conditions

Housing is a critical yet under-addressed determinant in both HIV and NCD trajectories in South Africa. Overcrowded and insecure housing can increase exposure to communicable diseases, including TB, and may complicate medication storage, privacy, clinic attendance and continuity of HIV and NCD care. For instance, populations with unstable housing exhibit higher rates of viral rebound and loss to follow-up in ART programmes,

resulting in persistent viraemia and increased risks of comorbidities (Ciccacci et al. 2024).

From the perspective of NCDs, substandard housing, especially in informal settlements, often exposes residents to indoor air pollution from biomass fuels, contributing to respiratory diseases, cardiovascular strain and metabolic dysregulation (WHO 2025a). Housing stress, such as eviction threats or overcrowding, is also a psychosocial stressor linked to poor dietary practices, alcohol abuse and mental health conditions such as depression, all of which contribute to NCD risk (Sahu et al. 2025).

Furthermore, integrated care models that recognise the interaction between social determinants like housing and clinical management of HIV and NCDs are more effective and cost-efficient. Jo et al. (2025) demonstrate that multi-month dispensing and community-level interventions tailored to socioeconomic realities, including housing stability, improved both adherence and health outcomes. Thus, housing is not merely a backdrop to health but a driver of disease vulnerability and resilience, meriting inclusion in all PHC strategies targeting HIV and NCD epidemics.

While social determinants such as housing, poverty and inequality significantly influence health globally, they assume heightened significance in South Africa because of the country's distinct sociopolitical and epidemiological context. The enduring legacy of apartheid-era spatial planning has produced entrenched residential segregation, resulting in overcrowded informal settlements with poor infrastructure, environmental hazards and limited access to quality health care, conditions that directly hinder HIV treatment adherence and promote the development of NCDs (Jo et al. 2025). Moreover, South Africa simultaneously faces a heavy dual disease burden, harbouring the world's largest HIV treatment programme alongside rising NCD prevalence, within one of the most unequal societies globally. This intersection of structural inequality, economic instability and high disease prevalence creates a 'syndemic' environment in which housing insecurity, GBV and limited health care access interact to magnify individual and population-level health risks (Sahu et al. 2025). Unlike in more stable or equitable settings, these determinants are not isolated risk factors but mutually reinforcing systems of disadvantage that uniquely intensify the impact of HIV and NCDs in the South African context. Understanding and addressing this interconnection is critical for designing responsive, equity-driven health policies.

Culture and traditions as social determinants of health

Culture and traditions are indeed shared across many African societies; however, South Africa's cultural landscape presents a uniquely complex

and influential context for health. With 12 official languages, deep ethnic diversity and a history shaped by apartheid and colonialism, South African cultures are marked by both fragmentation and resilience. Traditional health beliefs coexist with biomedical models, and for many communities, traditional healers remain the first point of contact for illness, playing a critical role in HIV disclosure, mental health management and chronic disease care (Kang'ethe 2024; Ndou-Mammbona 2022; Ngubane & De Gama 2024). Moreover, specific cultural practices such as initiation rituals, gender role expectations and attitudes towards sexual health and masculinity shape behaviours that directly affect HIV transmission, treatment adherence and health-seeking behaviours, often in ways distinct from other African contexts (Mfecane 2018).

Additionally, cultural norms around stoicism, patriarchy and stigma can delay diagnoses and restrict open discussions around chronic illnesses, such as diabetes and hypertension, particularly among males and older adults. Unlike in more ethnically homogeneous societies, South Africa's pluralistic and, at times, conflicting health worldviews require uniquely integrated, culturally sensitive health interventions. Thus, while cultural influences may be continent-wide, their expressions, interactions with history and impact on PHC systems in South Africa create a distinct social determinant landscape that must be addressed in a tailored manner.

Health beliefs and practices

Cultural beliefs and traditions deeply shape individuals' perceptions of health, illness and health care-seeking behaviours in South Africa. The country's cultural diversity, characterised by distinct languages, ethnicities and historical experiences, yields a diverse range of health worldviews that significantly influence community engagement with the formal health care sector. Traditional healers, who are legally recognised under South African law, continue to serve as trusted providers in many communities, especially in rural and peri-urban areas. Their role encompasses mental health support, chronic disease management and spiritual care, often operating alongside or in tension with biomedical systems (Orievulu et al. 2025; Pilusa et al. 2025). For many, health decisions are filtered through frameworks that blend ancestral beliefs, spiritual causality and social norms, which can influence the uptake of interventions such as vaccinations, ART adherence and cancer screening (Laher, Mahlangu & Sibiya 2025; Patrick et al. 2026).

Understanding and integrating these cultural perspectives is crucial not only for enhancing health care delivery but also for fostering trust and promoting health equity. Failure to consider these dynamics may result in delayed treatment, nonadherence or rejection of care altogether (Chavalala, Lebese & Makhado 2025; Pilusa et al. 2025). Thus, culturally competent

public health care strategies must incorporate collaboration with traditional health care practitioners, community leaders and local knowledge systems to ensure that interventions resonate with lived realities.

☐ Stigma and discrimination

Cultural norms in South Africa continue to perpetuate stigma around conditions such as HIV, TB and mental illness. Cultural and social beliefs may contribute to misconceptions about HIV and its treatment, potentially influencing testing, disclosure and continued engagement in care (Laher et al. 2025). It especially affects adolescents and people living in rural or traditional communities. Addressing these barriers requires culturally sensitive outreach, peer support models and public health campaigns that work with, rather than against, prevailing belief systems.

☐ Traditional healing practices

Traditional healers remain integral to health care for many South Africans, especially in under-resourced areas. While these practices can offer culturally meaningful care and spiritual comfort, they may also delay biomedical treatment or perpetuate misinformation about disease causality and treatment. However, research shows that structured collaboration with traditional healers improves HIV care, vaccine uptake and trust in formal health care (Orievulu et al. 2025).

☐ Gender roles and expectations

South African cultural norms often associate masculinity with stoicism and emotional suppression, which can prevent men from seeking care, especially for mental health and chronic diseases. Meanwhile, rigid gender roles expose women to greater risks of IPV, sexual coercion and restricted reproductive autonomy. These dynamics significantly impact HIV vulnerability and mental health, particularly in rural provinces (Mogano, Letsoalo & Oduaran 2025; Orza et al. 2015).

☐ Cultural dietary practices

South Africa is undergoing a nutrition transition, in which traditional diets are increasingly being replaced by high-fat processed foods. While some cultural dishes are healthy and nutritious, others are linked to increasing rates of obesity, type 2 diabetes and hypertension (Kamgain, Onyenweaku & Kesa 2024). Promoting culturally adapted nutrition education that honours traditional food heritage while addressing modern risks is critical for NCD prevention (Nwosu et al. 2022).

Cultural approaches to mental health

In many communities, mental illness is explained through ancestral or spiritual frameworks, and traditional healers are often the first point of contact. These interpretations may support or hinder care depending on how they are integrated into broader health care systems. Collaborative models that train traditional healers in basic mental health literacy show promise in increasing early detection and referral (Moagi, Thobakgale & Magoro 2022).

Cultural barriers to family planning

Cultural beliefs about fertility, masculinity and religious norms can discourage contraceptive use and shape attitudes towards family planning. Myths about infertility, shame and partner resistance often lead to high rates of unintended pregnancy and unsafe abortion, particularly among AGYW. Community-based interventions that engage male partners and elders are more effective in shifting norms (Aventin et al. 2023; Naidoo et al. 2024).

Initiation practices

Rites of passage, such as traditional male circumcision, are culturally significant but present public health risks when performed under unsafe or unregulated conditions. Reports of injury and death have prompted stronger regulation and collaboration with traditional authorities to ensure safer practices while preserving cultural meaning (Kajiita & Kang'ethe 2025; Kang'ethe 2024).

Culture profoundly shapes health behaviours in South Africa, informing beliefs, care-seeking, stigma and treatment engagement. Public health efforts must go beyond superficial inclusion and engage communities through culturally grounded, respectful partnerships. Collaboration with traditional health practitioners, community leaders and elders may support culturally responsive health promotion and strengthen connections between indigenous and biomedical systems of care (Moagi et al. 2022; Ramavhoya & Nesengani 2022).

Mitigation of various social determinants of health in South Africa

Mitigating or curbing the various SDoH in South Africa requires a multifaceted and collaborative approach involving government, communities, health care providers and civil society organisations. The following approaches address these determinants.

Poverty

Poverty remains a foundational driver of health disparities, perpetuating cycles of vulnerability, illness and diminished resilience among individuals and communities affected by HIV and NCD. In South Africa and across many low- and middle-income countries (LMICs), economic deprivation compromises access to essential health care services, nutritious food, safe housing and educational opportunities, factors that are intrinsically linked to the risk, progression and management of both infectious and chronic diseases. While the correlation between poverty and poor health outcomes is well established, addressing this intersection demands targeted, multisectoral interventions that go beyond clinical care.

This section explores practical, evidence-based strategies, such as expanding social safety nets, enhancing education and skills development, creating job opportunities and improving access to financial services, that can mitigate the impact of poverty on health. These interventions are not only vital to strengthening the socioeconomic foundations of health but also critical to ensuring sustainable, integrated PHC models that reduce HIV incidence, improve NCD outcomes and promote health equity for South Africa's most vulnerable populations.

Social safety nets

To address poverty and ensure economic security, it is crucial to strengthen social safety nets, including cash transfers, food assistance and housing subsidies. Such interventions have been associated with improved ART adherence and reduced HIV-related stigma (Cluver et al. 2021). Similarly, in South Africa, the child support grant (CSG) has indirectly improved health outcomes by reducing food insecurity, a known contributor to poor NCD control and ART nonadherence. The CSG is provisioned under Chapter 1, Section 3(a) and Chapter 2, Section 6 of the *Social Assistance Act 13 of 2004* (RSA 2004) by the South African Social Security Agency (SASSA).

Education and skills development

Education is a key determinant of health. Individuals with higher levels of education are more likely to access and adhere to HIV treatment and adopt healthy behaviours that prevent NCDs. In South Africa, school-based health and extracurricular programmes can improve HIV-related knowledge, attitudes and selected health behaviours among children and adolescents (Letsela et al. 2021). The Integrated School Health Policy provides a policy framework for linking education, health promotion and school health services (National Department of Basic Education [NDBE] 2020b). In South Africa, youth education and skills development programmes have

demonstrated benefits in reducing risky sexual behaviour and increasing economic independence, which lowers vulnerability to HIV.

Job creation

Public works and small and medium-sized enterprise (SME) support can reduce poverty-related vulnerabilities to NCDs (e.g. diabetes linked to food insecurity) and HIV by enhancing socioeconomic resilience. In Ethiopia, women's economic empowerment programmes, including microfinance and small enterprise support, have been associated with improvements in women's agency, household decision-making and economic bargaining power. Evidence from Ethiopian microfinance models suggests that access to loans and income-generating opportunities can strengthen women's participation in household decisions and enhance their perceived empowerment (Gobezie 2010). While this evidence does not directly demonstrate reduced HIV transmission, it is consistent with broader HIV prevention literature showing that economic vulnerability can increase women's exposure to HIV risk by limiting their ability to negotiate safer relationships and reduce dependency. For example, Filippone, Hernandez Trejo and Witt (2023) found that an economic empowerment and health promotion intervention among low-income women affected by HIV improved financial decision-making, HIV/STI knowledge, problem-solving strategies for risk reduction and overall empowerment. Together, these studies suggest that economic empowerment may indirectly reduce women's HIV vulnerability by improving agency, financial security and bargaining power, although direct evidence from Ethiopian SME programmes remains limited.

Evidence from Ethiopian SME programmes illustrates how women's participation in enterprise development can strengthen agency and bargaining power within households and communities. For example, Abaynesh Beynene, founder of AB Leather, established the business in 2008 with modest startup capital and later joined LOMI Leather, a women-led SME network that pools resources to access markets, training and equipment beyond the reach of individual entrepreneurs. Supported through skills development, shared technology and market access initiatives funded by the United Nations Industrial Development Organization (UNIDO) and the Italian Development Cooperation (AICS), the network enabled business growth, employment creation and export access (Obole & Arthur 2023). Such SME programmes demonstrate how women's economic participation enhances financial independence and decision-making power, which in turn improves their ability to access essential services, including health care, that may otherwise remain inaccessible.

Access to financial services

Enhancing access to financial services, including microcredit and savings mechanisms, to economically empower individuals and communities may foster financial independence and stimulate economic growth at the grassroots level. Providing easier access to these financial tools can help bridge the gap for those in underserved areas, potentially improving the overall economic landscape (South African Reserve Bank [SARB] 2020).

Education

Education is a transformative force in public health, serving not only as a cornerstone for socioeconomic advancement but also as a critical determinant of health outcomes across the life course. In the context of South Africa's dual burden of HIV and NCD, education empowers individuals with the knowledge, skills and agency necessary to make informed health decisions, adopt preventive behaviours and access care. From early childhood development (ECD) to quality schooling and school-based health services, investments in education yield far-reaching benefits, improving health literacy, reducing risk behaviours and mitigating the intergenerational transmission of poverty and disease.

However, systemic challenges, such as infrastructure deficits, inequitable access and social barriers, continue to hinder educational progress, especially in under-resourced areas. This section outlines practical, evidence-based strategies to enhance educational quality and accessibility, demonstrating how targeted reforms can contribute to a healthier, more equitable society in which learning and health reinforce one another across generations.

Quality education

Enhancing the quality of education requires addressing infrastructure deficiencies, increasing access to learning materials and ensuring regular professional development and teacher training. Quality education not only improves academic outcomes but is also directly correlated with improved health behaviours and health literacy. In Uganda and South Africa, better-educated individuals show higher levels of HIV awareness, reduced risk behaviours and better management of chronic conditions like diabetes and hypertension (Van der Mannen et al. 2024). Investments in school infrastructure and teacher development have also been shown to improve gender equity and reduce school dropout rates, both critical for preventing early pregnancy and HIV exposure among adolescent girls. This multifaceted strategy, as outlined by the NDBE (2020a), aims to elevate the overall standard of education.

Early childhood development

Investing in ECD programmes lays the foundation for lifelong health and educational attainment. Early cognitive and emotional development reduces school failure, increases later economic productivity and improves health behaviour. Studies in South Africa and Kenya suggest that participation in ECD programmes is associated with improved child nutrition and enhanced uptake of health interventions such as immunisation and better developmental and psychosocial outcomes, all of which may contribute indirectly to reduced vulnerability to NCDs and HIV-related health risks later in life (Sello, Adedini & Odimegwu 2023; Slemming, Biersteker & Lake 2024). Focusing on ECD can promote cognitive, social and emotional growth, preparing children for successful academic and personal futures.

School health care services

School-based health care services, including nutrition, mental health support and sexual health education, have a measurable impact on both HIV and NCD prevention. In South Africa, the Integrated School Health Programme (ISHP) has demonstrated success in addressing malnutrition, early sexual debut and menstrual health, each of which is a determinant of adolescent sexual health and reproductive (SHR) care and disease vulnerability (Shuro & Waggie 2021). Counselling services also reduce school dropout linked to untreated mental illness and GBV.

Community involvement

To foster a more collaborative and enriched learning environment, actively involving communities in the educational process is essential. This can be effectively achieved by strengthening parent-teacher associations and promoting community-driven initiatives. Such collaborative efforts enhance the overall educational atmosphere and ensure that various educational stakeholders work together towards common goals. As outlined by the NDBE (2020a), this approach emphasises the critical role of community engagement in continuously improving educational outcomes.

Social inequality

Social inequality remains a pervasive structural determinant of health in South Africa, deeply intertwined with the country's historical legacies and contemporary socioeconomic dynamics. Inequities in access to education, employment, legal protection and health care disproportionately impact marginalised groups, particularly women, racial minorities and LGBTQIA+

communities, thereby reinforcing patterns of disease vulnerability, especially in the context of HIV and NCD. Addressing these inequities is not only a matter of social justice but also a public health imperative.

Reducing the dual burden of HIV and NCDs requires transformative, equity-focused interventions that dismantle systemic barriers and promote inclusive development. Legislative action, public education and economic empowerment are critical pathways for South Africa to close these gaps and foster a more just and resilient health care system. The strategies that follow offer practical, evidence-based approaches to advancing equality and improving health outcomes for all.

☐ Legislation and policies

Enforcement of anti-discrimination legislation and policies that promote gender equality, racial equity and LGBTQIA+ rights is needed (South African Human Rights Commission [SAHRC] 2020). This highlights the importance of implementing anti-discrimination laws that support and promote gender equality, racial equity and the rights of LGBTQIA+ communities. It refers to a recommendation or guideline in the SAHRC document. The call to action emphasises the need for legal and policy measures to eliminate discrimination and ensure equal rights for all individuals, irrespective of their gender, race or sexual orientation.

☐ Education and awareness

Education and awareness initiatives play a pivotal role in addressing the dual burden of HIV and NCDs in South Africa and the broader sub-Saharan region. Effective health education enhances knowledge, shifts attitudes and empowers individuals to make informed decisions about prevention, testing, treatment and care. In South Africa, Cluver et al. (2021) found that educational interventions combined with social protection strategies significantly improved ART adherence, reduced stigma and enhanced health-seeking behaviour among adolescents living with HIV. Similarly, Van der Mannen et al. (2024) conducted a systematic review demonstrating that school-based health education programmes in countries such as Malawi and Zambia increased HIV knowledge and uptake of HIV testing among young people.

On the NCD front, Mboweni (2024) reported that community health education delivered by nurses in rural provinces during the COVID-19 pandemic improved patient engagement and adherence to hypertension and diabetes care protocols, highlighting the long-term utility of awareness campaigns in strengthening chronic disease management. Furthermore, Murudi-Manganye, Makhado and Sehularo (2023) emphasised that

integrating HIV and NCD education within PHC services can streamline patient communication, improve self-care and foster comprehensive health literacy. These findings collectively affirm that education and awareness efforts are not only foundational to public health but also essential to overcoming the intersecting challenges of HIV and NCDs in South Africa's evolving health care landscape. Implementing awareness campaigns is crucial for actively challenging stereotypes, combatting stigma and promoting inclusivity and diversity.

☐ Economic empowerment

Economic empowerment initiatives aim to level the playing field and foster an inclusive environment where individuals from historically disadvantaged backgrounds can thrive. By focusing on equitable access to resources and opportunities, such programmes significantly reduce economic disparities. Since the National Department of Trade, Industry and Competition (dtic) outlined these goals in 2020, several provincial reports have reaffirmed the government's commitment to these principles. For instance, the Western Cape Department of Infrastructure has implemented preferential procurement mechanisms and targeted enterprise support to empower marginalised groups (Western Cape Government 2023). While challenges in monitoring and execution remain, these initiatives reflect sustained momentum towards inclusive growth. Importantly, economic empowerment intersects with health equity: improving financial security and enterprise participation enables better access to care, nutrition and treatment adherence, factors crucial for managing both HIV and NCDs. Thus, economic inclusion efforts not only promote social justice but also create enabling conditions for the successful integration of HIV and NCD services across underserved communities.

☐ Health equity

Emphasising health equity requires a strategic approach that allocates resources and designs interventions focused on the needs of vulnerable and marginalised communities. This approach highlights the importance of acknowledging and addressing the disparities faced by these groups, ensuring that everyone can achieve their highest level of health and wellbeing (NDoH 2020).

☐ Unemployment

Unemployment is a significant SDoH in South Africa, influencing both economic security and access to health-promoting resources, including food, housing and health care. The effects of chronic unemployment extend

far beyond income deprivation, contributing to mental distress, reduced health care utilisation and increased vulnerability to HIV and NCDs. For individuals managing chronic illnesses, the inability to afford transportation, nutritious food or consistent care undermines treatment adherence and overall wellbeing.

Addressing unemployment, especially among youth and marginalised populations, is therefore not only an economic necessity but a public health priority. Multisectoral strategies, ranging from job training and youth employment initiatives to support for SMEs, micro, small and medium-sized enterprises (MSMEs) and labour market reforms, offer critical pathways to improve livelihoods and reduce the disease burden. The following interventions highlight how targeted economic empowerment can serve as both a health intervention and a catalyst for sustainable development.

Job training

It is suggested that job training and vocational programmes be expanded to improve employability and skill sets. This approach aims to equip individuals with the tools and knowledge needed to succeed in the workforce (National Youth Development Agency [NYDA] 2020).

Support for small and medium enterprises

Enhancing support for SMEs is crucial for fostering economic growth and innovation. This support can take various forms, such as providing easier access to financing, which is essential for SMEs to start up, scale up and maintain operations. Mentorship programmes are also vital, offering guidance, expertise and networking opportunities to help these businesses navigate challenges and grow. Additionally, creating stronger market linkages facilitates SMEs' access to new and broader markets, driving sales and expansion. As outlined by the South African Small Enterprise Development Agency (SEDA) (2021), these measures are vital to bolstering the SME sector, contributing to economic diversity and job creation.

Labour market reforms

Implementing legislative reforms to stimulate employment expansion while safeguarding workers' rights constitutes a critical strategy. As delineated in the National Treasury's (2020) report, these measures have been articulated with the dual objective of harmonising economic advancement with employees' wellbeing.

Youth employment initiatives

It is crucial to develop initiatives that provide young people with employment opportunities, such as internships, apprenticeships and support for entrepreneurship (NYDA 2020).

Gender-based violence

Gender-based violence is not only a profound violation of human rights but also a critical public health issue that intersects with the HIV and NCD epidemics in South Africa. Gender-based violence disproportionately affects AGYW, exposing them to elevated risks of HIV acquisition, mental health disorders and long-term physical health complications.

The pervasive nature of sexual violence, coercion and intimate partner abuse undermines bodily autonomy and access to SRH services, often entrenching cycles of trauma, poverty and disease. Given these interconnected risks, addressing GBV is fundamental to any integrated health strategy. A coordinated approach, combining prevention programmes, legal reforms, survivor-centred support services and educational initiatives, can help break the link between violence and poor health outcomes. The strategies that follow demonstrate how evidence-based and adolescent-responsive interventions can mitigate GBV and reduce its devastating impact on individuals and communities.

Prevention programmes

The implementation and financial support of programmes to prevent GBV, including community-based interventions and educational campaigns, are paramount (Gender-based Violence and Femicide [GBVF] Response Fund 2024). However, these programmes must also directly address the sexual and reproductive vulnerabilities of adolescent girls, who face disproportionately high rates of adolescent pregnancy and HIV infection in South Africa. This requires targeted interventions such as girl-focused life skills training, access to pre-exposure prophylaxis (PrEP) and safe spaces where AGYW can access mentorship and SRH services. Studies show that these approaches can delay sexual debut, improve condom negotiation and reduce exposure to sexual exploitation (Chemhaka & Simelane 2024).

Legal reforms

Enhancing laws and enforcement mechanisms to address GBV remains a crucial step in supporting survivors and deterring future violations. In the context of adolescent health, this includes stricter enforcement of laws against statutory rape, trafficking and abuse of minors. The justice system

must be made more accessible and youth-sensitive, ensuring that underage survivors of sexual violence can report abuse and receive comprehensive protection. Strengthening the implementation of laws addressing sexual violence, exploitation and abuse is essential for protecting adolescents' bodily autonomy and reducing their exposure to adverse SRH outcomes, including HIV (United Nations Population Fund [UNFPA] 2021).

Support services

The GBVF Response Fund (2024) proposes strengthening support services such as temporary shelters, trauma counselling and legal assistance for GBV survivors. These services are especially critical for adolescent girls who have experienced sexual violence, as early trauma is strongly correlated with increased HIV vulnerability and poor mental health outcomes. Expanding adolescent-friendly counselling services, integrating HIV testing and post-exposure prophylaxis (PEP), and providing long-term psychosocial care are essential components of a comprehensive GBV and HIV response strategy.

Educational initiatives

The NDBE's Life Orientation curriculum and Comprehensive Sexuality Education Scripted Lesson Plans address sexuality, HIV and other sexually transmitted infections, gender norms, relationships and responsible decision-making (NDBE 2019). However, these programmes must be strengthened to include explicit content on HIV prevention, contraceptive use and the risks of early sexual activity. When effectively implemented, comprehensive sexuality education (CSE) has been shown to delay sexual debut, increase HIV knowledge and reduce adolescent pregnancy rates (United Nations Educational, Scientific and Cultural Organization [UNESCO] 2024). Community resistance and inconsistent implementation remain barriers, requiring ongoing stakeholder engagement and teacher training.

Access to clean water and sanitation

Access to clean water and adequate sanitation is a foundational determinant of health, yet it remains unequally distributed across South Africa's communities, especially in rural, peri-urban and informal settlements. These disparities perpetuate infectious disease transmission and also undermine the management of chronic illnesses, including HIV and NCDs. Clean water and proper sanitation are essential for medication adherence, infection prevention, menstrual hygiene and overall immune function, especially for immunocompromised populations and individuals with chronic wounds or comorbidities. Without addressing these systemic gaps, health interventions

for HIV and NCDs risk falling short. A multipronged approach combining infrastructure development, hygiene promotion and community engagement is therefore crucial. The strategies below illustrate how water and sanitation improvements can facilitate holistic, integrated health care and social resilience.

☐ Infrastructure development

Investing in water and sanitation infrastructure, particularly in underserved and informal settlements, is critical for advancing equitable access to PHC services and mitigating environmental risks linked to both HIV and NCDs. Inadequate sanitation can compromise immune function, exacerbate opportunistic infections (OIs) in PLHIV and contribute to poor outcomes in individuals with chronic conditions such as diabetes and hypertension, where hygiene and wound care are essential. Access to safe water also supports medication adherence, as clean water is often required to take ART and other chronic medications. According to the South African National Department of Water and Sanitation (NDWS 2020), addressing these infrastructural gaps contributes to health resilience and productivity, two key enablers of sustained HIV and NCD care.

☐ Hygiene promotion

Public health campaigns promoting water hygiene, menstrual hygiene management and sanitation practices are vital not only for reducing communicable diseases like diarrhoea and cholera but also for supporting the health of immunocompromised individuals. For PLHIV, improved hygiene reduces the risk of secondary infections and hospitalisation rates. For those with NCDs, especially cardiovascular diseases and diabetes, sanitation education supports wound care and reduces the risk of infections. Hygiene promotion initiatives can also serve as platforms for integrating messages on HIV prevention, stigma reduction and NCD self-management, providing a holistic approach to health promotion (UNICEF 2020).

☐ Community engagement

Empowering communities to co-design and manage water and sanitation projects not only strengthens infrastructure sustainability but also enhances health care system engagement. Community involvement fosters trust and opens opportunities to integrate broader health promotion, such as HIV testing drives, BP screenings and diabetes education, into water and sanitation efforts. Community health care workers can bridge gaps by combining health literacy campaigns with WASH messaging, reaching marginalised populations who often experience the dual burden of poor

sanitation and inadequate access to HIV and NCD care. According to the NDWS (2020), such engagement builds local capacity and reinforces collective responsibility for both environmental and health outcomes.

Water and sanitation interventions do not operate in isolation; when aligned with integrated health service delivery, they strengthen the enabling environment for HIV–NCD care. Improved infrastructure, targeted hygiene education and local ownership of services reinforce the pillars of the integrated model: Accessibility, adherence and prevention, thereby addressing key SDoH in South Africa's most vulnerable communities.

Community and social support

In South Africa's complex health landscape, where the burden of HIV intersects with rising rates of NCDs, community and social support systems are not peripheral; they are central pillars of effective, equitable care. People living with HIV and NCDs often face overlapping social vulnerabilities, such as stigma, poverty and mental health challenges, that cannot be addressed by clinical interventions alone. Community-based structures, mental health integration and social services form a triad of support that facilitates care engagement, treatment adherence and improved quality of life (QoL). Utilising trusted local actors, integrating psychosocial services into care networks and aligning health initiatives with social protection frameworks all strengthen a person-centred approach to care. The following approaches highlight how a strengthened social fabric underpins successful HIV and NCD integration and resilience in vulnerable communities.

Community-based organisations

Community-based organisations (CBOs) play a foundational role in addressing SDoH by connecting underserved populations to essential health and social services. In the context of HIV and NCD integration, CBOs are instrumental in delivering community-level care, education, adherence support and outreach to marginalised and hard-to-reach populations. Their proximity to communities enables them to tailor interventions that reflect local realities, including culturally appropriate messaging around ART adherence, diabetes management and dietary education. These organisations also help reduce stigma by normalising care-seeking behaviours and facilitating peer support groups. Strengthening CBO capacity through sustained funding and technical training, as highlighted by the National Department of Social Development (NDSD 2020a), can enhance grassroots health care system linkages and improve continuity of care for PLHIV and NCDs.

Mental health services

Expanding access to community-based mental health services is essential in the integrated management of HIV and NCDs, as mental health is a cross-cutting determinant that directly impacts health behaviours, medication adherence and QoL. People living with HIV are at higher risk of depression and anxiety, which in turn can impair their engagement with care. Similarly, chronic NCDs such as type 1 diabetes and cardiovascular disease are often accompanied by psychological distress. Community mental health programmes, particularly those embedded within primary care and CBO structures, can facilitate early identification and referral, offer counselling and support psychosocial resilience. The NDoH (2020) recommends community-based mental health integration to address the dual burden of physical and mental illness, a recommendation that is especially relevant in areas with limited clinical resources.

Social services

Strengthening the delivery of state social services, including child welfare, elder care, disability support and social grants, creates a supportive environment in which integrated HIV and NCD care can succeed. Vulnerable populations often experience intersecting disadvantages: Food insecurity, inadequate caregiving and income instability, which directly affect their ability to access and adhere to long-term treatment regimens. For instance, older adults managing hypertension or HIV often rely on caregivers or community support systems to ensure clinic attendance and medication adherence. Similarly, children orphaned by HIV or affected by chronic illness within the household require protection, nutrition support and school access. Social service delivery, when aligned with health interventions, ensures that individuals are not left behind because of economic or structural barriers. The NDSD (2020b) emphasises this alignment as a cornerstone of inclusive and sustainable development.

Access to primary health care services

Ensuring equitable access to PHC services is a cornerstone of South Africa's national response to the dual burden of HIV and NCDs. While the country has made considerable strides towards integrating HIV services into PHC, the growing prevalence of NCDs, especially among PLHIV, demands a systemic shift towards more inclusive, person-centred care. Effective integration is not only about co-locating services but also about reimagining delivery models, re-engineering human resources and aligning digital infrastructure to support continuity of care. As the nation moves towards UHC, strengthening access means expanding beyond facility-based care to

leverage community platforms, optimise workforce roles and ensure that no patient is left behind because of fragmented services or social barriers. The following strategies highlight practical steps, ranging from PHC system investment and workforce training to community outreach and digital integration, that are essential to overcoming persistent gaps in access and achieving a sustainable, equitable and integrated model of HIV and NCD care.

☐ Health care system strengthening

Since 2020, South Africa has made incremental progress in strengthening its health care system, aiming to improve equity and integration in-service delivery. The NDoH (2020) prioritised investments in infrastructure, digital health care systems, human resources and patient-centred models of care, particularly in underserved provinces. Evidence from Kenya indicates that institutional support, leadership commitment, resource availability, teamwork and a supportive organisational culture can facilitate the integration of HIV and NCD services (Njuguna et al. 2025). Although these findings offer relevant lessons for South Africa, they should not be presented as an evaluation of South African programmes. These improvements have been associated with increased retention in care and better management of comorbidities like HIV–diabetes and HIV–hypertension. Despite these gains, significant disparities remain in rural and peri-urban areas, often because of staff shortages, equipment gaps and fragmented data systems. Therefore, continued investment in the health care system remains essential to ensure the full implementation of integration principles and sustain improved health outcomes.

☐ Community health care workers

Over the past five years, CHCWs have played a transformative role in expanding access to HIV and NCD services at the community level. Their numbers and scope of practice have steadily increased, especially under the Ward-Based Primary Healthcare Outreach Teams (WBPHCOTs) model. A study by Williams and Mash (2024) revealed that CHCWs were particularly effective in delivering HIV testing services, monitoring medication adherence and linking patients with chronic conditions to care facilities. Furthermore, their ability to conduct home visits and provide culturally sensitive health education has enhanced trust and engagement in hard-to-reach communities, helping reduce stigma associated with HIV and improve early detection of NCDs. However, challenges related to CHCWs' remuneration, training and integration into facility teams still hinder scale-up. To maximise their contribution, policy reform must ensure standardised training, continuous professional development (CPD),

certification and inclusion in national health care workforce plans (Williams & Mash 2024).

Integration of services

The integration of HIV and NCD services into South Africa's PHC model necessitates a multi-level, system-wide approach that is both practical and scalable. This begins with the development and nationwide implementation of standardised clinical guidelines that merge HIV, diabetes, hypertension and TB protocols into unified patient pathways. These guidelines should align routine screenings, follow-up visits and treatment protocols into one simplified model for implementation by PHC teams. For example, a patient attending an HIV consultation should be routinely screened for NCDs using a harmonised checklist and managed within the same facility using a shared follow-up schedule. The NDoH (2023) Adult Primary Care (APC) Clinical Decision Support Tool can serve as a foundational reference, updated to reflect integration-focused clinical workflows. To operationalise this in real time, facilities must adopt integrated digital tools, such as the integrated reporting tool developed by Murudi-Manganye, Makhado and Sehularo (2022), to capture and report HIV and NCD indicators within a unified system such as TIER.Net or DHIS2. This reduces duplication, enhances continuity of care and facilitates more effective monitoring of patient outcomes across various conditions.

Human resources are equally critical to implementation. Nurses and CHCWs must be upskilled through targeted in-service training that equips them to deliver both HIV and NCD services effectively, including polypharmacy management, health literacy support and lifestyle counselling. As emphasised by Murudi-Manganye et al. (2023), this capacity-building must be reinforced through structured mentorship, inclusion in staffing models and ongoing professional development. Task shifting, especially to CHCWs, should be expanded to include screening, medication delivery and adherence support at the community level, ensuring service continuity and reducing facility congestion. This ties directly into DSD models, such as integrated adherence clubs and expansion of the Central Chronic Medicine Dispensing and Distribution (CCMDD) System to cover multiple chronic conditions. Patients with comorbid HIV and NCDs should be able to collect their full medication regimen from a single location, minimising travel costs and increasing treatment adherence.

To ensure effectiveness, these models should be piloted through site-based demonstration projects using Plan-Do-Study-Act (PDSA) quality improvement cycles. Facilities implementing integrated care can track progress through continuous data collection on wait times, patient retention and health outcomes and iteratively refine service models based on patient

and provider feedback. Ultimately, community engagement is essential for securing buy-in and addressing stigma. Public health care messaging, led by CHCWs and CBOs, should explain the benefits of integrated services, encourage clinic attendance and promote positive health behaviours. Mechanisms such as community scorecards and stakeholder dialogues can improve transparency, responsiveness and community ownership of care models.

Integrating HIV and NCD care within South Africa's PHC framework requires practical reforms across clinical practice, digital systems, workforce training, service delivery platforms and community engagement. These steps will not only improve efficiency but also advance equity, reduce the dual burden of disease and ensure better long-term health outcomes, aligning with South Africa's UHC goals.

Food security

Improving food security has emerged as a pivotal strategy in advancing the integration of HIV and NCD care in South Africa's PHC system. Between 2021 and 2024, the government scaled up targeted nutritional interventions for vulnerable groups, including pregnant women, learners and chronically ill adults, to enhance both disease prevention and treatment adherence. For instance, the National School Nutrition Programme (NSNP) and antenatal-linked maternal nutrition services were adapted to include HIV testing and NCD risk screening. By 2023, these efforts reached over 9 million learners and more than 70% of pregnant women, contributing to measurable improvements in key health indicators like anaemia reduction and decreased incidence of low birth weight, which are linked to maternal HIV and long-term NCD risk (Gausi et al. 2021; Roomaney & Van Wyk 2023).

Complementing these efforts, agricultural interventions like the Comprehensive Agricultural Support Programme (CASP) and the Presidential Employment Stimulus have bolstered food production and economic resilience for over 120,000 smallholder farmers. These initiatives have improved household dietary diversity while also supporting health care system goals. In several provinces, community gardens integrated with PHC clinics now supply fresh produce directly to patients on ART and chronic NCD medications, regimens that require adequate nutrition for optimal efficacy (Gerber et al. 2024; Moyo-Chilufya & Mgutshini 2025).

The NDSD's Social Relief of Distress (SRD) programme, which distributed over 22 million food parcels and vouchers by 2024, has also been aligned with PHC services. In the more rural provinces like Limpopo and Mpumalanga, chronic outreach services now integrate nutritional assistance, tackling one of the most persistent barriers to adherence: hunger. A 2024 study by

Mahlangu et al. (as cited in Lyons et al. 2024) found that embedding food support within ART and NCD service delivery significantly improved adherence rates and reduced treatment discontinuation.

Collectively, these initiatives reflect a growing consensus: food security is a fundamental enabler of integrated HIV and NCD care. By improving nutritional status, stabilising food access and embedding agricultural and social support within the health care delivery platform, South Africa is moving towards a more holistic, equity-driven model of chronic disease management. These efforts not only address structural determinants of health but also serve as sustainable gateways to integrated, patient-centred care in high-burden, resource-limited contexts (Ngugi 2025; Van Pinxteren et al. 2024).

Culture and traditions

Promoting cultural sensitivity within the health care system has become a vital component of successful HIV and NCD integration in South Africa. In diverse and multilingual societies, health care professionals who demonstrate cultural competence, such as understanding local health beliefs, spiritual perspectives and familial dynamics, are better equipped to engage patients with empathy and respect. This sensitivity facilitates clearer communication, enhances patient trust and increases adherence to chronic treatment regimens such as ART and antihypertensives. Implementation data from community-based chronic disease interventions show that when providers reflect on their biases and adapt their approaches through culturally grounded training, patient outcomes improve markedly (Salifu et al. 2025; Sharma & Mwamba 2024). Such reflexivity is essential in contexts where structural inequalities and colonial histories have shaped patient–provider relationships.

Equally central to culturally congruent care is the collaboration between traditional healers and formal medical practitioners. In many South African communities, traditional healers remain the first point of contact for individuals seeking care for symptoms ranging from fatigue to chronic pain, conditions often linked to HIV or NCDs. Rather than viewing traditional medicine as oppositional, integrated health programmes have increasingly adopted frameworks that engage traditional healers in outreach, referrals and health promotion activities. This collaboration respects indigenous knowledge systems (IKSs) while reinforcing evidence-based medicine (Ramavhoya & Nesengani 2022). Research indicates that such partnerships enhance community acceptance of PHC services, increase the uptake of screening and treatment and reduce dropout rates, particularly among patients who rely on spiritual or ancestral explanations for illness (Ansbro 2024). When traditional healers are formally recognised

and trained to support chronic disease care, they become powerful allies in bridging the gap between cultural beliefs and clinical protocols.

Community dialogues serve as the foundation for embedding these culturally informed practices into routine care. Open forums where PHC providers and community members discuss health-related traditions, such as dietary restrictions, herbal treatments or mourning rituals, help demystify medical processes and dismantle distrust. These conversations provide health workers with insight into the sociocultural dimensions of health behaviour, allowing them to offer more tailored advice without alienating patients. Simultaneously, communities gain a clearer understanding of the biomedical rationale behind treatment recommendations. Evidence from participatory interventions in southern Africa underscores that such dialogues not only improve the cultural responsiveness of care but also foster shared accountability for health outcomes (Sharma & Mwamba 2024). By creating a space for mutual respect and knowledge exchange, community dialogues ensure that HIV and NCD integration efforts are not only medically effective but also socially resonant.

Tackling the complex issues surrounding SDoH in South Africa requires ongoing effort, collaboration and commitment at all societal levels. Social determinants such as income inequality, education, housing and access to health care profoundly influence health outcomes and must be systematically addressed through comprehensive policies and programmes. These initiatives should reduce disparities, promote equity and advance social justice, ensuring all citizens can achieve optimal health. Collaborative efforts between government, communities and the private sector are essential to creating lasting change and improving the population's overall wellbeing.

Conclusion

To strengthen the argument that a comprehensive, multisectoral approach grounded in the SDoH is not only necessary but also effective in addressing South Africa's HIV and NCD epidemics, it is essential to move beyond conceptual support and present evidence of implementation, both domestic and international. The critique that similar strategies fail in better-resourced countries ignores the nuance that implementation context, not just resources, determines outcomes.

Evidence from South Africa and other LMICs consistently supports the assertion that PHC-anchored, multisectoral interventions can substantially improve health outcomes. For instance, South Africa's experience integrating HIV and NCD care through PHC systems has shown measurable success when grounded in localised, community-engaged approaches.

A population-based study in rural KZN revealed that convergence between HIV and NCD care, bolstered by PHC strengthening, improved service coverage and health care system responsiveness despite socioeconomic constraints (Wong et al. 2021).

More broadly, a recent scoping review of multimorbid care in LMICs highlights that person-centred PHC delivery, supported by multisectoral partnerships, enhances early diagnosis, continuity of care and patient satisfaction. Notably, countries with limited budgets, such as India and Thailand, have made headway in managing complex NCD burdens through cross-sector alignment and policy coherence, offering practical implementation templates even in settings with chaotic governance or limited resources (Joseph et al. 2025; Zezai et al. 2024).

South Africa's own policy and programmatic architecture reflects global best practices. For instance, the NDoH's approach to integrating PHC, nutrition and social development under the 'Ideal Clinic' model, as well as community health worker platforms, aligns with the WHO's recommendations on SDoH-responsive health care system transformation (WHO 2023). Furthermore, a comparative review by Sanni et al. (2019) affirms that SDoH-focused multisectoral frameworks can effectively mitigate chronic disease risk and improve system equity when implemented with accountability mechanisms and community governance.

To meet South Africa's PHC goals, the country must resist the temptation to dismiss systemic reform as an idealistic or redundant exercise. Instead, it must double down on operationalising the SDoH agenda through actionable, evidence-informed levers:

- Institutionalise cross-sector coordination between health, education, housing and finance through joint budgets and outcome-linked metrics
- Empower PHC facilities as hubs of integrated care, not just clinical endpoints, equipping them with social workers, patient navigators and interdepartmental referral systems
- Scale community-led models that embed civic participation in health governance, including the co-design of service delivery priorities and monitoring tools
- Leverage international lessons through South–South collaboration, adopting adaptable blueprints from comparable LMIC successes.

The argument that systemic, SDoH-based reform has been 'said many times' should not obscure its necessity or potential. South Africa's context, marked by historical inequities and current economic hardship, demands more than tinkering in the health sector. It requires a resolute, empirically grounded strategy rooted in multisectoral governance, community

empowerment and PHC transformation. The evidence shows this is not only viable but also vital.

Declarations

Ethical considerations

This chapter synthesises existing literature and publicly available sources. No human or animal participants were involved; therefore, it did not require ethical approval.

Consent

Not applicable.

Author's contributions

Conceptualisation, L Makhado; *data curation*, L Makhado; *formal analysis*, L Makhado; *investigation*, L Makhado; *methodology*, L Makhado; *project administration*, L Makhado; *resources*, L Makhado; *validation*, L Makhado; *writing – original draft*, L Makhado; *writing – review and editing*, L Makhado.

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Data availability

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Disclaimer

The views expressed in this chapter are those of the author and do not necessarily represent the official views of their affiliated institutions or those of the publisher.

Chapter 3

Primary health care approach to the integrated management of HIV and noncommunicable diseases

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Abstract

The integration of human immunodeficiency virus (HIV) and noncommunicable disease (NCD) management in primary health care (PHC) settings is crucial for improving patient outcomes and health care system sustainability. This approach aligns with the World Health Organization's vision for integrated, people-centred health services. Primary health care, as the foundation of the health care system, can effectively provide comprehensive, accessible and integrated care for both HIV and NCDs, especially in low- and middle-income countries where resources are limited. Leveraging successful HIV vertical programmes, such as task shifting and community involvement, can enhance the management of NCDs. Implementing chronic care models in PHC can further improve the delivery of integrated services. Key principles of PHC, including inclusiveness, equity and community participation, are essential for successful integration. Ensuring accessibility, the delivery of supplies and equipment, affordability and the acceptability and appropriateness of services is crucial. This integrated approach addresses the burden of disease, promotes health equity and quality of life, and makes the health care system more resilient to crises such as pandemics.

Introduction

According to the World Health Organization (WHO) (2023a), integrated service delivery is essential for ensuring that people receive the right care, in the right place, at the right time. Such delivery should be people-centred and organised around how individuals present for care, rather than being driven solely by specific diseases, programmes or funding streams. While modern medicine's specialist and curative services remain indispensable, particularly for the management of complex and drug-resistant conditions, such as drug-resistant human immunodeficiency virus (HIV), multidrug-resistant tuberculosis (MDR-TB) and complicated noncommunicable diseases (NCDs), over-reliance on fragmented, disease-based models can undermine the long-term efficiency, equity and financial sustainability of health care systems. In response to the need for a more coordinated and sustainable approach to health care service delivery, WHO Member States adopted the Framework on Integrated People-Centred Health Services (IPCHS) (WHO 2019a). Integrating services, particularly at the primary health care (PHC) level, strengthens early detection, continuity of care, referral pathways and chronic disease management, while preserving access to specialised health care when clinically required. According to Murudi-Manganye, Makhado and Sehularo (2020), integrating HIV and

NCD management within PHC is crucial for transforming service delivery and improving patient outcomes. This chapter, therefore, focuses on the importance of PHC as a foundation of an effective health care system that works in synergy with specialist and curative services in the management of HIV and NCDs.

Importance of primary health care in managing HIV and noncommunicable diseases

Primary health care is the cornerstone of a health care system. It can facilitate the realisation of the United Nations' (UN) Sustainable Development Goals (SDGs), health security and universal health coverage (UHC), especially in low- and middle-income countries (LMICs), where resources are scarce, by taking services to where people live and work. Now that people living with HIV (PLHIV) on lifelong antiretroviral therapy (ART) are described as having a chronic disease, it is of great importance to provide comprehensive, integrated chronic care to these individuals at the PHC level. Described hereafter is the rationale for the central role of PHC in the management of HIV and NCDs.

Primary health care facilitates the provision of integrated services

The burden of NCDs such as hypertension, depression, obesity, hypercholesterolemia and metabolic syndrome in PLHIV in sub-Saharan Africa (SSA) is a significant public health concern that requires targeted and integrated interventions within an African context (Moyo-Chilufya et al. 2023). Emerging communicable diseases in the form of pandemics are worsening the situation as they cause disruptions to the progress made so far and they shift health priorities and political focus. In 2022, approximately 38 million people were living with HIV, despite the introduction and implementation of various HIV prevention strategies; the global numbers continue to rise, particularly in LMICs (Joint United Nations Programme on HIV/AIDS [UNAIDS] 2025). Sub-Saharan Africa contributes two-thirds of the world's total population of PLHIV and three-quarters of annual worldwide deaths from acquired immunodeficiency syndrome (AIDS) (Moyo et al. 2023).

Recent advancements in preventive strategies against infectious diseases have introduced a range of innovative options, including long-acting injectables, implants, vaginal rings and oral pre-exposure

prophylaxis (PrEP). These methods have been approved not only in the African region but also globally, reflecting a concerted effort to enhance public health outcomes. The primary objective of these strategies is to achieve zero new infections, thereby contributing to the cessation of the epidemic that has affected the world since around 1981. By employing these innovative approaches, we can work towards a future where the burden of disease is significantly reduced, ultimately stopping the transmission of these infections.

Despite the challenges PHC faces, including recurring patient complaints, inadequate service delivery, epidemics, pandemics and inequalities, the chronic care model (CCM) remains the approach for providing integrated services to PLHIV and those with NCDs within a primary care framework (Abrahams, Thani & Kahn 2022). This model serves as the initial point-of-care (PoC) for both groups and the majority of the population in South Africa. However, it is essential to understand the distinctions between PHC and the CCM.

Primary health care is a model of care that is person-focused at the point of service delivery, while being population-oriented in its planning, prevention and evaluation functions. It emphasises first contact, accessible, continuous, comprehensive and coordinated care for individuals and families within their community context. Simultaneously, PHC seeks to optimise population health by addressing the social determinants of health (SDoH), preventing disease and reducing inequities in access and health outcomes across population groups. The WHO's (2023b) whole-of-society approach does not negate person-centred care; rather, it situates individual health within the broader social and environmental conditions that shape daily life. In this way, PHC integrates individual-level clinical care with community- and population-level strategies, enabling multidisciplinary teams to respond effectively to both personal health needs and wider public health priorities.

Primary care is a vital component of the health care system, offering promotive, preventive, curative, rehabilitative and palliative services throughout life. However, the definition of PHC has evolved since 1978, leading to confusion. The WHO (2023b) now defines PHC as a whole-of-society approach aimed at achieving optimal health and wellbeing, focusing on people's needs and covering all aspects, from health promotion to palliative care, integrated into their daily environments (WHO 2023a). According to the WHO (2023b), PHC consists of three interrelated components: Comprehensive, integrated health services that include primary care and public health; multisectoral policies that address broader health determinants; and the engagement of individuals, families and communities to promote social participation and self-care.

The CCM promotes the development of long-term personal relationships among clients or patients and health professionals or teams of health care providers. The model helps enhance communication between clients and their families, encouraging them to be partners in health care.

According to a 2019 report by the WHO and the United Nations Children's Fund (UNICEF) on envisioning PHC in the 21st century, they endorse five fundamental roles in delivering integrated services for HIV and NCDs towards achieving UHC (WHO 2019c). These functions are outlined hereafter.

First contact

People living with HIV and those with NCDs initially have contact with skilled, knowledgeable and competent health care professionals, such as physicians, nurses and other PHC teams in their local communities, creating a strategic entry point and improving access to health services. Health care workers (HCWs) can serve as the initial point of contact and screening for both HIV and NCD risk factors during routine health visits.

People living with HIV and NCD patients receive timely diagnosis, health promotion, disease prevention, counselling, testing, education and treatment of both acute and chronic illnesses at their first contact with the PHC team. Such HCWs collaborate and refer patients appropriately to one another for further management and to the next level of care. These HCWs ought to advocate for their clients to ensure quality care.

Continuity of care

After diagnosis and initial management at hospital or second-level care, defined as district or specialist outpatient services, PLHIV and individuals with chronic NCDs may be referred to PHC facilities and community-based organisations (CBOs) for long-term continuity of care once clinically stable. Second-level care typically includes specialist HIV, medical or condition-specific clinics responsible for managing complex disease, treatment initiation, complications or treatment failure. At the PHC level, trained HCWs provide routine clinical follow-up, medication refills, adherence counselling and monitoring for early signs of complications, guided by standardised protocols. Primary health care practitioners do not replace specialist services for patients with advanced or complicated conditions such as antiretroviral (ARV) resistance, MDR-TB, organ failure or severe NCD complications. Instead, care is delivered through shared-care and

referral pathways, with timely escalation to higher levels of care when required. This coordinated approach supports continuity, strengthens therapeutic relationships and improves long-term health outcomes while ensuring that complex cases continue to receive appropriate specialist management.

☐ Comprehensiveness

The PHC model delivers a comprehensive range of promotive, protective, preventive, curative, rehabilitative and palliative services to PLHIV and individuals with NCDs. Comprehensiveness in PHC does not imply superficial or non-clinical care; rather, it reflects the capacity of trained HCWs to address a wide spectrum of health needs through clinical assessment, physical examination, monitoring of vital signs, diagnostic reasoning, treatment and follow-up across the course of life. Integrated HIV and NCD services enhance this comprehensiveness by enabling simultaneous clinical screening and management, including HIV testing, pregnancy assessment, body mass index (BMI) measurement, tuberculosis (TB) and diabetes screening, blood pressure (BP) monitoring and mental health support. These services require skilled HCWs who can interpret clinical findings, identify early complications and initiate or adjust care in accordance with established guidelines. These are in line with the *elements of PHC*, which include the following:

- **E:** *Education* about prevailing health problems and prevention and control methods
- **L:** Prevention and control of *locally* endemic diseases, which include HIV and NCDs
- **E:** Provision of *essential* drugs
- **M:** *Maternal* and child health care, including family planning
- **E:** *Expanded* immunisation against major infectious diseases
- **N:** Promotion of food supply and proper *nutrition*
- **T:** Appropriate *treatment* of common diseases and injuries
- **S:** Adequate *supply* of safe water and basic sanitation.

These elements of PHC are interdependent and clinically grounded. While digital technologies such as mobile applications (mHealth) and telemedicine (telehealth) and artificial intelligence (AI) may support PHC through data management, clinical decision support and patient reminders, they cannot replace the essential role of trained health care professionals in physical examination, longitudinal care, ethical judgement and therapeutic relationships. For PLHIV and individuals with NCDs, particularly those with multimorbidity, PHC remains a human-centred clinical practice supported, but not substituted, by technology.

☐ Stakeholder coordination

Primary care enhances team-based services in managing NCDs and HIV, organising different services and care across health care system levels and over time. It encourages active patient and community participation in all aspects of HIV and NCD care. Collaboration between PHC health care providers, local non-govermental organisations (NGOs), international donors and funders and government agencies can enhance resource sharing, ensuring PLHIV and those with NCDs have access to necessary medications and support services.

In South Africa, the PHC system falls under the National Department of Health (NDoH) and is primarily funded and managed by the government through public revenue. However, international donors, such as the United States President's Emergency Plan for AIDS Relief (PEPFAR) and the United States Agency for International Development (USAID), have historically played a critical complementary role in strengthening PHC capacity, particularly in the response to HIV, AIDS, TB and sexually transmitted infections (STIs). Although donor funding has recently declined (see Chapter 6), these partnerships have made substantial contributions to health care system development, workforce training and service delivery infrastructure. Given that many individuals living with HIV also experience NCDs, integrating NCD services into existing HIV programmes represents both an efficiency and equity opportunity. While the South African government bears the principal responsibility for resourcing PHC, continued donor engagement aligned with national priorities can support sustainable integration of HIV and NCD health care, ensuring that resources benefit all patients and reinforce a holistic, person-centred model of care (Shaw et al. 2015).

While it is recognised that donor agencies such as PEPFAR and USAID have their own strategic priorities and accountability frameworks, reflecting the principle that funding dictates policy and priorities, effective and sustainable health care interventions require alignment between donor agendas and national health care priorities. Therefore, rather than unregulated access to donor funds, a collaborative approach is needed in which donors advocate for and support the development of *integrated* guidelines for HIV and NCDs that are endorsed by the NDoH. This would ensure that external funding complements national policy goals and promotes a cohesive, person-centred model of care. In this way, integration becomes a shared objective driven by both donor commitments to health care system strengthening and national ownership of service delivery priorities.

People-centred

The PHC model enables genuinely people-centred care by placing the lived experiences of PLHIV and those with NCDs at the centre of service delivery. For the individual patient, often managing lifelong treatment, uncertainty about the future and responsibilities to family, PHC provides a trusted PoC where health concerns are understood within the realities of daily life. Through ongoing relationships with HCWs, patients receive not only health education but also empathetic support that empowers them to make informed decisions, voice their fears and preferences and actively participate in care planning.

Care plans for PLHIV and individuals with NCDs are therefore tailored not only to clinical indicators but also to personal circumstances such as stigma, employment demands, food insecurity, mental health challenges and family responsibilities. For families, people-centred PHC offers continuity, reassurance and coordinated support close to home, reducing the physical and financial burden of repeated hospital visits. Responding to individual needs while remaining embedded in the community, people-centred PHC strengthens trust, improves adherence and sustains hope. This approach ensures that integrated HIV and NCD care is efficient and affordable, humane, dignified and responsive to what truly matters to patients and those who depend on them.

Implementation of the chronic care model in primary health care

The CCM developed by Wagner and colleagues emerged during the 1990s as a framework for reorganising health care delivery for chronic conditions. It remains relevant to integrated HIV and NCD management because it promotes productive interactions between informed, activated patients and prepared, proactive health care teams (Stellefson, Dipnarine & Stopka 2013; Wagner 1998).

The CCM is most applicable to the management of clinically stable patients and relies on effective clinical information systems, quality data and coordinated service delivery. Although initiatives such as task shifting and adherence support programmes have been implemented, full integration of the CCM into South Africa's PHC system has been constrained by the persistence of disease-specific programmes. While vertical programmes for HIV, TB and maternal health have achieved important gains, their operation as parallel service delivery and funding streams may limit coordination and strain resources at facility and district levels (Harrison & Jordan 2022).

Evidence from SSA, including Kenya, Uganda, Tanzania and Rwanda, demonstrates that the CCM can be effective when supported by strong leadership, adequate staffing, functional infrastructure and robust monitoring systems (Harrison & Jordan 2022). However, operational challenges persist. Professional nurses and operational managers in PHC settings have reported shortages of staff and equipment, medicine

Source: Visualised by Sheillah Hlamalani Mboweni, Lufuno Makhado and Thendo Gertie Makhado, adapted from Stellefson, M, Dipnarine, K & Stopka, C 2013, 'The chronic care model and diabetes management in US primary care settings: A systematic review', *Preventing Chronic Disease*, vol. 10, e26. https://doi.org/10.5888/pcd10.120180.
Key: PHC, primary health care; SOPs, standard operating procedures; CBOs, community-based organisations; NPOs, non-profit organisations.

FIGURE 3.1: The chronic care model.

stockouts, long waiting times, poor infrastructure, inadequate defaulter tracing and insufficient training, all of which undermine the structure, process and outcomes of integrated chronic care (Ameh et al. 2017; Dagume-Ndou & Lumadi 2024). The effectiveness of the CCM, therefore, depends less on the model itself and more on the capacity of the health care system and the people responsible for its implementation. The CCM has six key elements, which include the following (Stellefson et al. 2013):

- Community and patient at the centre
- Delivery system design for health care, which is mainly PHC
- Self-management support and interventions
- Decision-making support
- Clinical information systems to guide progress and planning
- Organisation support.

The advantages of organisation support are that it can be adapted to the provider and organisational needs in managing HIV and NCDs, it can simplify operations, and it can produce highly effective, outcome-based systems (Stellefson et al. 2013).

While individual health care providers in PHC settings across South Africa often demonstrate strong ethical commitment to social justice and equity, the long-term viability of health care system reform depends on the integrity and effectiveness of governance structures. Evidence from rural South Africa indicates that despite the formal adoption of a district health care system model, inequities persist because of fragmented governance, weak accountability and limited institutionalisation of community participation (Fusheini & Eyles 2016; Sokhela 2024). In such contexts, top-down policies, directives and reform plans are vulnerable to implementation failure, particularly when corruption, resource leakage and political interference undermine trust and service delivery. Emerging long-acting HIV prevention technologies, including injectable PrEP, show the need for coordinated engagement between specialist centres, academic institutions and PHC services to ensure safe introduction, guideline development, provider training and equitable scale-up.

Studies from across SSA indicate that sustainable integration of PHC and progress towards UHC are more likely when reforms are anchored in participatory governance, transparency and shared accountability, rather than imposed through donor-driven or centrally managed programmes (Khatri et al. 2025; Olu et al. 2019). Evidence from Ethiopia demonstrates that embedding community engagement and equity principles within national PHC reforms can strengthen rural service delivery and improve UHC outcomes when governance structures support local ownership and oversight (Assefa et al. 2020). Globally, research confirms that community participation and accountability are central to equitable, people-centred

health care systems and to the durability of reform under real-world implementation pressures (Khatri et al. 2024; Sacks et al. 2020). Without such governance conditions, even well-designed health reforms are unlikely to withstand the rigours of implementation, particularly in rural and resource-constrained settings. Again, this requires commitment from government at all levels, a collaborative public–private partnership, and political will to address the broader, complex determinants of health and its interrelated physical, mental, social and wellbeing aspects, thereby achieving health for all.

Primary health care as a mechanism for supporting health and quality of life

Primary health care is a well-known mechanism for supporting wellbeing and quality of life (QoL). Primary health care facilitates the provision of integrated services to PLHIV and those with NCDs through the following:

- It can ensure that people receive personal, physical, mental, spiritual and instrumental support (i.e. tangible assistance such as financial resources, medical supplies, transportation and the availability of trained health personnel) to achieve the desired health outcomes and goals of the HIV and NCD programmes, and of public health more broadly.
- It relies on an adequate number and distribution of trained PHC physicians, nurses, HCWs, allied health professionals and others working as a health team and supported at the local and referral levels.
- Quality health service and cost-effectiveness are central to PHC and HIV and NCD treatment to reduce the burden of disease on patients and the health care system.
- It focuses on the principle of 'Health for all', and PLHIV and patients with NCDs rely on PHC to access services, especially in LMICs where the socioeconomic status of the community is lower. Primary health care can be easily accessible to all, offering simple, efficient services at a low cost, with cost-effective techniques and organisation.
- It integrates preventive, promotive, curative, rehabilitative and palliative health care services for HIV and NCDs. It ensures continuity, including access to readily available services for the community, such as sexual and reproductive health (SRH) care.
- Primary health care encourages new connections with community stakeholders with the vision and mission of reducing the prevalence of HIV and NCDs, through community participation and involvement.
- It has the ability to promote equity and equality among communities.
- Patient safety, service delivery performance and accountability are central aspects of PHC.

- In advocating for health promotion, PHC focuses on prevention, screening and early intervention to address health disparities.
- It is also perceived as an integral part of national socioeconomic development.

Integrating care for HIV and noncommunicable diseases using successful primary health care programmes

Primary health care is seen as an area or level of care to leverage the success achieved through the HIV vertical programme. A comprehensive literature review study conducted by Murudi-Manganye et al. (2020) reveals that much has been done in HIV management, and if the same can be done in NCDs, it will be an excellent investment to prevent and reduce premature death, mainly in LMICs. This work was initially carried out by HCWs appointed and funded by international donors. While the long-term goal is to transition these responsibilities to government-employed staff to ensure sustainability, South Africa's PHC system continues to experience shortages in personnel and funding (Fusheini & Eyles 2016). However, PHC human resources are already responsible for chronic disease management and screening, and these existing structures provide a viable platform for integrated service delivery. Rather than creating additional workload, integrating HIV and NCD services can leverage available resources, such as shared consultation spaces, multidisciplinary teams and common patient monitoring systems, to improve efficiency and continuity of care (Assefa et al. 2020). In this sense, integration is not only a response to workforce limitations but also a strategy to maximise existing capacity and strengthen the delivery of comprehensive, people-centred PHC.

A facility-integrated screening tool can be used that covers the assessment of both clinical and psychosocial factors; early diagnosis, treatment, referral and continuous follow-up; tracking and tracing those who miss appointments; and adherence education and counselling.

Task shifting and integration of HIV and noncommunicable disease programmes, with capacity-building in primary health care

Task shifting refers to the rational redistribution of clinical tasks among health workforce teams to optimise available human resources, as endorsed by the WHO (2008). In the South African context, task shifting has been formalised primarily through the nurse-initiated and managed antiretroviral therapy (NIMART) programme, which empowers professional nurses after

accredited training to initiate and manage ART under the NDoH guidelines (Crowley, Mokoka & Geyer 2021; Davies, Homfray & Venables 2013). This model operates within a regulated professional framework and does not delegate clinical decision-making to unqualified personnel. Community health care workers (CHWs), peer educators and expert patients play complementary, non-clinical roles, including adherence counselling, health promotion and patient tracing, thereby supporting professional staff rather than replacing them (Mboweni & Makhado 2020). Studies have shown that this structured form of task shifting has expanded access to ART, particularly in rural and resource-limited PHC facilities, without compromising the quality of care or professional accountability (Mboweni & Makhado 2023). Task shifting includes, for example, transferring ART initiation from doctors to PHC nurses; screening, counselling, testing, adherence, retention and linkages to lay counsellors or CHWs; administrative work from clinicians to administrative clerks; and treatment issuing to pharmacists' assistants.

Key principles and objectives of primary health care

> Primary healthcare is a whole-of-society approach to health that seeks to maximise health and wellbeing equitably by addressing people's needs throughout the life course. It combines integrated health services, multisectoral action on the broader determinants of health and the empowerment of individuals, families and communities. (WHO 2023b)

Primary health care in South Africa is grounded in the constitutional right of access to health care services and the principles of equity, dignity, participation and social justice (Republic of South Africa [RSA] 1996). Its principles guide how services should be designed and delivered, while its objectives describe the outcomes that an effective PHC system should seek to achieve. In integrated HIV and NCD care, these principles include intersectoral collaboration, community participation, appropriate technology, accessibility, acceptability, affordability, equity, appropriateness, effectiveness, efficiency and self-determination. Together, they provide a framework for developing services that are comprehensive, people-centred, culturally responsive and accessible throughout the life course.

Principles of primary health care

Primary health care should provide a one-stop service for PLHIV and NCDs, including intersectoral coordination, community involvement, health care system strengthening and use of appropriate technologies. These principles are pillars of PHC, enhancing people's physical, mental and social wellbeing, and they are particularly useful during a pandemic. Primary health care

enhances the health care system's resilience by proactively detecting epidemics at the community level and effectively responding to surges, serving as the foundation for addressing public health crises. Numerous studies have demonstrated that robust PHC systems serve as the bedrock of resilient health care systems, particularly during public health emergencies such as the coronavirus disease 2019 (COVID-19) pandemic. Effective PHC enables decentralised epidemic surveillance, early detection of infectious disease outbreaks, and continuity of essential services even under pressure (Bajoulvand, Ramezanlou & Derakhshani 2023; Shami, Gholipour & Naghibi 2023).

Primary health care providers serve as the first point of contact and are well-positioned within communities to quickly identify abnormal health patterns, thereby playing a crucial role in early epidemic response (Stengel et al. 2022). This capacity not only improves case detection and isolation but also alleviates the burden on tertiary health services by managing non-critical conditions at the primary level (Mosadeghrad, Afshari & Isfahani 2024). Moreover, evidence from LMICs during the COVID-19 pandemic illustrates how adaptive financing and governance mechanisms within PHC structures allowed for resource mobilisation and service flexibility during crises (Pradhan, Samnani & Abbas 2023).

The integration of PHC into broader health care system strategies fosters community trust, ensures equitable access and reinforces preparedness across all levels of care (Sundararaman, Muraleedharan & Ranjan 2021). Primary health care also contributes to system-wide resilience by enabling health care system actors to operate cohesively through well-established referral networks, consistent communication and continuous care provision even in the face of disruptions (Lugten et al. 2023). Therefore, strengthening PHC is not only a pragmatic response to current health threats but also a strategic imperative for future pandemic preparedness and system resilience.

Community involvement

Community involvement is an essential principle of PHC and a human rights approach to health. Participation is not enough; PLHIV and those with NCDs should be actively involved in their care. This is a process in which the community, PLHIV and those with NCDs participate in making informed decisions about their health. It is a social approach that highlights the community's health care needs and addresses SDoH. Community involvement entails the community's participation in identifying its health needs, planning, organising, decision-making and implementing health care programmes. It also ensures effective and strategic planning and evaluation of health care services. Communities and

civil society organisations that perform various functions should actively participate in addressing health and other social issues within their communities. Without community participation and involvement, the health care programmes cannot run smoothly and UHC cannot be achieved.

People living with HIV, those with NCDs, groups and activists should be involved in developing policies, guidelines and strategies to deal with the burden of diseases. Communities should be empowered to have ownership and be at the forefront of community-based health programmes to ensure sustainability, and such good practices by the health care system can yield better health outcomes. Community involvement can promote human dignity and address disparities and inequality by engaging with CBOs. People living with HIV and those with NCDs should always remain the key role players in care, while family members, friends and neighbours also play a significant role as a support structure. This will enhance the implementation and sustainability of self-care interventions, providing a foundation for the development of formal or informal partnerships.

☐ Intersectoral coordination

Intersectoral coordination has a vital role to play in restoring, promoting, maintaining and attaining the health of PLHIV and those with NCDs. The involvement of specialised agencies, the private sector, CBOs, community volunteers, CHWs and the public sector is essential to improving health by changing the behaviour and lifestyles of PLHIV and NCD patients through public campaigns and by ensuring that treatment is available in health care facilities. Intersectoral coordination ensures that different sectors collaborate and function interdependently to meet the health care needs of people. It also refers to the delivery of health care services in an integrated manner. Government departments such as those concerned with agriculture, the food industry, nutrition, education for health literacy, housing, communication and other sectors must be involved, as they provide a regular link and referral system to achieve health for all, specifically for PLHIV and NCD patients.

☐ The use of appropriate technology

Appropriate health care technologies are an essential strategy for improving the availability and accessibility of health care services. It has been defined as:

> Appropriate technology may be understood as technology that is scientifically sound, adaptable to local needs, acceptable to its users and maintainable using resources that the community and country can afford. (Training and Research Support Centre [TARSC] 2014, p. 3)

According to the WHO (2025) *Health Policy and Standards*, health technology refers to the organised application of knowledge and skills through devices, medications, vaccines, procedures and systems designed to address health issues and enhance QoL. Appropriate technology uses cheaper, scientifically valid and acceptable equipment and techniques. It is also necessary to ensure that the technology is scientifically reliable and valid, adapted to local needs, acceptable to the community, accessible and affordable with local resources and supported by mechanisms made available to everyone. A study conducted by Mboweni and Risenga (2022) about the impact of COVID-19 on the management of chronic diseases affirms that the sudden emergence of the pandemic and the application of regulations, including restrictions on movement, necessitated the use of telemedicine or telehealth to ensure access to services, as people with chronic diseases require clinical review and continued treatment.

Another study by Mboweni and Risenga (2023) on the experiences of patients with chronic diseases during the COVID-19 pandemic found that patients valued the use of technology in PHC, such as telephone counselling sessions and SMS reminders for appointments and treatment collection. These measures alleviated their fears by providing support and information while allowing them to stay home, thus minimising their exposure to infections from public transport and health care facilities where sick individuals congregate.

Accessibility

Promoting accessibility is an essential principle of PHC and of health care in general, and it is a central aspect of the community's social equity and social and economic development. Primary health care should address health inequities and disparities to ensure that services are accessible to the most vulnerable recipients, including those with the lowest incomes and those living in remote areas. It is essential to note the difference between equality and equity. Primary health care plays a vital role in addressing health inequities by ensuring that essential health care services are accessible to marginalised populations, including those living in poverty or in rural areas. Equitable access is a core principle of PHC and is central to achieving UHC (WHO 2021). It is essential to differentiate between equality and equity in health care system planning. Equality implies that everyone receives the same resources and services regardless of their needs or circumstances. In contrast, equity acknowledges that individuals and communities have different starting points and health burdens; thus, resources must be allocated proportionately to achieve comparable health outcomes (WHO 2021). This means that equity-oriented PHC does not treat everyone the same but rather responds to different needs with tailored interventions to eliminate disparities in health access and outcomes (Agyei & Kumah 2024).

Integrated service delivery models for HIV and NCDs are proving essential in advancing equitable access to health care, particularly for underserved populations. Such models not only streamline care but also help address overlapping vulnerabilities and service barriers experienced by PLHIV and those with chronic conditions.

Evidence from Uganda demonstrates that community-based NCD services significantly improved the QoL for PLHIV by enhancing access and treatment adherence, especially in settings with constrained infrastructure (Ddamulira, Nsereko & Musoke 2020). Similarly, integrated community care programmes in Lesotho improved long-term NCD management among PLHIV by embedding services within primary care frameworks (Duffy et al. 2017).

Mobile clinics and telehealth interventions play a transformative role in expanding reach. A recent systematic review found that digital health tools, such as virtual consultations and mobile applications (apps), have effectively reduced physical and financial access barriers in LMICs (Jones-Esan, Somasiri & Lorne 2024). These platforms enabled regular follow-ups and medication adherence for chronic conditions like HIV and hypertension, particularly benefiting rural and disabled populations.

Community health care workers can extend the reach of PHC by supporting health promotion, community screening, referral, treatment adherence and follow-up, particularly in underserved communities. Their effectiveness depends on appropriate training, supervision, remuneration, referral systems and integration into formal health services (Khatri et al. 2024). Community-based integrated management of HIV, diabetes and hypertension is being evaluated in Tanzania and Uganda to understand its implementation, acceptability and potential contribution to decentralised chronic disease management (Van Hout et al. 2024).

Medication delivery, flexible appointment scheduling, multi-month dispensing and peer-support arrangements can reduce logistical and psychosocial barriers and improve continuity of care by adapting service delivery to patients' clinical circumstances and preferences (Ehrenkranz et al. 2021).

Culturally competent care, when integrated into frontline HCWs' training protocols, fosters trust and engagement. This is critical for stigmatised conditions such as HIV and for patients from diverse sociocultural backgrounds (Goldstein et al. 2023). Collectively, these strategies demonstrate that integrated HIV and NCD services, when guided by an equity framework, can substantially enhance health care accessibility and reduce systemic disparities.

Despite the growing adoption of integrated HIV and NCD services and community-centred innovations, persistent systemic barriers continue to undermine equitable access to care. A study by Mboweni and Makhado (2020) identified key obstacles to the initiation and management of ART. These included insufficient training for health care professionals, limited human resources, inadequate infrastructure, poor data management systems and structural weaknesses at the district health care level. These constraints collectively compromise the capacity of PHC systems to deliver timely and consistent services to PLHIV.

Moreover, the effectiveness of NIMART is significantly hindered by weak integration between HIV and NCD services. While nurses receive training through adult primary care (APC) models, which are designed to support integrated clinical approaches, the disconnection between theoretical instruction and real-world implementation continues to challenge care quality and efficiency (Mboweni & Makhado 2019). These findings highlight the need for systemic alignment between policy, infrastructure, training and service delivery frameworks.

To advance inclusivity and reduce chronic disease disparities, PHC systems must intentionally promote both equality and equity. According to the Centers for Disease Control and Prevention (CDC 2024), health disparities are 'preventable differences in the burden of disease, injury, violence or opportunities to achieve optimal health that are experienced by socially disadvantaged populations'. Addressing these disparities requires more than geographic and financial accessibility; it also requires attention to cultural acceptability and health care providers' attitudes, which can be barriers even when services are physically available.

Operational factors, such as clinic hours, must be adapted to suit the working lives of individuals managing chronic conditions. Outreach strategies, including mobile clinics and community-based teams, are particularly important for populations who must travel considerable distances or face lengthy travel times to reach a health facility. Geographical accessibility should be assessed using contextually appropriate measures of distance, travel time, transport availability, cost and terrain. By incorporating flexibility, community proximity and culturally competent care, PHC systems can close the service coverage gap and build more resilient, inclusive and equitable health care delivery models.

☐ Acceptability

The integration of HIV and NCDs should be acceptable to patients, and they should be involved in decision-making regarding their care and preferences. Health care providers should share information with patients in their local language and avoid using terminology or jargon that hampers

understanding (RSA 2004, 2013; WHO 2019a). Patients' views, feelings, expectations and perceptions should be considered and met. Patients have rights and should be respected; however, they must be made aware of their responsibilities. No information or details about a patient can be released without their permission. It may only be shared with a HCW's colleagues who manage the patient. Otherwise, it is an offence. All health care providers should therefore sign an oath of confidentiality when dealing with patient information (RSA 2004, 2013).

☐ Affordability

The HIV and NCD services in PHC should be affordable. In some countries, these services are provided free of charge, while in others, patients still must pay, resulting in treatment interruptions for those who cannot afford them because of low income, unemployment or poverty (WHO & World Bank 2023). Transport costs and PHC facilities far from people are other barriers that they cannot afford.

This highlights the necessity of implementing the National Health Insurance (NHI), South Africa's flagship policy initiative for achieving UHC (RSA 2024). The NHI proposes a centralised national fund through which the government would purchase health care services from both public and private providers, aiming to guarantee equitable access to affordable and specialised care, particularly for uninsured and low-income populations. However, given that Parliament's *NHI Act 20 of 2023* is currently being legally challenged on the grounds of affordability and feasibility, alternative or complementary models must also be considered.

In the interim, strengthening the district health care system with strategic purchasing and public–private partnerships could advance equity and access within existing fiscal constraints. Expanding the reach of PHC re-engineering through contracting private general practitioners, integrating HIV and NCD management and leveraging donor-supported infrastructure offers a pragmatic, phased pathway towards UHC, even if a full NHI rollout is delayed. Ultimately, sustained political commitment and reallocation of resources to PHC remain essential for addressing South Africa's dual burden of HIV and NCDs.

☐ Equity

All patients with chronic diseases should be treated fairly without discrimination on the grounds of race, age, gender, gender identity or sexual orientation, including those who are lesbian, gay, bisexual, transgender, queer and/or questioning, intersex, asexual and others (LGBTQIA+). Patients should not be discriminated against because of their

disability, condition or geographical location. They should also not be called by their diagnosis (RSA 1996, 2004; WHO & World Bank 2023). Patients should be treated with respect and dignity (RSA 1996). Confidentiality should always be maintained. Health care providers should operate within the legal, ethical and moral parameters of the health care system, respecting the guidelines of quality assurance bodies (QABs) that regulate the practice of their profession and the cultural values of the community they serve.

☐ Appropriateness

Offering comprehensive, one-stop integrated services through a 'supermarket' approach can enhance the management of HIV and NCDs in PHC settings. The 'supermarket' approach in PHC refers to a one-stop, client-centred model of service delivery, where multiple health services are offered at a single facility or service point during the same visit. Similar to how a supermarket provides diverse goods under one roof, this approach allows patients to access a comprehensive range of services, such as HIV testing and treatment, NCD screening (e.g. for diabetes or hypertension), family planning, maternal and child health and health education, without the need for multiple appointments or referrals (WHO 2019a, 2023a). This model enables patients to access all necessary services in a single consultation room, rather than being referred to multiple locations, thereby reducing long wait times and incomplete care.

The services should meet the patient's physical, psychological and social needs and be tailored to the patient's age, abilities, knowledge and affordability (Ehrenkranz et al. 2021). Patients should be empowered to administer self-care interventions and manage their own treatment. Hence, individualised care is essential.

☐ Effectiveness

It is not sufficient merely to implement integrated HIV and NCD management; health care providers must also monitor and evaluate whether intended outcomes and goals are achieved, ensuring that resources are utilised effectively for maximum patient benefit (Duffy et al. 2017; Kintu et al. 2020; Murudi-Manganye et al. 2020). The implementation of standards and guidelines for the integrated management of HIV and NCDs should therefore be reviewed and strengthened to prevent the continuation of 'vertical provision' of services, that is, the delivery of care through disease-specific, stand-alone programmes that operate in isolation from one another (Murudi-Manganye et al. 2020). Such vertical structures, historically common in HIV and TB programmes, have often led to duplication of effort, fragmented data systems and inefficiencies in patient care.

In this context, preventing vertical provision means promoting horizontal integration, a collaborative, system-wide approach where data, resources and care processes are shared across programmes and disciplines. This ensures that monitoring, quality assurance (QA) and guideline implementation occur within a unified PHC framework, supported by trustworthy data and coordinated oversight at national and district levels. The goal is not to limit expert-led guidance, but to foster an integrated system in which both policy and practice align with people-centred care.

☐ Efficiency

For the successful integration of HIV and NCDs, health care providers must effectively utilise time and resources, including equipment and medications, to address the needs of both patients and the community (Duffy et al. 2017; WHO 2023a). The NDoH should allocate sufficient budget for supplies, treatments and equipment while ensuring adequate stock at pharmaceutical depots. Additionally, HCWs in PHC facilities need to play a crucial role in managing inventory effectively. They should monitor weekly and monthly stock levels and place orders accordingly to prevent shortages, while also avoiding overstocking, which can lead to expiration and unnecessary waste.

Health care workers should provide patients with health education, adherence counselling and support during each visit, including demonstrating self-care skills so that patients can continue to care for themselves at home (Duffy et al. 2017; Kintu et al. 2020).

☐ Self-determination

Self-determination in PHC refers to the right and ability of PLHIV and those with NCDs, as well as their communities, to make informed decisions about their health and wellbeing (RSA 2004). Effective self-determination occurs when HCWs empower patients through education, shared decision-making and participatory care (Ehrenkranz et al. 2021; RSA 2004; WHO 2019a). This includes supporting self-care practices, such as maintaining a balanced diet, adhering to treatment schedules, exercising regularly and participating in peer-led support groups.

However, self-determination must also be understood within an ethical context of social responsibility. In public health, autonomy cannot be exercised in isolation from its impact on others. For instance, in HIV care, measuring viral load helps identify patients who are not adhering to treatment, a situation where nonadherence may endanger both the individual and their sexual partners. Similarly, in vaccination programmes, refusal to vaccinate affects not only the child but also community immunity. Therefore, PHC practice should promote a balanced form of autonomy that

respects personal agency while recognising the individual's ethical duty to protect others. This approach aligns with PHC's foundational values of solidarity, equity and collective wellbeing, ensuring that personal choices support, rather than undermine, public health goals (Ehrenkranz et al. 2021).

Therefore, PLHIV and NCD patients should be motivated to understand their conditions and participate actively in decision-making with health care providers. In PHC, self-determination is crucial because it promotes patient autonomy, respect and engagement, ultimately leading to improved health outcomes. This concept also extends to communities having the authority to influence and direct the health services and policies that affect them, ensuring that these services are responsive to their specific needs and cultural contexts.

The objectives of primary health care

Apart from the principles, PHC has the following objectives, which can only be achieved when the principles and provision of integrated and comprehensive PHC services are implemented. The objectives of PHC are:

- To enhance programmes and services that promote the healthy growth and development of children and youth
- To encourage community engagement with both governmental and local sectors to improve the overall health of their communities
- To develop and improve community satisfaction with the PHC system
- To advocate for and support healthy public policies across all sectors and governmental levels
- To endorse and promote the execution of provincial PHC guidelines and initiatives
- To ensure timely and reasonable access to PHC services
- To uphold accountability standards in professional practice
- To establish PHC teams and networks within the limits of available resources
- To support comprehensive, integrated and evidence-driven PHC services.

Challenges of primary health care that may hinder the success of HIV and noncommunicable disease integration

Even though PHC effectively facilitates the integration of HIV and NCDs, the approach faces challenges. These can be dealt with decisively at national, provincial, regional, district and local levels, based on the WHO (2019b) recommendations provided in Table 3.1.

TABLE 3.1: Addressing challenges in mitigating human immunodeficiency virus and noncommunicable diseases through primary health care.

Challenges to the implementation of PHC	Mitigation measures for ensuring effective PHC
• Insufficient staffing and a lack of health care professionals • Deficient technology and equipment • Substandard infrastructure, particularly in rural locations • An emphasis on curative health services at the expense of preventive and promotional care • Difficulties related to geographic distribution • Low quality of health care services • Lack of financial support in health care programmes • Lack of community participation • Poor distribution of HCWs and with HCWs concentrated in urban areas • Lack of intersectoral collaboration	• Fostering community involvement by establishing connections, facilitating clear communication and highlighting the goals and advantages of PHC • Establishing QA mechanisms by developing measurable clinical, service delivery and patient experience indicators (e.g. viral suppression rates, waiting times and patient satisfaction) to monitor PHC performance, identify service gaps and guide continuous quality improvement through staff training and resource optimisation • Development of clinical guidelines, including the implementation of an essential drugs list • Allocating resources as per the needs of the central, provincial, state and local levels • Establish a planning procedure to identify goals and set benchmarks, focusing on families and communities that are most vulnerable • Encourage research that targets specific issues within health management systems • Create avenues to elevate health as a key priority in district development, ensuring health departments collaborate effectively in health-related initiatives • Formulate guidelines and frameworks that outline the roles and responsibilities of provincial governments

Source: Tabulation of data by Sheillah Hlamalani Mboweni, Lufuno Makhado and Thendo Gertie Makhado, adapted from the WHO (2019b) report, *Review of 40 years of primary health care implementation at country level*.
Key: PHC, primary health care; QA, quality assurance; HCWs, health care workers.

Re-centring the narrative: Placing the patient and provider at the heart of integration

While this chapter outlines systemic and structural strategies for integrating HIV and NCD services, it has admittedly underemphasised the lived realities of the very people most affected by this integration, patients and frontline HCWs. Health care systems transformation must be more than technical reform; it must elevate the agency, dignity and voice of both patients and providers.

Patients living with HIV and NCDs in LMICs often navigate overlapping stigmas, financial hardship, limited mobility and social isolation, all while managing lifelong treatment (Owusu et al. 2024). These realities are not adequately captured through guidelines alone. A patient-centred approach requires care models that address these contextual challenges and prioritise individualised support, including psychosocial care, flexible treatment delivery and cultural competence (Devi et al. 2020; Ehrenkranz et al. 2021).

Health care workers, meanwhile, shoulder an enormous burden as they attempt to operationalise integrated care models with limited infrastructure, overwhelming caseloads and chronic staff shortages. They frequently experience burnout and helplessness when institutional support is lacking (Moyo-Chilufya et al. 2023; Zezai et al. 2024). The emotional toll of this work is compounded by inadequate supervision and underinvestment in their professional development and wellbeing.

Integrated care systems that centre both the patient's and the provider's voices are more likely to succeed. Such a framework fosters trust, supports adherence and promotes continuity of care. As Ehrenkranz et al. (2021) argue, scaling differentiated service delivery models requires moving beyond medical efficiency towards human-centredness. Similarly, UNAIDS and WHO (2022) identify integrated mental health and psychosocial support as essential components of person-centred HIV prevention, treatment and care. We therefore affirm that health care system integration is not only a policy imperative but also a moral and ethical one. Integration must preserve human dignity, centre relational care and embed the values of empathy, respect and equity into every aspect of PHC reform.

Conclusion

Integrating HIV and NCD management into PHC systems is vital for addressing the growing burden of chronic diseases, particularly in LMICs. This chapter discussed how PHC can effectively provide holistic, sustainable and equitable care when supported by evidence-based models such as the CCM. The chapter highlights successful strategies from HIV programmes, such as task shifting, community engagement and differentiated service delivery, that can be adapted to improve NCD outcomes and enhance overall system resilience.

Crucially, it argues that integration is not merely a technical solution; it is also a moral obligation. Effective integration requires centring the needs of patients and HCWs within the health care system. Patients managing both HIV and NCDs face complex medical, social and structural challenges that demand personalised and culturally sensitive care. Concurrently, HCWs in PHC settings face systemic pressures, including overburdened workloads and limited resources, yet they play a key role in this integration. Their insights and experiences should be respected and incorporated into health policy and practice. The benefits of a well-integrated and person-centred PHC system are significant. Such a system promotes equity by ensuring that all individuals, regardless of socioeconomic status, gender, geography, or health diagnosis, can access high-quality, continuous and affordable health services. It also leads to greater patient engagement, better clinical

outcomes and improved continuity of care, especially in environments with limited resources and fragmented services.

To move forward, ongoing collaboration between governments, civil society, health care providers and international partners is essential. Investments should focus on strengthening health infrastructure, training the workforce, fostering digital innovation and promoting community-based health education. Monitoring and evaluation frameworks should go beyond clinical indicators to consider patient satisfaction, provider wellbeing and community empowerment. Ultimately, achieving UHC and resilience in health care systems hinges on our ability to create integrated, inclusive and compassionate PHC systems that reflect the real experiences of patients and providers while upholding dignity, justice and the fundamental right to health for everyone.

Declarations

Ethical considerations

The chapter comprises a literature synthesis and policy analysis. No human or animal participants were involved; therefore, it did not require ethical approval.

Consent

Not applicable.

Authors' contributions

Conceptualisation, SH Mboweni, L Makhado and TG Makhado; *data curation*, SH Mboweni; *formal analysis*, SH Mboweni; *investigation*, SH Mboweni; *methodology*, SH Mboweni and L Makhado; *resources*, L Makhado; *visualisation*, SH Mboweni, L Makhado and TG Makhado; *validation*, TG Makhado; *writing – original draft*, SH Mboweni, L Makhado and TG Makhado; *writing – review and editing*, SH Mboweni, L Makhado and TG Makhado.

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Data availability

Data sharing is not applicable as no new data were generated or analysed in this study.

Disclaimer

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Chapter 4

Human immunodeficiency virus and noncommunicable disease screening and diagnosis

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Abstract

This chapter explores the critical role of primary health care (PHC) in screening, diagnosing and managing human immunodeficiency virus (HIV) and noncommunicable diseases (NCDs). It emphasises the importance of integrated screening tools and strategies to ensure early detection and effective management of these conditions. The chapter highlights the use of the Bandason screening tool for identifying HIV among children and adolescents. It discusses the significance of routine HIV and NCD screening for individuals aged 13–64 years. It also outlines common screening tests for chronic diseases and emphasises the importance of regular examinations to prevent and manage health risks. The chapter demonstrates the need for an integrated approach in PHC settings to optimise patient outcomes, reduce stigma and enhance the efficiency of health care delivery. Overall, the chapter advocates for a comprehensive and coordinated PHC approach to address the dual burden of HIV and NCDs, particularly in low- and middle-income countries.

Introduction

Screening is the cornerstone of medicine and public health care, enabling the diagnosis of people presenting with or without clinical signs and symptoms, initiating treatment early before complications occur, and thereby identifying the 'at-risk' population. Strengthening PHC is an important investment because it provides an accessible platform through which preventive, promotive, diagnostic, treatment, rehabilitative and palliative services can be delivered in an integrated and people-centred manner (WHO & UNICEF 2020). Health screening involves identifying potential health issues or risks by collecting a medical history, asking targeted health-related questions, performing a physical examination and utilising specific diagnostic techniques. These techniques may include human immunodeficiency virus (HIV) rapid and self-testing, blood glucose and blood pressure (BP) monitoring, urine dipstick analysis, home pregnancy testing and vision and hearing screening. The process typically targets asymptomatic individuals to identify those at elevated risk for particular conditions.

The objective of screening is to achieve early identification and implementation of lifestyle adjustments or monitoring to lower the risk of developing a disease or to detect it early for optimal treatment. Screening tests are not primarily diagnostic; instead, they are used to identify a specific group within the population that requires further testing to confirm the presence or absence of a disease. The screening and diagnostic

approaches should adhere to the relevant World Health Organization (WHO 2021b) consolidated guidelines and South African National Department of Health (NDoH 2020) national guidelines for integrating the prevention and management of noncommunicable diseases (NCDs) within HIV and acquired immunodeficiency syndrome (AIDS), tuberculosis (TB) and sexual and reproductive health (SRH) initiatives. Within this framework, screening and diagnostic methods should be adapted to national and population-specific geodemographic contexts and to locally relevant structural and health care system challenges. A range of strategies may therefore be employed for the screening and diagnosis of HIV and NCDs, depending on setting and resource availability.

The screening and diagnosis of HIV and NCDs can also be facilitated through the coordinated use of integrated screening approaches within PHC facilities and community settings. In line with WHO (2021a) guidance, these approaches typically combine standardised risk assessment, disease-specific screening modules and clinical algorithms, such as those applied in essential NCD interventions and in the integration of NCD services within HIV, TB and SRH programmes. When implemented coherently, these approaches support the systematic identification of people living with or at risk of HIV and NCDs, enabling timely diagnosis, early initiation of treatment where indicated and ongoing monitoring. Delays in routine health assessments may increase the risk that conditions progress to more advanced stages before detection, underscoring the importance of early and continuous screening within PHC systems. However, disparities in access to health services continue to constrain effective screening implementation, with individuals who have health insurance more likely to undergo routine screening than those without coverage (Alba, Zheng & Wadhera 2024).

Screening and diagnosis of HIV among children and adolescents

A four-item HIV screening tool was developed by Bandason et al. (2016) to identify children and adolescents living with HIV in Zimbabwe. It was adopted by most low- and middle-income countries (LMICs) to optimise HIV screening and testing. A study to validate Bandason's screening tool was funded by the Centers for Disease Control (CDC), and it was adopted for use by lay health care workers (HCWs) in limited-resource countries such as South Africa. This initiative was also supported by the United States President's Emergency Plan for AIDS Relief (PEPFAR), as it was found to be a sensitive and straightforward method for identifying children living

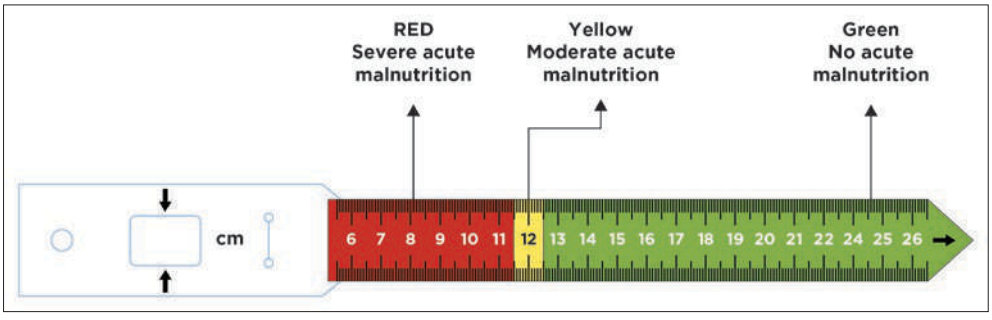
with HIV in LMIC settings (Bandason et al. 2016). The screening tool includes the four questions:

1. Has the child been admitted to the hospital before?
2. Does the child have recurring skin problems?
3. Are one or both parents of the child deceased?
4. Has the child had poor health in the last three months?

The four-question screening tool from Bandason et al. (2016) was adapted into a 12-question tool for HIV risk assessment by Antelman et al. (2021), as follows:

1. *Relative died*: Are one or more siblings or biological parents of the child or adolescent deceased?
2. *Hospitalisation*: Has the child or adolescent ever been admitted to a hospital?
3. *Poor health*: Has the child or adolescent had poor health in the last three months?
4. *Skin*: Has the child or adolescent had recurring skin problems?
5. *Identifying a family member who is ill*: Is the child or adolescent living with a chronically ill parent or family member?
6. *History of TB*: Has the child, adolescent or anyone in the household ever been prescribed TB treatment?
7. *Family member who is HIV-positive*: Are one or more siblings or biological parents of the child or adolescent HIV-positive?
8. *Malnourished*: Is the child or adolescent malnourished? A simple band or tape is used to measure the mid-upper arm circumference (MUAC) of the child, as recommended by the United Nations Children's Fund (UNICEF), to determine if the child is malnourished (see Figure 4.1).
9. *Identifying cough*: Has the child or adolescent had a cough for one month or longer?
10. *History of abuse*: Has the child or adolescent ever been or is currently being sexually abused or violated? This includes physical harm or injury, verbal or non-verbal emotional harm, any form of sexual contact, exploitation or rape and neglect.
11. *Sex history (if ≥ 10 years)*: Is the adolescent sexually active?
12. *History of pregnancy (if ≥ 10 years)*: Does the adolescent have a child of their own or are they pregnant?

The CDC recommends that all individuals aged 13–64 years be tested for HIV at least once as part of routine health care, while those with ongoing HIV risk factors should be tested at least annually (CDC 2025). To facilitate this, an integrated screening tool has been developed to help health care providers and patients seamlessly incorporate HIV and NCD screening into routine care.



Source: Image from nutriverse with added captions, used for research purposes within the restrictions and provisions as per nutriverse's Code of Conduct, of which a copy is available at https://nutriverse.io/code-of-conduct/
Key: cm, centimetre.

FIGURE 4.1: A simple band or tape to measure mid-upper arm circumference with indicators.

While the South African NDoH has not yet formally endorsed a standardised integrated screening tool for HIV, TB, NCDs and sexually transmitted infections (STIs), there is strong support for such an approach, given the current programmatic priorities (NDoH 2023). The NDoH's *National Adherence Guidelines for HIV, TB and NCDs* emphasise the importance of integrated screening among patients with chronic conditions, recognising it as a crucial intervention to enhance access to care, improve treatment adherence and ensure long-term patient retention (NDoH 2020). These guidelines propose a minimum package of interventions, including integrated education and counselling, the management of multiple chronic conditions within a single consultation and the application of standard operating procedures (SOPs) by both clinicians and non-clinicians.

In the absence of formal national endorsement, PEPFAR-funded implementing partners proactively developed and implemented integrated screening tools in the districts they supported. This initiative not only demonstrates the feasibility and effectiveness of such tools in enhancing efficiency and reducing missed diagnostic opportunities but also shows the importance of delivering patient-centred, streamlined services. These innovations align with the intent of the adherence guidelines and provide a solid foundation for future national standardisation. Ultimately, this comprehensive approach aims to foster early testing and diagnosis, thus improving health outcomes for patients and helping to reduce the stigma associated with HIV. Individuals with ongoing HIV risk should be tested at least annually, while more frequent testing, such as every three to six months, may be considered according to the nature and frequency of exposure and applicable national guidance. These individuals include the following (CDC 2025; WHO 2024):

- Individuals who inject drugs, and their partners
- Individuals engaged in transactional sex for goods such as money or drugs

- Partners of individuals living with HIV
- Sexually active gay, bisexual and other men who have sex with men (MSM). For these individuals, more frequent testing, such as every three to six months, may be advisable
- Heterosexual individuals who, or whose partners, have had one or more sexual partners since their last HIV test
- Individuals undergoing treatment for hepatitis, TB or STI.

Six common and important health screening tests that enable PHC professionals to identify patients at risk and diagnose chronic diseases in the public sector will now be explored.

Cholesterol

Cholesterol testing and monitoring should be performed annually in adults aged 40 years and older, particularly in men, postmenopausal women and individuals with cardiovascular risk factors such as hypertension, diabetes, obesity, smoking or a family history of heart disease. It is also recommended that patients of any age on lipid-lowering medications (LLMs) assess the effectiveness of their lipid-lowering treatment (LLT) and adjust the LLT accordingly.

Cholesterol levels indicate overall heart health and high levels increase the risk of heart disease. A simple lipid profile test determines whether lifestyle adjustments or changes are necessary to protect or improve heart health. Total cholesterol levels circulating in the body are determined as high-density lipoprotein (HDL) or low-density lipoprotein (LDL). Lifestyle modifications to reduce cholesterol include routine exercise, maintaining a healthy weight and cholesterol-lowering diets that focus on increasing fibre and unsaturated fats, reducing saturated and trans fats and limiting ultra-processed foods and refined sugars. Additionally, consider taking LLMs, such as statins (e.g. atorvastatin and simvastatin [SIM]) for primary or secondary cardiovascular prevention, ezetimibe (EZE) to reduce intestinal cholesterol absorption, or proprotein convertase subtilisin/kexin type 9 (PCSK9) inhibitors for high-risk patients who require further low-density lipoprotein cholesterol (LDL-C) lowering. A total cholesterol level below 5.0 mmol/L is categorised as normal, whereas a result of 5.0 mmol/L and above is deemed high and undesirable (September et al. 2024).

Eye examinations

Visual loss is common among people with NCDs, especially diabetes mellitus and hypertension, and those living with HIV, including adults and children. Routine eye examinations are thus required (Addo et al. 2021). Routine screening is crucial for maintaining and protecting good vision

while preventing eye diseases. Undergoing an annual eye check-up can help identify a range of eye conditions, such as near-sightedness (myopia), cataracts, diabetes, ocular retinopathy, hypertension, glaucoma, retinal occlusion and macular degeneration, to prevent vision impairment and blindness.

Additionally, a simple eye test can provide insights into one's overall health. Changes in one's sight can signal underlying health issues such as diabetes or high BP. A Snellen chart is commonly used to test visual acuity in PHC and the public sector; however, other tests, such as colour blindness testing, pupil response testing and eye movement testing, are also performed as indicated.

Cancer screening

Routine cancer screening examinations, such as mammograms, Pap smears, occult blood examination of stool and colonoscopies, play a crucial role in identifying cancer in its initial stages when treatments are more effective and less costly. Undergoing these screenings can save lives and is essential for overall wellbeing.

Cancer incidence and mortality are increasing in South Africa, with approximately 50,000 new cancer cases diagnosed annually in the general population, alongside a rising cancer-related mortality rate (International Agency for Research on Cancer [IARC] 2022; Statistics South Africa [Stats SA] 2023). These population-level trends are driven by established risk factors, including tobacco use, harmful alcohol consumption, physical inactivity, unhealthy diets, environmental exposures and co-existing infectious diseases such as TB. Between 2008 and 2019, females accounted for 51.3% of diagnosed cancer cases and males for 48.6%, with median ages at diagnosis of 59 years for females and 64 years for males. The median age at death from cancer was 62 years for females and 64 years for males, suggesting later-stage diagnosis and poorer outcomes, particularly among males (Stats SA 2023).

While these data describe the general population, cancer has also emerged as an increasingly important cause of morbidity and mortality among people living with HIV (PLHIV) as survival improves with long-term antiretroviral therapy (ART) (Odeny et al. 2024). Among PLHIV, cancers are commonly grouped into AIDS-defining malignancies, such as Kaposi's sarcoma (KS), cervical cancer and non-AIDS-defining cancers, including breast, colorectal, lung, prostate and liver cancers, which are being diagnosed more frequently as this population ages (Mathoma, Sartorius & Mahomed 2024; National Cancer Institute [NCI] 2024). Although the incidence of common solid tumours such as breast and colorectal cancer is

not uniformly higher among PLHIV than among HIV-uninfected individuals, these cancers represent a growing concern because they often occur at younger ages and in the context of multimorbidity and health-system delays (Odeny et al. 2024). Several HIV-associated and non-AIDS-defining cancers are amenable to prevention and earlier detection through strengthened PHC, including cervical cancer screening, hepatitis B vaccination, tobacco cessation and appropriate referral for age-based cancer screening (NCI 2024). Clear differentiation between general population cancer trends and HIV-associated cancer risk is therefore essential for informing integrated HIV and NCD strategies in South Africa.

Early cancer screening is a valuable tool as it enables the detection of cancer at a stage that is often manageable. Regular screenings can also identify precancerous conditions that can be addressed before progressing to cancer. It is important to bear in mind that numerous types of cancer do not exhibit symptoms until they have advanced significantly. Being aware of one's health status enables early intervention and better treatment outcomes.

Cervical cancer

Cervical cancer incidence and mortality rates are highest among black African women in South Africa, largely because of late diagnoses and the increased prevalence of HIV in this population (Stats SA 2023). Women in South Africa face a lifetime risk of one in 41 for cervical cancer. The incidence rate is estimated to be between 22.8 and 27 per 100,000 women, compared to a global average of 15.8, making it the second most common cancer among adolescent girls and women aged 15–44 years (National Cancer Registry [NCR] 2022). Women with HIV are significantly more likely to develop cervical cancer, with nearly 99% of cases linked to human papillomavirus (HPV) infection, particularly the HPV 16 and 18 strains, responsible for 70% of cases (Stats SA 2023). Thus, vaccinating adolescent girls and young women (AGYW) against HPV, along with screening and HIV testing and the use of condoms during anal and vaginal sex, is essential for prevention and early detection.

Cervical cancer screening should be initiated earlier and conducted more frequently among women living with HIV (WLHIV) than in the general population. A Pap smear (Papanicolaou smear) is recommended annually from the age of 25 years for WLHIV and from 30 years for women in the general population, with follow-up screening every three to five years for WLHIV and every five to 10 years for HIV-negative women, up to the exit age of 65 years, irrespective of HIV status (Adams & Botha 2024). The procedure involves the collection of exfoliated cells from the cervical surface, which are stained and examined microscopically to identify

cytological abnormalities. Early identification of precancerous changes enables timely intervention and can prevent progression to invasive cervical cancer.

Liquid-based cytology (LBC) is often considered more effective than conventional Pap smears for detecting cervical intraepithelial neoplasia (CIN) because it yields cleaner samples with fewer false-negative results (Andersen et al. 2020). However, recent evidence shows that high-risk HPV deoxyribonucleic acid (DNA) testing is more sensitive than both LBC and Pap smears for detecting high-grade cervical lesions. A meta-analysis by Sutedja et al. (2024) found that LBC had a lower detection rate for cervical cancer compared with HPV testing (odds ratio 1.91, 95% confidence interval [CI]: 1.14–3.20), supporting HPV testing as the preferred method for primary cervical cancer screening.

According to the WHO's (2021b) global cervical cancer screening guidelines and the South African NdoH's (2021a) *Cervical Cancer Prevention and Control Policy*, HPV testing is now the recommended primary screening method for women aged 30 years and older, while Pap smears and LBC remain secondary or follow-up tests where HPV testing is unavailable. Importantly, LBC is not universally available across South African PHC clinics because of higher equipment and consumable costs; therefore, conventional Pap smears remain the standard of care in most public-sector facilities, with LBC mainly implemented in urban or tertiary settings.

Other common cancers among people living with human immunodeficiency virus and noncommunicable diseases

Breast cancer

Self-assessment and annual examinations by health care providers are essential for the early detection of cancer in PLHIV and those with NCDs. A trained nurse conducts a clinical breast examination, including a physical and visual evaluation of the breast to identify any irregularities. Both women and men should be informed about performing monthly self-examinations to spot any abnormalities. While men are at substantially lower risk of breast cancer than women, breast cancer does occur in men and is often diagnosed late. In line with South African PHC and HIV–NCD integration frameworks, the emphasis is therefore on education, awareness of symptoms and timely clinical evaluation rather than routine screening in men (NCI 2025). Mammograms are the most effective method for the early detection of breast cancer, allowing treatment at a more manageable stage before it becomes palpable or symptomatic (Gaddam et al. 2021).

☐ *Prostate cancer*

Regular prostate-specific antigen (PSA) testing and rectal examination should be done yearly. Prostate-specific antigen testing should be conducted annually, starting at age 40 for all males at high risk of prostate cancer (John et al. 2024). This includes men with more than one first-degree relative (father, brother or son) who were diagnosed with prostate cancer at an early age (younger than 65 years). The PSA test is a blood examination primarily employed for prostate cancer screening. This test quantifies the level of PSA in the bloodstream, with elevated levels potentially signalling prostate inflammation or prostate cancer. Prostate-specific antigen is a protein generated by both cancerous and non-cancerous prostate tissue in the small gland situated beneath the bladder in males. The blood sample is sent to a laboratory for evaluation. Prostate-specific antigen levels ranging from 4 ng/mL to 10 ng/mL might be interpreted as elevated and could suggest an increased risk of cancer. Yet, a high PSA level does not invariably signify the presence of cancer; additional evaluation is necessary to confirm this. Men should be encouraged to maintain a healthy body weight, as obesity has been associated with prostate cancer risk. Proposed biological mechanisms include the role of adipose tissue-derived adipokines, which may influence prostate cancer development (Mistry et al. 2007).

☐ *Colon (colorectal) cancer*

Colorectal cancer typically develops from precancerous polyps, which are abnormal growths in the lining of the colon or rectum. Screening tests are therefore essential, as they can detect these polyps early and allow their removal before malignant transformation. The faecal occult blood test (FOBT) or faecal immunochemical test (FIT) provides a non-invasive screening option that may be implemented in primary care and resource-constrained settings (Krist et al. 2021). These tests are inexpensive, non-invasive and suitable for routine population-level screening in PHC settings or those with limited resources.

When FOBT or FIT results are positive, patients may be referred for confirmatory diagnostic procedures, such as colonoscopy, sigmoidoscopy or imaging studies (e.g. computed tomography [CT] colonography). These investigations allow for direct visualisation and biopsy of suspicious lesions but require technical expertise and are generally limited to higher-level health care facilities. Although advanced imaging and endoscopic procedures have important diagnostic and screening roles, stool-based screening with an annual high-sensitivity guaiac-based faecal occult blood

test or FIT provides a non-invasive option that does not require bowel preparation or anaesthesia. The selection of a screening strategy should nevertheless consider available resources, patient preferences and the capacity to ensure diagnostic colonoscopy following an abnormal stool-test result (United States Preventive Services Task Force [USPSTF] 2021).

Anal cancer

Anal cancer is highly preventable because of its association with HPV, a group of 150 related viruses that infect skin surfaces, including the genitals and anus. Anal squamous cell carcinoma (ASCC), the most common type, is caused by different strains of HPV that can be prevented with prior vaccination of at-risk men and women. While eight out of 10 people will be infected with HPV at some point, most infections clear on their own (NCR 2022). However, chronic infections with 'high-risk' HPV types can lead to anal and other cancers. Low-risk types may cause warts but are unlikely to become cancerous.

Risk-based anal cancer screening is recommended for populations with a substantially increased incidence of anal cancer. Screening should commence at 35 years for MSM and transgender WLHIV, and at 45 years for other PLHIV and for MSM and transgender women without HIV. Screening is also recommended 10 years after solid-organ transplantation and within one year of a diagnosis of vulvar precancer or cancer, provided that appropriate diagnostic and treatment capacity is available (Stier et al. 2024).

Blood pressure

According to Krist et al. (2021) and the NDoH (2021b), routine BP screening should begin at 18 years of age and occur at least annually for adults aged 40 and older or those with elevated cardiovascular risk, and every three to five years for younger, lower-risk adults. Regular BP monitoring enables early detection and management of hypertension, reducing the risk of heart disease, stroke and premature death. This examination assesses arterial pressure and is a standard procedure during medical visits to screen for elevated BP, aiding in the detection of hypertension. A normal BP reading for adults is 120/80 mmHg. People living with HIV are occasionally at risk of developing hypertension because of the renal toxicity of some antiretrovirals (ARVs), although this complication is rare. Hypertension in PLHIV is more frequently caused by cardiovascular disease (atherosclerosis), type 2 diabetes and renal impairment from various causes. Blood pressure must be closely monitored and controlled in clients and, where present, managed with laboratory tests and appropriate therapy.

Blood glucose screening

Individuals are advised to undergo rapid blood testing every six months to monitor glycaemic control and assess diabetes-related risk. Regular follow-up with the PHC team is recommended to support effective diabetes management and prevent complications, including visual impairment and peripheral circulatory problems such as diabetic foot disease (neuropathy, poor circulation, foot ulcers, infections or Charcot foot). Healthy adult Blood-glucose concentrations vary according to the timing of measurement, recent food intake and the method used; fasting and random values should therefore be interpreted against the appropriate diagnostic or treatment thresholds (American Diabetes Association Professional Practice Committee 2023a).

Various types of glucose tests

Primary health care professionals utilise blood glucose assessments, including:

- *Glycated haemoglobin (HbA1c) test*: This test evaluates average blood sugar levels typically over two to three months, indicating prediabetes or diabetes.
- *Fasting blood sugar test*: This test assesses the glucose levels in the blood following at least an eight-hour fasting period. Conducted after an overnight fast, this examination provides information on prediabetes, diabetes and gestational diabetes. The typical range is 3.9–5.6 mmol/L.
- *Glucose tolerance test*: This examination measures blood sugar levels before and after consuming a glucose-containing liquid, requiring an overnight fast and blood draws on the testing day. Blood sugar levels are monitored at intervals after ingestion, such as at one, two and three hours.
- *Random blood sugar test*: This test provides immediate blood sugar readings without fasting requirements, permitting testing at any time of the day.

Body mass index assessments

This assessment tool estimates body fat by comparing height and weight, known as the body mass index (BMI). A normal BMI is between 18.5 and 24.9 kg/m^2. Higher BMI levels indicate an increased risk for various conditions like heart disease, hypertension, type 2 diabetes, gallstones, respiratory issues and certain cancers. Maintaining a healthy BMI reduces the risk of chronic diseases, enhances heart and lung health, improves mobility and positively affects mental wellbeing.

Diagnosis of HIV and noncommunicable diseases

The WHO (2019) provides the following recommendations for HIV and NCD screening, diagnosis and treatment. The initiation of ART should adhere to the fundamental principles of offering patient-centred care. Patient-centred care involves tailoring services around health needs, preferences and expectations of individuals and communities while maintaining their dignity and respect, particularly for vulnerable groups. It emphasises the importance of involving and supporting individuals and their families in their health care decisions.

Every individual newly diagnosed with HIV should undergo retesting to confirm their status before commencing ART, employing the same testing methods as the initial test to minimise the risk of misdiagnosis. This retesting protocol should be upheld even in environments where rapid ART initiation is practised.

The adoption of the 'treat all' recommendation, advocating for ART initiation for all HIV-positive individuals irrespective of their cluster of differentiation 4 (CD4) cell count, facilitates swift initiation of ART, including the provision of same-day initiation when there are no medical contraindications (Chen et al. 2004).

Individuals without contraindications for rapid ART initiation should receive comprehensive information about the advantages of ART and be given the option for rapid initiation, including the possibility of starting on the same day. Prompt ART initiation is particularly crucial for individuals with low CD4 cell counts, as they face a heightened risk of mortality. However, immediate ART initiation should be delayed where there is a risk of immune reconstitution inflammatory syndrome (IRIS), as it may be life-threatening, especially in the presence of opportunistic infections (OIs), such as TB, meningitis and KS, among others. Individuals should not be pressured to start treatment immediately; instead, they should be guided in making an informed decision about the timing of ART initiation. To screen individuals for HIV, the following questions can be asked:

- When was your last HIV test conducted?
- What were the results of the test?

At the same time, adults and children can be screened for TB based on the symptoms listed below:

For adults

- A cough for two weeks or more
- Drenching night sweats

- Unexplained weight loss
- Fever for two weeks or more

In children

- A cough for two weeks or more that is not improving with treatment
- Fever for more than two weeks
- Documented weight loss or failure to thrive (check Road to Health Card)
- Fatigue (being less playful or constantly tired).

The five Cs of HIV testing services

According to the WHO (2019) guidelines, all HIV testing services (HTSs) should adhere to the *five Cs*: Consent, confidentiality, counselling, correct test results and connection (linked to prevention, care and treatment services). These principles are universal and should be applied in all HTS scenarios.

Consent

Individuals undergoing HTSs must provide informed consent for testing and counselling; verbal consent is acceptable (written consent is not mandatory). They should be educated about the testing process, their right to refuse testing and the implications of self-testing. Mandatory or coercive testing is never justified. Approaches such as provider-assisted referral and social network-based testing require the consent of both clients and their contacts.

Confidentiality

Human immunodeficiency virus testing services must maintain confidentiality, ensuring that discussions between the provider and client remain private unless the client consents to disclosure. While confidentiality is crucial, it should not perpetuate secrecy, stigma or shame. Counsellors should discuss disclosure preferences with clients and consider shared confidentiality with trusted individuals for support. The public health benefits of testing should outweigh potential risks. The main objective of testing should be to enhance the wellbeing of those tested and to improve health outcomes for the entire population. Human immunodeficiency virus testing services should be broadened, not just to reach high testing rates or meet specific HIV testing goals but also to ensure that everyone in need has access to quality HTS, along with effective connections to prevention, care, treatment and support services. Human immunodeficiency virus testing must always be voluntary and consent should be obtained through informed discussion prior to the test. Any form of coerced or mandatory testing is unacceptable, regardless of whether the pressure comes from health care providers, partners or family members.

Counselling

Pre-test information and post-test counselling should be provided, with the option for private inquiries. Post-test counselling is essential following an HIV test. Quality assurance (QA) mechanisms, mentoring systems and supportive supervision are necessary to ensure high-quality counselling, including the utilisation of various channels such as peer providers and digital tools like videos, social media and other mobile applications (apps).

Correct test results

HTS providers should strive for accurate testing services, supported by QA measures, to ensure accurate diagnoses. Individuals who test positive for HIV should undergo a confirmatory test, ideally on the same day, before initiating ART. This retesting serves as a quality-assurance measure to confirm the initial diagnosis and prevent misclassification because of false-positive results. This confirmatory test should not delay ART initiation; rather, it should be completed immediately after the first reactive test, allowing same-day treatment to proceed once positivity is verified. This approach maintains both diagnostic accuracy and rapid linkage to care, supporting the principles of the 'test-and-treat' policy while ensuring that only confirmed HIV-positive individuals begin lifelong ART.

Connection

Linking individuals to prevention, care and treatment services is vital, with emphasis on effective follow-up and ongoing support. Offering HTS without proper linkage to care, including ART, provides limited benefits. Providers and testers are responsible for ensuring effective service linkage. These principles reveal the importance of ethical, confidential and supportive HTSs that prioritise individual wellbeing and PHC outcomes.

HIV testing modalities

According to the WHO's (2019) consolidated guidelines on HIV testing, people can access HTSs in various areas in the PHC setting. Human immunodeficiency virus testing services include the full range of services that should be provided alongside HIV testing. These include brief pre-test information and post-test counselling; linkage to appropriate HIV prevention, care and treatment services and other clinical and support services; and coordination with laboratory services to support QA. Human immunodeficiency virus testing services can be delivered in various contexts, including facility-based and community-based settings.

Facility-based HIV testing services

It is advisable to offer HIV testing to all demographic groups across various health care services, including those focused on STIs, hepatitis, TB, children under 5 years old, immunisation efforts, malnutrition programmes, antenatal care (ANC) and specialised services for key populations. This comprehensive strategy is an effective way to identify individuals living with HIV. In areas with a high prevalence of HIV, facility-based HTSs should be implemented. In regions with low HIV prevalence, testing should be provided for:

- Adults, adolescents or children attending clinical settings who show signs or symptoms or have medical conditions suggesting possible HIV infection, including TB and STIs
- Children known to be HIV-exposed as well as symptomatic infants and older children
- Members of key populations and their partners
- All pregnant women.

Community-based HIV testing services

Community-based HIV testing services (CBHTS) provide an approach to HIV testing that takes place outside of traditional health care facilities, within communities where people live, work and socialise. These services are designed to increase accessibility to HIV testing, particularly for populations that may face barriers to accessing health care facilities, such as stigma, discrimination, geographic distance or lack of trust in the health care system. By bringing testing services directly into communities, CBHTS aims to access hard-to-reach individuals who may not otherwise seek testing, thereby increasing early diagnosis and linkage to care.

High HIV burden settings

The WHO (2019) advocates for community-linked HTS to be connected to prevention, care and treatment programmes for populations more severely affected by HIV. Additionally, it suggests regular facility-based testing, especially targeting high-risk populations.

Low HIV burden settings

For populations less severely affected by HIV, community-linked HTS are still strongly recommended by global health authorities to enhance early diagnosis and linkage to care. These services should be combined with prevention, care and treatment interventions. This is particularly true for hard-to-reach populations. Although high-certainty evidence remains limited, multiple evaluations have demonstrated that community-based

and lay-provider-led testing significantly increase testing uptake and facilitate timely ART initiation compared with facility-only models (Sharma et al. 2015).

HIV rapid self-testing

An HIV self-test enables an individual to collect their specimen, perform the test and interpret the result privately. HIV self-testing should be offered as an additional approach to HTS. A reactive self-test result is not an HIV-positive diagnosis and must be followed by confirmatory testing using the national testing algorithm by a trained provider (WHO 2024).

The following are some of the community-based HIV testing under differentiated HIV testing approaches

- *Provider-assisted referral* (also called index testing and assisted partner notification): Provider-assisted referral, also called index testing or assisted partner notification, is a voluntary partner-service approach in which a trained provider, with the consent of a person diagnosed with HIV, assists in contacting their sexual or drug-injecting partners and offering them HIV testing options, which may include facility-based testing, community-based testing or HIV self-testing (WHO 2024).
- *Social network-based strategies*: Social network-based testing may be offered as an additional HIV-testing approach within a comprehensive package of prevention, care and treatment services. It uses members of a social network to promote testing or distribute self-testing kits to sexual partners, drug-injecting partners and other social contacts. This is a conditional WHO recommendation based on low-certainty evidence (WHO 2024).
- *Lay provider HIV testing*: Appropriately trained and supervised non-professional/lay providers can autonomously perform safe, secure and effective HIV testing using rapid diagnostic tests (RDTs), provided that national testing algorithms and quality-assurance procedures are followed (WHO 2015b, 2024). This is highly recommended, with moderate-quality evidence.

Types of HIV tests

There are three categories of HIV tests: antibody tests, antigen and antibody tests and nucleic acid tests (NATs). The immune system generates antibodies in response to viruses such as HIV. Antigens are substances that trigger the immune system into action. In the case of HIV infection, a protein component of the viral cell wall known as P24 can be detected before the development of antibodies, i.e. very early on after infection. HIV testing is commonly conducted using blood or oral fluid samples.

Antibody test

An antibody test searches for HIV antibodies in blood or oral fluid. Health care workers can administer these tests, or individuals can perform self-testing. Tests using blood drawn from a vein can detect HIV earlier than those using finger-stick blood samples or oral fluid. These tests are accessible at PHC facilities and can be purchased over the counter at local pharmacies. Rapid antibody tests (RATs) are typically conducted using finger-stick blood or oral fluid. They yield results in 30 minutes or less. HIV self-tests provide results within 20 minutes. The typical window period for antibody tests ranges from 23 days to 90 days after exposure to HIV. Most rapid tests and self-tests are antibody-based.

Antibody and antigen tests

Antigen and antibody (immunoglobulin [Ig]) tests are recommended for laboratory testing. This laboratory test involves drawing blood from a vein. It can usually detect HIV 18–45 days after exposure. A rapid antigen and antibody test can be performed by a trained HCW with a finger-stick blood sample. The results are available in 30 minutes or less. A rapid antigen and antibody test can usually detect HIV 18–90 days after exposure (HIV.gov n.d.). While specific test brands may differ, the testing algorithm and detection timelines are generally consistent with international standards and adapted to local laboratory and community-based service capacity.

Nucleic acid test

A NAT searches for the actual HIV in the bloodstream. During an NAT, a health care provider will extract blood from a vein and forward the sample to a laboratory for analysis. This test can determine if an individual is infected with HIV or assess the level of virus present in the blood (known as an HIV viral load [VL] test). Nucleic acid tests can detect HIV at an earlier stage than other testing methods. It is recommended for individuals who have recently been exposed to or potentially exposed to HIV, or who display early HIV symptoms, and have received negative results from an antibody or antigen test. Results from an NAT or an antigen and antibody laboratory test may take several days to be processed. Typically, an NAT can identify the presence of HIV within 10–33 days after exposure (HIV.gov n.d.).

Informed selection of HIV testing options through consultation with health care providers

No HIV test can immediately detect HIV right after infection because of the window period, which is the duration between HIV exposure and when the

virus becomes detectable by a test. The length of the window period varies depending on the type of HIV test being used. Typically, an NAT can detect HIV the earliest, usually within about 10–33 days after exposure. It is important to understand the specific window period for each HIV test type. If an individual suspects recent exposure to HIV within the last 72 hours, they should promptly consult a health care provider, an emergency room physician or an urgent care provider to discuss post-exposure prophylaxis (PEP).

Following a potential HIV exposure, if a client receives a negative HIV test result, they should undergo testing again after the window period specific to the test taken to avoid potential false-negative results. A negative test result does not conclusively indicate the absence of HIV, as it could still be within the window period. Key points to consider are:

- If subsequent tests taken after the window period also return negative and there have been no further exposures, it suggests the individual does not have HIV. Therefore, continuous preventive measures such as taking HIV prevention medications known as pre-exposure prophylaxis (PrEP) are advised for sexually active individuals, those using needles for drug injection or those at risk of contracting HIV, i.e. having a partner who is HIV-positive.
- A negative test result for one individual does not confirm the HIV status of their partner.
- Individuals with specific risk factors should continue regular HIV testing, ideally at least once a year.

What does a positive HIV result mean?

A reactive HIV screening result does not independently establish an HIV-positive diagnosis. Human immunodeficiency virus infection should be confirmed through the national HIV-testing algorithm before an HIV-positive diagnosis is communicated and ART is initiated (NDoH 2016; WHO 2024). A confirmed positive HIV result does not necessarily mean that the individual has advanced HIV disease or AIDS. The WHO defines advanced HIV disease in adults, adolescents and children aged 5 years and older as a CD4 cell count below 200 cells/mm^3 or the presence of a WHO Clinical Stage 3 or 4 condition. All children younger than 5 years living with HIV are considered to have advanced HIV disease, subject to the qualifications specified in the applicable clinical guidance (NDoH 2026; WHO 2021a). The WHO Clinical Stage 4 includes serious HIV-related conditions such as pneumocystis pneumonia, cryptococcal meningitis and extrapulmonary TB (NDoH 2026; WHO 2021a). Nevertheless, early diagnosis, timely initiation of ART and sustained treatment adherence can prevent disease progression and enable many PLHIV to maintain their health.

HIV-testing services must protect clients' privacy and confidentiality. Anonymous testing does not link the test result to personally identifying information. Confidential testing records the client's identity and result, but access to this information is restricted to authorised persons involved in the client's care or otherwise authorised by law. Health information may not be disclosed without the client's written consent unless disclosure is authorised or required by law or justified under the limited circumstances stipulated in the *National Health Act 61 of 2003* (NDoH 2016; Republic of South Africa [RSA] 2004, 2013). A reactive HIV self-test result is not an HIV-positive diagnosis and must be followed by provider-administered testing beginning with the first test in the national HIV-testing algorithm (NDoH 2018; WHO 2024).

Individuals with a confirmed HIV-positive diagnosis should be supported to consider disclosing their status to sexual or drug-injecting partners. Disclosure should be voluntary, informed and undertaken in a manner that protects the client's safety, privacy and autonomy. Before supporting disclosure, health care providers should assess possible risks, including stigma, abandonment, intimate partner violence (IPV) and other adverse consequences (Kennedy et al. 2015; WHO 2013). Disclosure may facilitate partner testing, social support, engagement in HIV services and treatment adherence; however, these benefits vary according to the individual's relationships, circumstances and safety, and disclosure may also result in stigma, rejection or violence (Kennedy et al. 2015; WHO 2013).

Disclosure to employers

In most instances, an employer will only become aware of an individual's HIV status if the individual chooses to disclose it. South African law does not require employees or applicants for employment to disclose their HIV status and employers may not compel such disclosure or require HIV testing, except in limited circumstances authorised by the Labour Court in terms of the *Employment Equity Act 55 of 1998* and its *Code of Good Practice on Key Aspects of HIV and AIDS and Employment* (National Department of Labour [NDoL] 2000; RSA 1998). Employers may assess an individual's capacity to perform the inherent requirements of a job or to comply with occupational health and safety standards, but this assessment does not extend to a general right to inquire about or require disclosure of HIV status.

In occupational settings, including health care environments where there is potential exposure to blood or bodily fluids, workplace safety is addressed through the application of standard infection prevention and control measures rather than through disclosure of HIV status, in line with national guidance and international best practice (International Labour Organization [ILO] 2010; NDoL 2000).

Where an individual receives health insurance coverage through their employer, the insurer is legally required to maintain strict medical confidentiality and may not disclose the individual's HIV status to the employer. Any processing of employee health or benefits information must comply with confidentiality and privacy protections under the *Employment Equity Act 55 of 1998*, the *Code of Good Practice on HIV and AIDS and Employment* and international labour standards, including ILO Recommendation No. 200 on HIV and AIDS and the World of Work (ILO 2010; NDoL 2000; RSA 1998). These guidelines affirm that no worker should be obliged to disclose their HIV status and that such information must remain private and confidential

What should be done when the patient is diagnosed with HIV?

Receiving an HIV diagnosis can mark a pivotal moment in a person's life, evoking emotions like sadness, hopelessness or anger. Health care professionals in PHC settings, particularly those trained in nurse-initiated management of antiretroviral treatment (NIMART), play a crucial role in supporting clients through the initial phases of diagnosis. These professionals can assist clients in finding suitable HIV care and treatment plans aimed at promoting a long and healthy life.

It is recommended that all individuals with HIV commence ART, regardless of the duration of infection or their current health status. Effective HIV treatment is lifelong and can reduce the level of HIV in the bloodstream (VL) to such a low extent that it becomes undetectable through standard tests, a state known as an undetectable VL. Maintaining an undetectable VL is paramount for overall health and is the most effective way to safeguard one's wellbeing and prevent transmission to others; thus, U (undetectable) = U (untransmissible).

Role of primary health care workers in screening, diagnosis and management of HIV and noncommunicable diseases

The PHC discipline has successfully redefined the roles and responsibilities of the PHC team in line with WHO (2021b) recommendations and emerging research. A study conducted by Murudi-Manganye, Makhado and Sehularo (2020) revealed that training received by nurses under the integrated chronic care model (ICCM) improved their level of knowledge, skills and scope in PHC. The training includes NIMART, integrated management of childhood illness (IMCI) and NCDs in the form of adult primary care (APC). However, integration must still be optimised at the management and district levels.

The WHO's (2021b) new consolidated guidelines for prevention, treatment, service delivery and monitoring paved the way for integrated HIV and NCD guidelines, with an emphasis on ending the HIV pandemic and the burden of chronic disease as a significant public health threat by 2030, especially in LMICs. Mboweni and Makhado (2020) have described the roles and responsibilities of PHC NIMART-trained nurses in managing HIV and NCDs, as discussed hereafter.

Advocacy for comprehensive prevention and management of infections

Preventing the spread of communicable diseases among various groups, including PLHIV and those with NCDs of all ages and key populations, including preventing mother-to-child transmission (MTCT) of diseases like HIV, hepatitis, listeriosis, malaria, STIs and TB is achieved through educational initiatives, community awareness campaigns and the provision of comprehensive prevention strategies such as voluntary medical male circumcision (VMMC), PrEP, PEP and the distribution of condoms. These can be achieved by implementing the following strategies:

- Enhancing the quality of antenatal and postnatal care for mothers, both HIV-negative and positive, as part of the prevention of mother-to-child transmission (PMTCT) programmes, including those with NCDs.
- Providing HIV testing, BP checks and glucose testing for individuals without documented HIV status, alongside offering provider-initiated counselling and testing for all individuals under their care. This includes services like HIV index and recency testing – an HIV assay that determines recent exposure – for partners and children, as well as monitoring BP and glucose levels.
- Conducting thorough history taking and physical examinations to identify potential risks or the presence of NCDs, establishing a baseline assessment for NCDs, and recognising conditions that require immediate attention and referral. Physical examinations aid in identifying contraindications to ART initiation, diagnosing OIs and determining the clinical stage of HIV disease. This process helps clinicians understand the severity of the patient's condition, assess associated mortality risks, and determine the urgency and timing of ART initiation.

A patient living with an NCD should undergo a targeted and structured clinical assessment at each visit, focusing primarily on the management of their chronic condition while maintaining a holistic approach to overall health.

This includes taking an updated medical history that covers medication adherence, lifestyle changes and new symptoms, as well as performing

focused physical and diagnostic evaluations relevant to the specific NCD. For instance, in a patient with diabetes or hypertension, the assessment should include BP measurement, blood glucose monitoring, urine dipstick analysis (for protein or glucose) and calculation of weight and BMI.

Foot examinations should be conducted to identify neuropathic injury, ulcers or inflammation early, thereby preventing complications. Eye examinations are essential for detecting diabetic retinopathy, vision impairment and cataracts. The purpose of these focused evaluations is to identify early warning signs of disease progression or treatment side effects and to provide individualised patient education and counselling. This structured yet patient-centred approach strengthens the relationship between the patient and the health care provider, ensuring continuity of care and improved long-term outcomes.

☐ Conduct integrated screening

Primary health care NIMART-trained nurses should conduct integrated screening for NCDs, TB, pregnancy and STIs and screen for mental health, nutritional, neurodevelopment and cervical issues as follows:

- *Tuberculosis*: Identifying clients with a positive TB screening test for further investigations like GeneXpert and recognising those with a negative TB screen who might qualify for tuberculosis preventive therapy (TPT).
- *Meningitis*: Diagnosing and managing individuals with symptoms of conditions like cryptococcal and other forms of meningitis to reduce associated morbidity and mortality.
- *Mental wellbeing*: Evaluating active depression and other mental health concerns, such as psychosis and substance abuse, to pinpoint potential risks to treatment adherence and side effects.
- *Noncommunicable diseases*: Detection of NCDs such as hypertension, diabetes and epilepsy to address these major chronic illnesses or coexisting conditions and prevent drug interactions or contraindications. Blood pressure should be interpreted against the applicable national diagnostic and treatment thresholds. An HbA1c below 5.7% (<39 mmol/mol) is below the threshold used to identify prediabetes, whereas an HbA1c target of <7% (<53 mmol/mol) is appropriate for many non-pregnant adults with established diabetes. Glycaemic targets should nevertheless be individualised according to factors such as age, comorbidities, treatment burden, risk of hypoglycaemia and patient preferences (American Diabetes Association Professional Practice Committee 2023a, 2023b).

- *Pregnancy-related assessments*: Inquiring about pregnancy status or plans for conception to ensure timely referral to ANC, taking measures to prevent MTCT, evaluating fertility and contraceptive requirements for non-pregnant individuals, and assessing eligibility for ART regimens. Providing support to pregnant and breastfeeding women by assisting in planning for facility-based deliveries, selecting feeding options, administering treatment to infants, arranging for polymerase chain reaction (PCR) and rapid tests for babies, and obtaining caregiver consent for necessary medical investigations for the child.
- *Sexually transmitted illnesses*: Screening for STIs, particularly in sexually active patients, to detect and provide early treatment.
- *Child vaccination and development*: Immunisation and neurodevelopmental assessment in babies and children for prompt referrals and follow-ups.
- *Cervical cancer*: Cervical screening to identify women with cervical abnormalities.
- *Nutritional evaluation*: Identifying recent weight loss that might indicate active OIs or other conditions, as well as recognising under- or overweight patients who require nutritional guidance and lifestyle support. Encouraging breastfeeding and advising mothers on feeding options to enhance and sustain the nutritional wellbeing of infants and children exposed to HIV, thereby bolstering the immune system. Incorporating a healthy lifestyle plan to assist patients in adopting nutritious eating habits, regular exercise, reducing smoking, managing stress and ensuring adequate rest to prevent and manage NCDs.
- *Enabling the gathering of baseline clinical samples*: Collecting CD4 cell counts to determine eligibility for co-trimoxazole preventive therapy (CPT), screening for cryptococcal antigen to identify asymptomatic individuals requiring referral for a lumbar puncture and CSF examination and pre-emptive fluconazole treatment, assessing renal function with creatinine and estimated glomerular filtration rate (eGFR), evaluating HbA1c levels to manage anaemia and determining the need for specific ART medications and screening for hepatitis B virus (HBV) and hepatitis C virus (HCV) co-infections.
- *Collaborative response*: Interpreting results and reports from the National Health Laboratory Services (NHLS), identifying problems and devising appropriate interventions to address the problem in collaboration with other multidisciplinary teams.

The mental health assessment tool is applied to evaluate the patient's mental wellbeing by:

- Inquiring about the patient's education regarding their treatment regimen

- Assessing the patient's understanding of their treatment and verifying the correct comprehension of the treatment plan, including the timing of each medication intake
- Providing clear and supportive explanations that link difficulties with adherence to medication and unfavourable test results.

☐ Initiation of antiretroviral therapy and clinical management of patients on treatment

Accelerating access to ART initiation; assessing eligibility criteria and reasons for deferring ART; selecting appropriate treatment regimens; delivering essential adherence advice for adults, children and adolescents; and incorporating lifestyle adjustments are part of patient care. This area involves:

- Restarting ART for individuals who have halted treatment
- Managing clients with concurrent TB and HIV infections
- Transitioning stable ART patients between primary regimens and switching non-responsive patients with confirmed virologic failure to a second-level regimen
- Promptly referring complex cases for specialised care
- Managing OIs and complications associated with HIV and TB with a team-based approach at the PHC level, where nurses and clinicians collaborate to treat uncomplicated cases in line with national guidelines, while more complex or severe presentations are referred to higher-level facilities for specialised management and follow-up care
- Offering comprehensive care for additional conditions, including SRH services like contraception and mental health support, while identifying and combatting stigma, IPV and gender-based violence (GBV)
- Providing care for infants and children exposed to HIV
- Identifying eligibility for preventive measures such as TPT and CPT for infections.

☐ Tracking, retrieval and reconnection

Timely follow-up with patients who miss appointments is crucial for ensuring treatment continuity and preventing loss to follow-up, particularly in chronic disease programmes. This process, as outlined in South Africa's National Adherence Guidelines (NDoH 2020) and supported by the WHO (2021b), involves structured mechanisms for tracking and re-engaging patients. These include communication through reminder calls or SMS, and where needed, community-based tracing conducted by ward-based primary health care outreach teams (WBPHCOTs), community health care workers (CHCWs) or home-based

carers (HBCs). When patients return to care, either voluntarily or after outreach, they are linked to reconnection services for review of their treatment plan, adherence counselling and barrier assessment to support long-term retention.

Provision of enhanced adherence counselling

Enhanced adherence counselling (EAC) is a targeted, intensified intervention designed to support patients struggling to meet their treatment goals because of adherence challenges. It goes beyond routine counselling by offering personalised support, structured follow-up and multidisciplinary involvement. Enhanced adherence counselling plays a critical role in optimising treatment outcomes for individuals with persistently abnormal clinical indicators and those at risk of treatment failure. Implementing systematic protocols for identifying eligible patients and engaging them in timely adherence counselling is essential for the success of chronic disease management across health conditions.

The criteria for EAC include:

- People living with HIV with a VL exceeding 50 copies/ml while on ART, following a clinician's heightened VL evaluation indicating potential adherence challenges
- Hypertensive individuals with persistently elevated BP readings above 140/90 mmHg despite being on treatment
- Diabetes mellitus patients with HbA1c levels exceeding 7% while under ongoing treatment
- Tuberculosis patients presenting with positive sputum smears after two months of treatment
- Individuals encountering adherence difficulties with any prescribed chronic medications
- Patients demonstrating suboptimal treatment outcomes based on clinical markers or clinician concern.

In the provision of EAC, a facility-wide protocol for identifying patients with abnormal results can be established, which may include the use of visual systems such as colour-coded stickers, file annotations or designated folders. Identified cases should prompt clinician reassessment and, where appropriate, referral to an adherence counsellor. Health care providers must clearly communicate the patient's most recent evaluation results to encourage transparency and engagement. Health care workers and adherence counsellors should collaboratively assess barriers to adherence and work with the patient to develop practical, sustainable strategies.

Patients should be supported in redefining or reinforcing their treatment goals in alignment with the next steps in care. Enhanced individualised

support must be provided during treatment regimen changes, particularly when transitioning to second-line or alternative therapies. Where applicable, referrals for additional clinical or psychosocial services should be initiated to provide comprehensive support. Facility managers should, wherever feasible, allocate counsellors with specialised experience in managing adherence challenges to work with these high-priority patients.

☐ Adaptability in the provision of antiretroviral therapy

Antiretroviral therapy can be effectively integrated into daily life when approached with flexibility, understanding and patient-centred guidance. While adherence remains critical for treatment success, individuals receiving ART should recognise that occasional challenges may arise and these can be managed without compromising the effectiveness of their regimen. The following key points aim to dispel misconceptions, promote informed decision-making and support the adaptability needed for sustained ART adherence:

- Dispel any myths and misunderstandings regarding medication adherence and clarify that there is room for flexibility in treatment.
- Stress the significance of patients selecting a convenient time to adhere to their prescribed medication regimen.
- Guide patients in handling late or missed doses, depending on the specific treatment plan.
- Outline the protocol for managing alcohol consumption while undergoing treatment, advising patients to prioritise their medication, even if alcohol intake is a concern.
- Advise patients against using traditional remedies that might conflict with their prescribed treatment, recommending coordination with their health care provider to ensure treatment continuity if traditional medicine is being used.

☐ Patient encounters

Understanding the personal and contextual challenges that affect patients' ability to adhere to treatment is essential to delivering compassionate and effective care. Each individual's experience with ART is shaped by their environment, lifestyle, beliefs and support systems. By creating space for open communication and acknowledging these diverse factors, health care providers can offer tailored solutions that strengthen adherence and empower patients in their care journey.

- Inquire with patients about factors that occasionally pose challenges to treatment adherence. Encourage patients to openly discuss personal matters that could impact their adherence, offering support to tackle issues like alcohol or substance use that might lead to missed doses.

- Clarify the necessity of taking medication irrespective of meals and guide managing medication in cases of food insecurity. Inform and aid patients in accessing government assistance programmes as needed.
- Consider the patient's religious and traditional convictions that could influence treatment adherence.

☐ Determine approaches that may enhance strong adherence to treatment

Supporting patients in identifying and implementing strategies for consistent treatment adherence is essential for long-term health outcomes. A proactive, collaborative approach, centred on each individual's lifestyle, preferences and available support, can foster greater ownership of their health. The following strategies encourage meaningful dialogue, empower patients to plan for success and reinforce the role of social and systemic support in achieving adherence:

- Ask the patient about the strategies that could assist them in remembering to take their medication.
- Discuss various adherence methods and reminders, weighing the pros and cons tailored to the individual, such as having a treatment buddy for reminders, setting phone alarms, receiving support from a family member, conducting pill counts, using calendars or pill boxes, linking medication to mealtimes and employing modified directly observed therapy (DOT) like a treatment supporter (this also applies to children).
- Ask the patient about an individual who could help them ensure that they take medication daily. Explore sources of social support for the patient, underscoring the significance of support networks in managing and adhering to treatment, including family, friends, peer groups, faith-based communities and workplace support.
- Encourage open expression of emotions and thoughts about the illness.
- Empower the patient to devise a personalised plan addressing the barriers discussed, aiming to foster self-sufficiency with guidance from health care providers or lay counsellors.
- Inform the patient about upcoming assessments at the facility to monitor adherence and treatment effectiveness in alignment with disease-specific guidelines (e.g. follow-up VL tests for HIV in three months; HbA1c tests for diabetes in three months).
- Explain that treatment collection will become more streamlined with normal results at the following assessment. Patients on treatment for over six months can request enrolment in a simplified treatment supply system of their preference with extended supplies based on facility availability. Patients with persistently abnormal results after the first adherence counselling session (e.g. second VL > 50 copies/mL for HIV; second HbA1c > 7% for diabetes) should be referred for a follow-up session.

☐ Revealing information to minors and young people

Disclosure should be approached as a supported, developmentally appropriate and people-centred process rather than as a single event. Decisions should consider the individual's autonomy, informed participation, privacy, safety and psychological wellbeing. Where children are involved, their evolving capacity, expressed wishes and best interests should guide the timing, content and manner of disclosure. Age-appropriate counselling and continuing support should be provided to children, caregivers and families throughout the disclosure process (WHO 2011; United Nations 1989).

Drawing on ethical, human-rights and disclosure guidance, the following principles should inform disclosure:

- *People-centred care*: Focuses on integrated health services that address the holistic needs of individuals, families and communities, particularly in disclosure decisions involving children and family dynamics.
- *Informed consent*: Essential for allowing individuals to make knowledgeable choices regarding participation in health programmes and the use of their data.
- *Respect for privacy*: Enables individuals to control how and when their personal information is shared, protecting them from unauthorised disclosure.
- *Respect for autonomy*: Empowers individuals to decide on the timing and format of disclosure, as well as whether to disclose information at all.
- *Doing no harm*: Emphasises the importance of considering risks and unintended consequences in disclosure processes to ensure safety and wellbeing.
- *The child's best interest*: Prioritises the child's wishes, relationships and overall wellbeing, ensuring their protection from harm in all decision-making.
- *Mental health and wellbeing*: Highlights the necessity of supporting the mental health of children, adolescents and families impacted by HIV in disclosure interventions.

Médecins Sans Frontières (MSF) (2015) indicates that caregivers, in collaboration with health care professionals, should initiate this process as described below:

- *Non-disclosure (under six years)*: Children are not informed of their diagnosis at this early stage, but routines around medication and clinic visits are established to promote comfort and familiarity.
- *Partial disclosure (six to 10 years)*: Children begin receiving a process of progressive disclosure characterised by basic, age-appropriate health

information without explicitly naming the condition. The goal is to foster understanding while preparing for full disclosure.
- *Full disclosure (above 10 years)*: Children are given progressive, complete, age-appropriate information about their diagnosis. Open dialogue encourages them to ask questions and actively participate in managing their health.

Clinician's responsibility

Clinicians play a central role in guiding the disclosure process by evaluating the child's and caregiver's developmental readiness. They must assess the child's medical, emotional and psychosocial status and provide clear, culturally sensitive advice on when and how to initiate disclosure. Clinicians should support caregivers in understanding the rationale for gradual disclosure and help tailor the timing and content to the child's individual needs. In cases where there are concerns, such as caregiver anxiety, stigma or complex family dynamics, clinicians should offer ongoing guidance and coordinate with the counsellor to ensure a multidisciplinary support plan is in place.

Counsellor's role

The counsellor acts as the primary facilitator of the disclosure process. Their role includes educating the caregiver on the disclosure stages (non-disclosure, partial, full), preparing them emotionally and offering tools to explain the condition to the child in a developmentally appropriate manner. Counsellors should conduct sessions jointly with the caregiver and the child, where appropriate, using storytelling, play therapy or visual aids, depending on the child's age. They must ensure that the child feels emotionally supported during and after disclosure and refer both caregiver and child to additional psychosocial services, such as support groups or mental health care, if signs of distress or resistance are observed.

Caregiver's role

The caregiver, guided and supported by the counsellor and clinician, is responsible for maintaining a nurturing and open environment for the child. The caregiver should commit to disclosing information gradually as recommended, while being honest, reassuring and emotionally available. They must be willing to answer questions, help the child cope with their diagnosis and reinforce positive attitudes about treatment and health. The caregiver's consistent involvement, especially during the transition from partial to full disclosure, is essential in fostering trust and resilience in the child.

☐ Supervising individuals on antiretroviral therapy

Providing excellent care during follow-up appointments enhances adherence, helps achieve and maintain viral suppression, reduces side effects and other harmful effects, and improves overall quality of life (QoL). Patients should be informed about the significance of abnormal and normal test results.

Viral load monitoring and management are crucial for assessing the clinical, virological and immunological response to ART. This monitoring includes managing VL outcomes in infants, children, adolescents, pregnant women attending ANC and adults and conducting regular VL assessments. Interventions should be implemented to suppress VLs, which may involve offering enhanced support for adherence.

Personnel supervising individuals on ART should be offered clinical assistance. Seasoned NIMART nurses within the health care setting are tasked with aiding pre-service nurses, recently trained qualified individuals and staff in understanding guidelines, interpreting results, initiating ART and implementing interventions. These experienced nurses can undergo training as clinical nurse mentors via the district clinical mentorship programmes to impart skills and knowledge to newly trained nurses, thereby enhancing clinical proficiency in managing PLWH. Additionally, they can conduct in-service training sessions to ensure that staff and NIMART-trained nurses stay informed about the latest advancements and research.

NIMART-trained nurses are responsible for recording clinical observations, outcomes and actions in a clear, signed and dated manner in accordance with record-keeping protocols. Managing data involves implementing systems and procedures, such as conducting clinical record audits to pinpoint deficiencies and establish a QA and quality enhancement plan, as well as projects aimed at addressing these shortcomings. The advantages of implementing the integrated management of HIV and NCDs are described in the next section.

■ Building a strong and dynamic district and primary health care system

Developing a strong, dynamic district and PHC system is vital for addressing the multifaceted health challenges facing contemporary populations, particularly in LMICs. Evidence suggests that integrating health services, particularly for NCDs and infectious diseases such as HIV, leads to improved health outcomes and efficient resource use within district health care systems.

Importance of integrated health services

The WHO (2015a) emphasises the necessity of integrated, people-centred health services to promote overall health and wellbeing, stating that robust PHC is fundamental for achieving universal health coverage (UHC) (Noknoy et al. 2021; Zhang et al. 2023). Integrating services ensures that patients receive comprehensive care that addresses various health needs, improving both accessibility and satisfaction (Khatri et al. 2023; Zezai et al. 2024). For instance, integrated services in Namibia demonstrated enhanced quality and efficiency in PHC through the co-location of HIV and SRH services (Zapata et al. 2017).

Integrating care is particularly essential for managing comorbidities. The dual burden of HIV and NCDs, prevalent in many settings, requires care systems to evolve from vertical, disease-specific programmes to holistic, integrated approaches that leverage existing health infrastructure. Countries like South Africa and Mozambique have taken significant steps in this direction by employing district care systems to re-engineer PHCs and promoting collaborative, patient-centred care models (Aantjes, Quinlan & Bunders 2014; Pfeiffer et al. 2010; Sokhela 2024). The South African experience illustrates that integrating health services can lead to greater continuity of care and improved accessibility, as demonstrated by successful programmes to manage both HIV and NCDs in community settings (Aantjes et al. 2014; Murudi-Manganye, Makhado & Sehularo 2023a).

Challenges in integration

Despite the recognised benefits of integrated health care services, numerous challenges persist. In many LMICs, resource constraints hinder seamless service integration, as evidenced by workforce inadequacies and insufficient funding (Ashipala & Himarwa 2022; Kintu et al. 2020). A systematic scoping review revealed that HCWs in urban areas faced significant hurdles in implementing integrated services, including inadequate training and unclear operational guidelines (Ashipala & Himarwa 2022; Zezai et al. 2024). Additionally, political and organisational contexts can influence the effectiveness of integrating health programmes. For example, the integration of comprehensive approaches at the primary level may be hampered by rigid health service structures and insufficient investment in preventive care (Edelman et al. 2025; Ramani, Sivakami & Gilson 2019).

Achieving lasting success in integrating health services necessitates strong leadership and governance mechanisms. Supporting policies that facilitate collaboration across sectors while ensuring adequate resource allocation are crucial to overcoming the barriers identified by health practitioners (Badacho & Mahomed 2023; Loban et al. 2021). The commitment

of health authorities to prioritising integrated service delivery is vital for sustaining these initiatives and for effectively responding to changing health needs (Badacho & Mahomed 2023; Shiroya et al. 2021).

Framework for a robust district health care system

To create a strong and dynamic district health care system, a multifaceted approach is required that addresses the organisation, funding and evaluation of health care delivery systems. Key components of this framework are described in the following sections.

Emphasis on primary health care

The prioritisation of PHC as the entry point for health services ensures comprehensive care and community involvement (Noknoy et al. 2021; Zhang et al. 2023).

Integrated care models

Implementing models that simultaneously address multiple health needs, including preventive, curative and rehabilitative services, can improve health outcomes for patients with comorbid conditions (Khatri et al. 2023; Reynolds & Sutherland 2013).

Collaboration and stakeholder engagement

Building relationships among health care providers, community organisations and governmental agencies fosters a well-coordinated system that not only addresses health needs but also ensures the sustainability of services (Garchitorena et al. 2018; Oksavik et al. 2021).

Capacity-building and training

Investing in the continuing professional development (CPD) of HCWs is essential to ensuring that they can maintain current competencies, address gaps in knowledge and practice and adapt to emerging health challenges (Magwenya, Ross & Ngatiane 2023). Through these strategies, district health care systems can enhance their responsiveness to community health needs, ultimately paving the way for greater resilience against current and future health challenges. Successful examples from various countries provide valuable lessons on overcoming integration challenges and sustaining improvements in health service delivery (Aantjes et al. 2014; Kintu et al. 2020; Shiroya et al. 2021).

Building a strong and dynamic district and PHC system requires a systemic shift from vertical disease-focused programmes to integrated, patient-centred care models. By addressing fragmentation and resource limitations, fostering collaboration among stakeholders and prioritising comprehensive health strategies, LMICs can enhance their health care system performance. Ensuring robust health care systems is not solely about managing diseases but also fundamentally about strengthening community health, leading to improved wellbeing and health equity.

Provision of cost-effective primary health care services

The design of an integrated HIV–NCD prevention and management model has been shown to be cost-saving or cost-neutral when compared with parallel vertical programmes, particularly at the PHC level. Evidence from ICCMs demonstrates reductions in patient transport costs, visit frequency, laboratory investigation duplication and provider time, while maintaining or improving clinical outcomes (Murudi-Manganye et al. 2020). In South Africa, where HIV services are already decentralised and embedded within PHC, the integrated chronic disease management (ICDM) model has demonstrated improved clinic efficiency, reduced waiting times and better continuity of care for patients with multimorbidity, without proportional increases in operational costs (Murudi-Manganye et al. 2020; WHO 2015a).

While approved clinical guidelines and training materials for HIV and major NCDs (such as hypertension and diabetes) have indeed been available for several years, the challenge has not been the absence of guidance, but rather the operational integration of these guidelines into routine clinical workflows, supervision systems and monitoring frameworks at the facility level. Empirical studies from South African PHC settings indicate that nurses trained in both HIV and NCD management report increased workload and role expansion without commensurate staffing adjustments, highlighting that integration requires organisational redesign, task redistribution and management support, rather than guideline development alone (Murudi-Manganye et al. 2020).

Although South Africa has comparatively strong clinical expertise and the largest ARV programme globally, resource constraints persist at the service-delivery level, particularly in rural and peri-urban districts, where shortages of nursing staff, consultation space and time remain well-documented. Integrated HIV–NCD care leverages existing infrastructure and human resources more efficiently, enabling health care systems to absorb rising NCD burdens within established HIV platforms, rather than creating new parallel services. Consequently, evidence from South Africa and other LMICs shows that integrated models are associated with lower incremental costs and improved system efficiency, supporting their

scalability and sustainability (Murudi-Manganye et al. 2020; WHO 2015a). However, countries can still conduct feasibility and cost-effective research on different integration models as a requirement before pursuing any approach.

☐ Avoiding duplication of roles

In many LMICs experiencing shortages of human resources for health (HRH), HIV and NCD programmes are managed by separate teams at national, provincial, district and local levels. However, at the facility level, these programmes are often implemented by a single nurse or health care provider, which creates role overload, fragmented workflows and confusion in service delivery. For integration to be meaningful and practical, it must therefore begin at the programme and policy level, rather than being limited to the point of service delivery.

Evidence from South Africa supports this concern. A study by Mboweni and Makhado (2019) found that HIV, TB and NCD programmes are overseen by different programme managers, complicating implementation at the facility level. Nurse-initiated and management of ART-trained nurses reported being overwhelmed by multiple, and sometimes conflicting, instructions from different programme managers and having to rely on several disease-specific guidelines for a single patient. As a result, care was often delivered in silos rather than through a single, integrated programme managed by one provider.

☐ Standardised patient care

According to Murudi-Manganye et al. (2020), strengthening the implementation of integrated HIV and NCD management frameworks is essential for delivering standardised, high-quality care at the PHC level. While nurses are exposed to both infectious and non-infectious disease management during their pre-service education and clinical practice, evidence suggests that challenges arise primarily in operationalising and integrating existing guidelines within routine care, rather than from a lack of foundational clinical knowledge.

Murudi-Manganye et al. (2020) found that poor adherence to treatment guidelines was associated with difficulties in navigating multiple, parallel protocols and translating them into integrated patient-centred care, which negatively affected clinical competence and patient outcomes. This highlights the need for structured theoretical and practical support that enables nurses to integrate HIV and NCD care within a single clinical encounter, using harmonised guidance such as NIMART and APC, rather than additional disease-specific training. Strengthening supportive

supervision, clinical mentoring and workflow integration is therefore critical to standardising patient care and improving outcomes in PHC settings.

Availability of integrated policies for HIV and noncommunicable diseases

Low- and middle-income countries should develop national strategic plans that address both the prevention and management of HIV and NCDs, aligned with integrated clinical services management policies. According to the WHO (2021b), all countries should establish chronic disease management policies and guidelines that support integrated service delivery. In response to this global guidance, South Africa developed the National Policy Development Framework (The Presidency, Republic of South Africa 2020), which provides overarching direction for policy formulation, coordination and implementation across the health sector.

Health policies serve to provide procedures, direction and guidance to health care system actors on how to address specific issues and situations. They provide a mandate, clarify roles and responsibilities to ensure consistency, promote uniform decision-making, strengthen accountability of individuals and organisations, protect the public from inappropriate use of patient and system resources and reduce unnecessary conflict within the health care system. Policies also reflect organisational values, codes of conduct and institutional culture.

Building on policy direction, a model or conceptual framework may be developed to support implementation. This is supported by Mboweni and Makhado (2020), who demonstrated that conceptual frameworks are critical for reflecting programme structure, processes and outcomes. Empirical evidence from South African PHC settings further indicates that such frameworks help align policy intent with operational practice, particularly in the context of integrated HIV and NCD management (Murudi-Manganye et al. 2023a, 2023b).

Donabedian's (1988) structure–process–outcome (SPO) model provides a well-established theoretical basis for assessing quality of care. Within this framework, structure refers to physical infrastructure, human resources, staff training and financial inputs available within the health care service; process refers to how care is delivered, including technical processes such as assessment, diagnosis, referral, prevention, patient education and standards of care, as well as interpersonal processes encompassing patient–provider interactions. Outcomes reflect the effects of care on patients and populations, including changes in health status, behaviour, knowledge, patient satisfaction, life expectancy and QoL, and represent the primary goal of health care delivery.

Within this context, Murudi-Manganye et al. (2023a) developed a conceptual model for integrated HIV and NCD management to support standardised, patient-centred care. Subsequent studies from the Limpopo province in South Africa demonstrated that such models and associated tools, such as integrated reporting systems, strengthen coordination, clarify roles and improve monitoring of patient outcomes, without implying deficiencies in existing national programmes (Murudi-Manganye, Makhado & Sehularo 2022, 2023a). These frameworks are therefore best understood as implementation support mechanisms that assist policymakers and implementers in optimising existing policies, resources and clinical expertise.

Availability of integrated HIV and noncommunicable diseases guidelines

Available guidelines strengthen the implementation of the integrated management of HIV and NCDs. Integrated services need serious attention to avoid vertical duplication. Integrating HIV and NCDs into routine care is not just beneficial but also an investment and should receive key consideration when developing policies and guidelines in sub-Saharan Africa (SSA), other LMICs and globally, as it helps achieve and maintain socioeconomic benefits for HIV and NCD comorbidities (Kintu et al. 2020).

Improved nurse-initiated management of anti-retroviral therapy and adult primary care clinical competence

Clinical competence among NIMART-trained nurses has been evaluated using a range of methods, including randomised controlled trials, multifaceted interventions, qualitative process evaluations and direct observation during APC and NIMART implementation. Despite these efforts, evidence indicates that the integration of HIV and NCD clinical competencies remains inconsistent at the PHC level, particularly in rural settings. A South African study by Mboweni and Makhado (2019) demonstrated that post-training mentorship, structured supportive supervision and formal competency assessment are essential to sustain and translate training into effective clinical practice.

Empirical evidence further shows that ongoing clinical mentorship and in-service support, rather than one-off training, are critical for maintaining competence in integrated HIV–NCD care. Findings from the Limpopo province revealed that NIMART-trained nurses reported gaps in confidence and clinical decision-making when managing NCDs alongside HIV, despite prior training, highlighting the need for CPD and workplace-based learning (Murudi-Manganye et al. 2023b). These findings support

integrating HIV and NCD competencies into both pre-service curricula and structured in-service CPD, rather than duplicating discipline-specific training.

Clinical competence is ultimately reflected in measurable patient outcomes aligned with clinical guidelines. In HIV care, the primary clinical target is achieving and sustaining an undetectable VL, which is the accepted indicator of effective ART and optimal clinical management, rather than merely decreasing VL (WHO 2021a). In the context of integrated HIV–NCD care, effective management is similarly indicated by sustained viral suppression, controlled BP, glycaemic stability and the absence of preventable complications among patients with comorbid conditions (Murudi-Manganye et al. 2020, 2023a).

Evidence also indicates that clinical competence is strengthened through onsite mentorship, supportive supervision and proactive facility-level management, which enable early identification of skills gaps, reinforce adherence to guidelines and support integrated clinical decision-making (Mboweni & Makhado 2019; Murudi-Manganye et al. 2022). Effective managers play a critical role by ensuring the availability of guidelines, clinical tools and supportive supervision structures and by adopting proactive planning approaches that strengthen integrated service delivery rather than reactive problem-solving.

Availability of a health information system for integrated HIV and noncommunicable diseases

Health information is critical for policy and decision-makers and in planning services. Low- and middle-income countries should adopt reliable, effective district health information systems with clearly defined health performance indicators to monitor, track and evaluate the HIV and NCD programme. These data should be made available to all role players to support planning and budgeting for the integrated programme.

There is also a need for standardised data collection tools for both HIV and NCDs, starting from screening to management. These data should be verified and cleaned at the facility or community level before being captured in the system by facility managers to ensure quality; otherwise, it will mislead planners. The monitoring and evaluation processes should be strengthened and adhered to in order to identify gaps and develop quality improvement plans. A study conducted by Mboweni and Makhado (2020) affirms that effective data management can improve HIV and NCD management in PHC by informing policymakers and implementers.

Conclusion

Screening is a fundamental aspect of medicine, nursing and public health care. Its core objective is to identify individuals who are asymptomatic, as well as those who exhibit clinical signs and symptoms of diseases. By doing so, screening facilitates early treatment, thereby preventing potential complications that could arise if conditions go undetected. This proactive approach relies on a combination of subjective and objective assessments that health care providers can conduct. Such measures represent a significant investment that PHC systems can offer comprehensively and effectively.

As described in this chapter, screening tests are not designed to be diagnostic tools. Instead, their role is to pinpoint a specific population subgroup that may require further testing to validate the presence or absence of disease. This distinction is vital because it helps manage expectations about the purpose and outcomes of screening procedures. These procedures can be performed in various settings: They may be self-administered by individuals, conducted by HCWs in PHC facilities or organised within community health initiatives. This flexibility allows screening to be widely accessible and to cater to diverse populations.

Furthermore, these screening and diagnostic methodologies align with the WHO (2021b) consolidated guidelines, which advocate for the integration of NCD prevention and management within HIV, AIDS, TB and SRH care programmes. Public health efforts can be more effective and impactful by tailoring strategies to the specific demographics and challenges of different nations or populations. Ultimately, implementing robust screening processes is crucial in promoting health equity and improving health outcomes worldwide.

Declarations

Ethical considerations

This chapter comprises a review of existing evidence and screening guidelines. No human or animal participants were involved; therefore, it did not require ethical approval.

Consent

Not applicable.

Authors' contributions

Conceptualisation, SH Mboweni, L Makhado and TG Makhado; *data curation*, SH Mboweni; *formal analysis*, SH Mboweni; *investigation*, SH Mboweni; *methodology*, SH Mboweni and L Makhado; *resources*, L Makhado; *supervision*, L Makhado; *validation*, TG Makhado; *writing – original draft*, SH Mboweni and L Makhado; *writing – review and editing*, SH Mboweni, L Makhado and TG Makhado.

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Competing interests

The authors declare no competing interests.

Data availability

Data sharing is not applicable as no new data were generated or analysed in this study.

Disclaimer

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Chapter 5

Treatment and management of HIV and noncommunicable diseases

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Abstract

This chapter explores the integrated management of human immunodeficiency virus (HIV) and noncommunicable diseases (NCDs) within South Africa's health care framework, highlighting the significance of a unified approach to enhance clinical outcomes. It highlights the evolution of antiretroviral therapy (ART) in response to the dual burden of HIV and NCDs, emphasising the transition to evidence-based treatment regimens, including the adoption of dolutegravir (DTG). The chapter reviews medication interactions and side effects pertinent to the current ART protocols, addressing the complexities of managing comorbid HIV and NCDs. It advocates enhanced patient adherence and retention strategies, recognising the critical role that health care

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professionals play in navigating the challenges posed by concurrent health issues. Through a comprehensive analysis, this chapter contributes to the broader discourse on improving the quality of care and clinical outcomes for individuals living with HIV in the context of the rising prevalence of NCDs.

Introduction

The integrated chronic disease management (ICDM) model aims to merge the management of noncommunicable diseases (NCDs) with existing frameworks for communicable diseases to enhance the use of primary health care (PHC) services (Lebina et al. 2019; Muddu et al. 2020). The prevalence of multimorbidity is significant across sub-Saharan Africa (SSA), including South Africa, where integrated human immunodeficiency virus (HIV) and NCD management is regarded as a transformative approach for achieving better clinical outcomes, particularly since people living with HIV (PLHIV) face an elevated risk of developing NCDs (Muddu et al. 2020). In South Africa, more than seven million individuals are living with HIV. The widespread availability of antiretroviral therapy (ART) has significantly extended life expectancy. However, despite these advancements, a high prevalence of HIV persists, and many PLHIV are simultaneously affected by the dual burden of HIV and NCDs (Ganesh 2019; Hopkins et al. 2019; Muddu et al. 2020). The coexistence of HIV and NCDs complicates the management of both conditions through multimorbidity, polypharmacy, potential drug–drug interactions and fragmented disease-specific services. In addition, HIV infection and some ARTs may contribute to the development of metabolic, cardiovascular and other chronic comorbidities (Garrib et al. 2019; Muddu et al. 2020).

Guidelines from the World Health Organization (WHO) and the South African National Department of Health (NDoH) emphasise the need for routine screening of HIV-positive patients for hypertension, diabetes and other NCDs (NDoH 2016b; Sharman & Bachmann 2019). Integrated clinical services management aims to provide patient-centred care, enabling access to high-quality treatment within a single PHC facility (Ameh 2020; Muddu et al. 2020; NDoH 2018; WHO 2014). Despite progress on the Joint United Nations Programme on HIV/AIDS (UNAIDS) 90–90–90 targets in many sub-Saharan and other low- and middle-income countries (LMICs), NCDs and multimorbidity are increasingly prevalent, particularly in rural and semi-urban regions, such as the Limpopo province in South Africa (UNAIDS 2017). Although simplified treatment guidelines have improved viral suppression and survival among PLHIV, the increasing prevalence of hypertension, diabetes,

cardiovascular disease and other NCDs has created a growing need for ICDM, particularly as the population receiving long-term ART is getting older (Lebina et al. 2023; Maimela et al. 2016; WHO 2025). To address these challenges, the NDoH called for all PHC facilities to adopt integrated management approaches to HIV and NCDs.

The Ideal Clinic Initiative, introduced in 2014 by the NDoH, integrates clinical service management (Hunter et al. 2017). An Ideal Clinic, as defined under the Ideal Clinic Initiative, is characterised by effective facility reorganisation, appropriate infrastructure and strong service management systems that support integrated chronic care (NDoH 2025, 2026). It operates from well-maintained buildings with essential equipment and functional information and communication systems and is staffed by an adequate number of health care professionals who are supported through training and ongoing capacity-building. Efficient administrative systems enable accurate record-keeping, patient prioritisation and adherence to national clinical guidelines. Central to this model is ICDM, which promotes the coordinated, cost-effective management of chronic conditions, including HIV, diabetes and hypertension, and is designed to empower nurses and other health care workers (HCWs) to deliver integrated care. The Ideal Clinic approach is further strengthened by managerial support and collaboration with other government departments, the private sector and non-governmental organisations (NGOs) to address social determinants of health (SDoH) (NDoH 2025, 2026).

Evidence-based treatment and management guidelines for HIV and noncommunicable diseases in South Africa

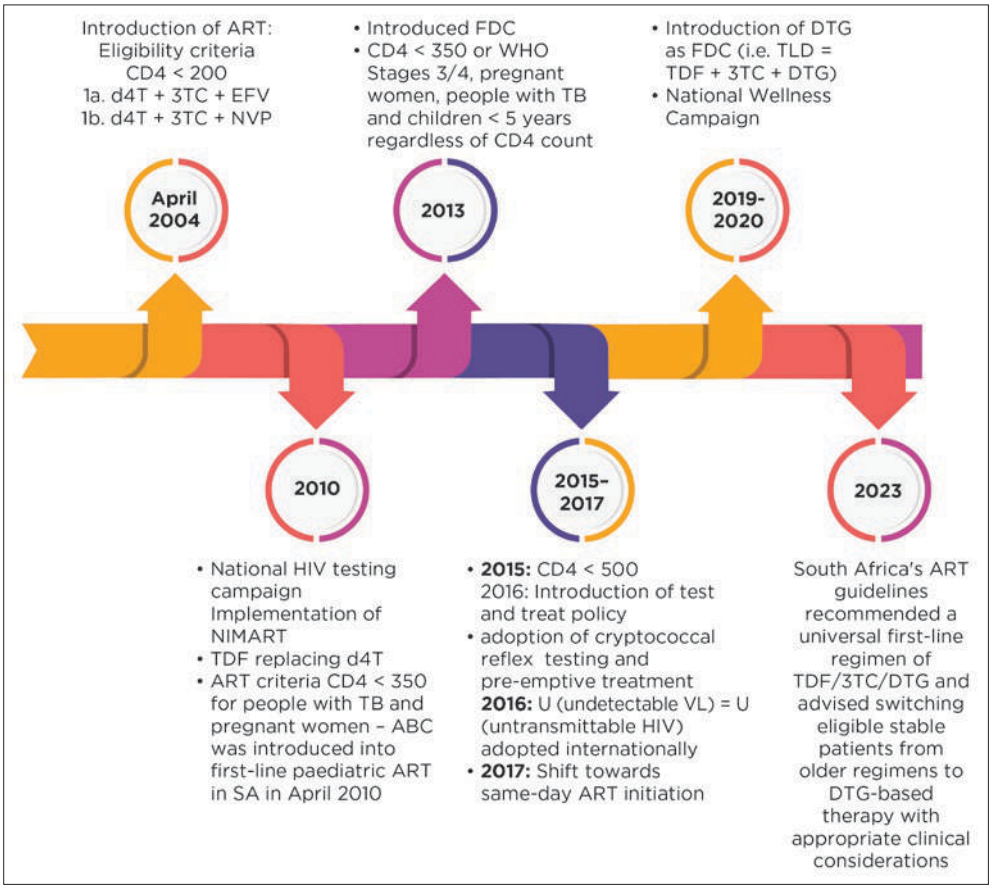
Since 2004, South Africa has rolled out ART regimens for children and adults living with HIV. However, PLHIV were referred to hospitals to access ART as the treatment was considered specialised. The criteria for ART initiation included both clinical and laboratory factors, such as a cluster of differentiation 4 (CD4) count of less than 200, with most PLHIV in Stages 3 or 4 and requiring hospital admissions to treat opportunistic infections (OIs). Antiretroviral (ARV) treatment management was previously at a hospital or specialised clinic. During the evolution of ART management, stable patients on ART were referred from the specialised HIV clinics to community-based clinics for continuity of care. The referral of patients from specialised facilities was formalised in 2020 in the referral policy for health care services and health care systems in South Africa (NDoH 2020).

History of HIV treatment and milestones of the antiretroviral treatment programme in South Africa

It has been over 20 years since South Africa implemented evidence-based treatment and management guidelines (NDoH 2004). Three principles of ART guided the implementation of ART worldwide, namely: The need to identify those infected with HIV, the initiation of ART as soon as possible for those newly diagnosed using the NDoH ART Clinical Guidelines (NDoH 2023) for drug selection and the suppression of the client's viral load (VL) to undetectable levels for all those on ART. In addition to the three ART principles, health care professionals, including those trained in nurse-initiated management of antiretroviral therapy (NIMART), support patients in adhering to treatment proactively, monitor treatment side effects and outcomes and act when treatment failure is suspected.

The milestones of the ART programme in South Africa are presented in Figure 5.1 and further outlined here:

- *2004*: Introduction of 'first-line' ART and eligibility criteria for ART initiation at CD4 < 200 (NDoH 2004)
- *2010*: Task shifting with the introduction of NIMART, tenofovir (TDF) replacing stavudine (D4T), and CD4 threshold increased to 350 for pregnancies and tuberculosis (TB) co-infected patients. Abacavir (ABC) was introduced into first-line paediatric ART in South Africa in April 2010 (Fairall et al. 2012; NDoH 2010a, 2010b)
- *2013*: Introduction of fixed-dose combination (FDC), universal coverage for children under five years accessing ART, expansion of ART eligibility to all adults with CD4 < 350 or WHO Stages 3 or 4, irrespective of CD4 (NDoH 2013a, 2013b)
- *2015*: Introduction of ART eligibility at CD4 < 500 (NDoH 2015)
- *2016*: Introduction of universal test and treat (irrespective of CD4-access count) (NDoH 2016a; WHO 2015)
- *2016*: U (undetectable VL) = U (untransmittable HIV) adopted internationally (Eisinger, Dieffenbach & Fauci 2019; Rodger et al. 2016, 2019)
- *2016–2017*: Shift towards same-day test and treat (NDoH 2016b; Rosen et al. 2016)
- *2019*: Dolutegravir (DTG) replaces efavirenz (EFV) in first-line ART and is approved for use in second-line ART (NDoH 2019; Nel et al. 2020; WHO 2022).

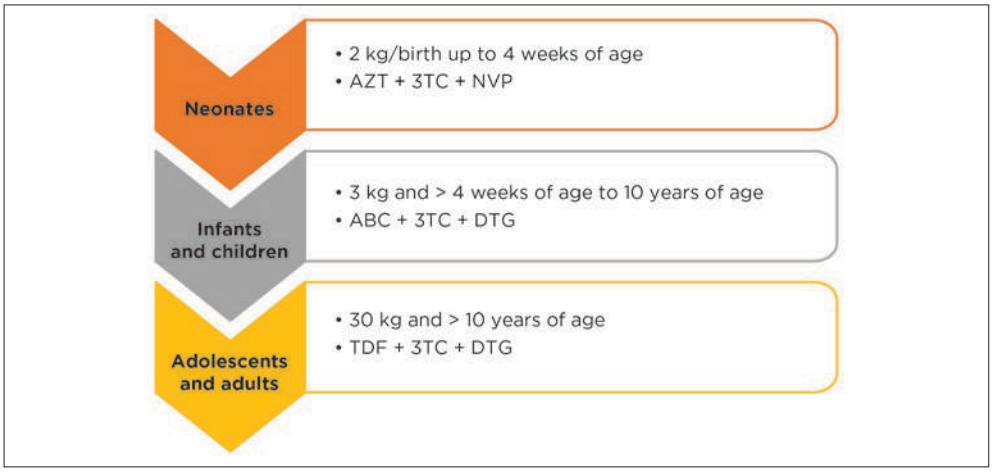


Source: Nthuseni Sharon Murudi-Manganye, adapted from the National Department of Health (2019) clinical guidelines.
Key: 3TC, lamivudine; ABC, abacavir; ART, antiretroviral treatment; CD4, cluster of differentiation 4; D4T, stavudine; DTG, dolutegravir; EFV, efavirenz; FDC, fixed-dose combination; HIV, human immunodeficiency virus; NIMART, nurse-initiated and management of ART; NVP, nevirapine; TB, tuberculosis; TDF, tenofovir disoproxil fumarate; VL, viral load.

FIGURE 5.1: Antiretroviral treatment milestones in South Africa.

Current antiretroviral treatment regimen in South Africa

Owing to ongoing research and emerging evidence on ART implementation, the regimens for adults and children have undergone several updates. As of August 2023, the NDoH informed provinces of changes to the ART guidelines. These changes were primarily informed by improved viral suppression with DTG and its greater tolerability compared to other ART drugs. The ART regimen is determined based on age, weight, comorbidities and potential drug interactions, as illustrated in Figure 5.2. The NDoH (2023) ART guidelines require that all historic patients be switched to the updated regimens shown in Figure 5.2.



Source: Nthuseni Sharon Murudi-Manganye, adopted and adapted from the National Department of Health (2023) ART clinical guidelines.
Key: 3TC, lamivudine; ABC, abacavir; AZT, azidothymidine; DTG, dolutegravir; kg, kilogram; NVP, nevirapine; TDF, tenofovir disoproxil fumarate; ART, antiretroviral therapy.

FIGURE 5.2: Recommended antiretroviral regimen in South Africa, adopted and adapted from the National Department of Health (2023) antiretroviral therapy clinical guidelines.

Emerging evidence of DTG resistance among some treatment-experienced individuals with viraemia has highlighted the importance of adherence support, routine VL monitoring and strengthened HIV drug-resistance surveillance. Although DTG continues to have a high genetic barrier to resistance and remains the preferred component of first-line ART, national guidelines may require further revision as local and international surveillance evidence evolves (WHO 2024).

The ART clinical guidelines recommend that all HIV-infected adult and adolescent males and females, including pregnant women, be initiated on a 'first-line' ART regimen consisting of TDF, lamivudine (3TC) and DTG (NDoH 2023). There are, however, PLHIV who were previously well controlled on other ART drugs, and the current guidelines require these patients to be switched to DTG-based regimens. However, some precautions must be considered, as switching is not a one-size-fits-all solution. The regimens for those not yet switched are ABC, 3TC and EFV (or nevirapine [NVP]); zidovudine (AZT), 3TC and EFV (or NVP); and AZT, 3TC and lopinavir (LPV) co-administered with a low dose of ritonavir (LPV/r).

Advances in long-acting ARV agents are increasingly reshaping the HIV treatment and prevention landscape. Long-acting formulations may reduce daily pill burden, treatment fatigue and concerns regarding privacy and stigma while expanding person-centred treatment options. Their integration into routine services nevertheless requires appropriate patient

selection, reliable appointment systems, trained staff, pharmacovigilance, resistance monitoring and health-system readiness (Agovi et al. 2024; Czarnogorski et al. 2022).

Common medication interactions and side effects

Although ART implementation for PLHIV improves quality of life (QoL) and extends lifespan by suppressing VL, it should be administered cautiously. In this chapter, the focus is on 10 drugs currently in use in South Africa, namely 3TC, ABC, DTG, EFV, emtricitabine (FTC), TDF, LPV, NVP, ritonavir (RTV) and AZT. In this section, the ART combination given to newly diagnosed HIV patients and those already on ART before 2023 is described. The Liverpool Symptoms Checker[2] and the WebMD Drug Interaction Checker[3] were utilised to describe and summarise the common medications, drug interactions and side effects associated with ART formulations used in South Africa.

As PLHIV are living with NCDs, the clinical management of patients must be informed by the approved clinical guidelines. For instance, patients must be screened for baseline blood laboratory data to ensure that the correct ART regimen is compatible with the NCD prescriptions. Table 5.1 on drug interactions outlines the considerations of health care professionals when a patient has a dual burden of diseases. Patients with renal insufficiency must not receive TDF until the creatinine levels and estimated glomerular filtration rate (eGFR) are within normal ranges. All patients initiated on TDF-based regimens should be assessed for renal insufficiency, especially children under 16 and pregnant women.

Each category of ART drug has some form of side effect(s), drug interaction, warnings and actions to be followed if there are interactions and side effects. The adult primary care (APC) guidelines and essential medicine list outline the management of side effects. To manage ART side effects and drug interactions, health care professionals should undergo training in NIMART or advanced clinical care. This topic is fully covered in Chapter 7 of this book. Table 5.1 summarises the ART drugs according to (1) the name of the drug, (2) the class of ARVs, (3) drug interaction, (4) the action of the interacting drug and (5) side effects.

2. Refer to https://www.covid19-druginteractions.org/checker

3. Refer to https://www.webmd.com/interaction-checker/default.htm

TABLE 5.1: Summary of antiretroviral classifications, actions, drug interactions and side effects.

Name of drug	Class of ARV	Action	Drug interaction	Clinical management of interactions	Side effects
Efavirenz (EFV)	Non-nucleoside reverse transcriptase inhibitor (NNRTI)	Binds to reverse transcriptase and prevents HIV from replicating.	• EFV can accelerate the metabolism of various medications in the body, potentially reducing their efficacy. • Some affected drugs include atovaquone or proguanil, azole antifungals (e.g. itraconazole, ketoconazole), bedaquiline, cobicistat (COBI), elbasvir or grazoprevir, macrolide antibiotics (e.g. clarithromycin), methadone, rifabutin, sertraline, certain cholesterol-lowering statins (e.g. atorvastatin, pravastatin, simvastatin) and warfarin, among others. • Additionally, EFV may lower the effectiveness of hormonal contraceptives, such as pills, patches or rings.	• Patients are encouraged to maintain a comprehensive list of all products they use, including prescription medications, over-the-counter (OTC) drugs and herbal supplements, and share this information with their health care providers. • It is essential not to start, stop or adjust the dosage of any medication without consulting a health practitioner or professional nurse.	• Common side effects of EFV include dizziness, difficulty sleeping, drowsiness, unusual dreams and difficulty concentrating. • These effects typically start within one to two days of initiating the medication and usually subside within two to four weeks. • Taking EFV on an empty stomach at bedtime can help minimise these side effects. Patients are advised to avoid alcohol and street drugs while on EFV, as these substances can exacerbate the side effects.

Table 5.1 continues on the next page→

TABLE 5.1 (cont.): Summary of antiretroviral classifications, actions, drug interactions and side effects.

Name of drug	Class of ARV	Action	Drug interaction	Clinical management of interactions	Side effects
Nevirapine (NVP)	NNRTI	Binds non-competitively to HIV-1 reverse transcriptase and inhibits the conversion of viral ribonucleic acid (RNA) into deoxyribonucleic acid (DNA), thereby preventing HIV replication.	• NVP can speed up the removal of many other medications from the body, which may affect how they work. Examples of affected drugs are antiarrhythmics (e.g. amiodarone), atazanavir (ATV), COBI, elvitegravir, some drugs used to treat seizures (e.g. clonazepam), azole antifungals (e.g. itraconazole, ketoconazole), macrolide antibiotics (e.g. clarithromycin), and methadone, among others. • Prednisone should not be used to prevent a rash, as it may actually increase the risk of a rash during the first six weeks of NVP treatment. • *NB:* NVP should not be co-administered with rifampicin because of substantial reductions in NVP plasma concentrations, which can lead to virologic failure.	• Patients should discuss additional or alternative reliable birth control options with their doctor and use an effective barrier method, such as latex or polyurethane condoms or dental dams, during sexual activity to help reduce the risk of transmitting HIV to others. • They should inform their doctor if they experience new spotting or breakthrough bleeding, as these may indicate that their hormonal birth control is not functioning effectively.	• Common side effects of NVP include tiredness, nausea, vomiting or diarrhoea, with drowsiness occurring rarely. If any of these symptoms persist or worsen, a health care provider or pharmacist should be notified promptly. • NVP frequently causes a rash, which is often harmless. However, distinguishing a common rash from one that signals a severe reaction can be challenging. Patients should seek immediate medical attention if they develop any rash.

Table 5.1 continues on the next page→

TABLE 5.1 (cont.): Summary of antiretroviral classifications, actions, drug interactions and side effects.

Name of drug	Class of ARV	Action	Drug interaction	Clinical management of interactions	Side effects
Emtricitabine (FTC)	Nucleoside reverse transcriptase inhibitor (NRTI)	• Blocks the action of the reverse transcriptase enzyme, which HIV needs to replicate. • Partial activity against hepatitis B virus (HBV).	• FTC is not approved for treating HBV infection. If a patient has HBV in addition to HIV, HBV symptoms may get worse or become very serious if they stop taking FTC. • Orlistat may interact with this drug. Patients should inform their doctor if they are taking orlistat concurrently with this medication to ensure safe and effective use.	If a patient is taking medications to treat seizures, orlistat may reduce the effectiveness of these drugs. If a patient notices an increase in the frequency or worsening of seizures, they should stop taking orlistat immediately and inform their doctor.	Common side effects of this medication may include headache, diarrhoea, insomnia or darkening of the skin on the palms of the hands and soles of the feet. If these side effects persist or worsen, a health care provider should be contacted for further guidance.
Lamivudine (3TC)	NRTI	After intracellular phosphorylation, 3TC inhibits HIV reverse transcriptase by competing with naturally occurring nucleotides and terminating viral DNA-chain elongation. It also has activity against HBV.	• Some products that may interact with this drug are orlistat and sorbitol. • FTC is similar to 3TC and should not be taken together with this medication. It is important to check the labels of all HIV medicines, as they may contain the same ingredients found in this product.	• 3TC and FTC should not be co-administered, as they are similar medications, and taking them together may increase the risk of side effects without providing additional benefits. • Check the patient's HBV status before starting therapy, as 3TC has activity against HBV.	Headache, dizziness, nausea, diarrhoea or difficulty sleeping may occur. If any of these effects persist or worsen, a health care provider should be contacted for further guidance.

Table 5.1 continues on the next page→

TABLE 5.1 (cont.): Summary of antiretroviral classifications, actions, drug interactions and side effects.

Name of drug	Class of ARV	Action	Drug interaction	Clinical management of interactions	Side effects
Tenofovir disoproxil fumarate (TDF)	NRTI	TDF is converted to tenofovir and subsequently phosphorylated intracellularly. Its active metabolite inhibits HIV-1 reverse transcriptase and HBV polymerase through DNA-chain termination.	• Renal toxicity. • Products that may interact with this drug include adefovir, orlistat and other drugs that may harm the kidneys (including aminoglycosides such as amikacin or gentamicin). • Some other drugs used to treat HIV infection, including atorvastatin, may interact with TDF. TDF can reduce the effectiveness of atorvastatin by lowering its blood levels.	• Patients should consult their clinician if they have any concerns about their treatment. If they have an HBV infection, stopping TDF may cause their HBV symptoms to worsen or become very serious. • TDF has activity against HBV.	• Common side effects include dizziness, diarrhoea, headache or difficulty sleeping. • More serious side effects may include mental or mood changes (e.g. depression, anxiety or confusion), signs of kidney problems (e.g. renal dysfunction and changes in urine output) and unusual thirst.
Zidovudine (ZDV) and/or azidothymidine (AZT)	NRTI	Following intracellular phosphorylation, AZT competitively inhibits HIV reverse transcriptase and terminates viral DNA-chain elongation, thereby reducing viral replication.	• Some products that may interact with this drug include orlistat, probenecid, ribavirin, stavudine (D4T) and drugs that can suppress bone marrow function, such as ganciclovir, dapsone, trimethoprim and certain chemotherapy drugs (e.g. doxorubicin, vincristine). • Other medications may also affect how ZDV and AZT are removed from the body, potentially altering their effectiveness. Examples include methadone, rifampicin and drugs used to treat seizures (e.g. phenytoin, valproic acid).	ZDV and AZT have caused severe blood and bone marrow problems, including decreased red blood cells (anaemia) and white blood cells (neutropenia). This occurs more often in PLHIV with advanced AIDS. Blood problems may require blood transfusions or stopping of the medication. A severe peripheral neuropathy may occur when using high doses of ZDV or AZT.	• Headache, nausea, vomiting, difficulty sleeping or loss of appetite may occur. Seldom prescribed at this time.

Table 5.1 continues on the next page→

TABLE 5.1 (cont.): Summary of antiretroviral classifications, actions, drug interactions and side effects.

Name of drug	Class of ARV	Action	Drug interaction	Clinical management of interactions	Side effects
Dolutegravir (DTG)	Integrase strand transfer inhibitor (INSTI)	HIV uses an integrase enzyme to transfer its genetic material into cell DNA. INSTIs block this action.	• Rifampicin • Metformin • Calcium supplements • Anticonvulsants	• *Rifampicin:* Increase DTG dose to 50 mg 12-hourly. If on TLD FDC, add DTG 50 mg 12 hours after the TLD dose. • *Calcium supplements:* Decrease DTG concentrations when taken together on an empty stomach. To prevent this, DTG and calcium supplements can be taken simultaneously, preferably with food. It is safe to dissolve the DTG dispersible tablets in breast milk. Iron supplements decrease DTG concentrations if taken together on an empty stomach. To prevent this, DTG and iron supplements can be taken simultaneously, preferably with food. However, calcium and iron supplements must be taken at least four hours apart. Magnesium/aluminium-containing antacids decrease DTG. • *Metformin:* DTG increases metformin concentrations. Maximum metformin dose: 500 mg in 12 hours. • *Anti-convulsants:* Concentrations should be taken at least two hours before or six hours after DTG, regardless of food intake. Avoid co-administration if possible. Alternative agents that do not interact with DTG include valproate, lamotrigine, levetiracetam and topiramate. Remember that valproate is contraindicated during pregnancy. Double the DTG dose to 50 mg 12-hourly for carbamazepine, phenytoin or phenobarbital if an alternative anticonvulsant *cannot be used*.	Headache, weight gain and difficulty sleeping may occur.

Table 5.1 continues on the next page→

TABLE 5.1 (cont.): Summary of antiretroviral classifications, actions, drug interactions and side effects.

Name of drug	Class of ARV	Action	Drug interaction	Clinical management of interactions	Side effects

Lopinavir (LPV)	Protease inhibitor (PI)	PIs inhibit another enzyme called HIV protease to prevent HIV replication.	The most common clinically significant interactions with LPV and ritonavir (RTV) include rifampicin-based TB treatment, anticonvulsants such as carbamazepine and phenytoin, statins (e.g. simvastatin and lovastatin), anticoagulants (e.g. warfarin and rivaroxaban), inhaled corticosteroids (e.g. fluticasone, hormonal contraceptives and methadone), and phosphodiesterase inhibitors (e.g. sildenafil).	• There is a warning that it should not be co-administered with abacavir (ABC).*
				• *NB:* PIs inhibit the metabolism of many drugs and thus increase the risk of toxicity, e.g. prolonged QTc interval with cardiac drugs, etc.
				• Recent clinical trial data appear to confirm an increased cardiac risk with ABC. Check interactions before prescribing LPV.
					• **Gastrointestinal issues**
					  • *Diarrhoea:* This is one of the most commonly reported side effects.
					  • *Nausea and vomiting:* Some patients experience nausea and vomiting.
					  • *Abdominal pain:* Discomfort or pain in the stomach area.
					• **Metabolic complications**
					  • *Hyperlipidemia:* Elevated levels of cholesterol and triglycerides.
					  • *Hyperglycemia:* Increased blood sugar levels can lead to or exacerbate diabetes.
					• **Liver toxicity**
					  • *Elevated liver enzymes:* Indicating potential liver stress or damage.
					  • *Hepatitis:* Inflammation of the liver.
					• **Central nervous system effects**
					  • *Headache:* Commonly reported by patients.
					  • *Dizziness:* Some patients may experience a sense of imbalance or light-headedness.
					• **Fat redistribution**
					  • *Lipodystrophy:* Abnormal distribution of body fat, which can include fat loss in the face, arms and legs and fat accumulation in areas like the abdomen, neck or breasts.

Table 5.1 continues on the next page→

TABLE 5.1 (cont.): Summary of antiretroviral classifications, actions, drug interactions and side effects.

Name of drug	Class of ARV	Action	Drug interaction	Clinical management of interactions	Side effects
Ritonavir (RTV)	Protease inhibitor (PI)	RTV inhibits the HIV protease, which is essential for viral maturation. It behaves as a PI at high doses. However, at a low dose – as RTV is used – it acts as an adjunct to enhance the activity of the PIs with which it is combined.	Multiple drug–drug interactions: • Amiodarone • Warfarin • Ketoconazole • Diazepam • Nifedipine • Simvastatin • Dexamethasone • Cyclosporine • Fentanyl	• *Dose adjustments:* In many cases, the doses of interacting drugs need to be reduced to avoid toxicity. • *Therapeutic drug monitoring:* Blood levels of certain drugs may need to be monitored to ensure safe and effective dosing. • *Switching medications:* Sometimes, a non-interacting alternative drug may be preferred. • *Close monitoring:* Patients taking RTV, especially those who are also taking other medications, should be closely monitored for side effects or signs of toxicity	• *Gastrointestinal issues*: Nausea, vomiting, diarrhoea and abdominal pain are common. • *Metabolic complications*: Hyperlipidaemia, hyperglycaemia and insulin resistance. • *Liver toxicity*: Elevated liver enzymes and hepatitis. • *Cardiovascular risks*: Prolongation of the QT interval, which can lead to heart rhythm problems. • *Peripheral and oral paraesthesia*: Tingling sensations, often in the hands or feet.

Table 5.1 continues on the next page→

TABLE 5.1 (cont.): Summary of antiretroviral classifications, actions, drug interactions and side effects.

Name of drug	Class of ARV	Action	Drug interaction	Clinical management of interactions	Side effects
Darunavir (DRV)	PIs are often co-administered with a pharmacokinetic booster such as RTV or COBI to enhance their plasma concentration.	Inhibits the HIV-1 protease, thereby preventing the cleavage of viral polyproteins into functional proteins required for viral maturation. This results in the production of immature, non-infectious viral particles, thereby suppressing viral replication.	• Rifampicin: Contraindicated – markedly reduces DRV levels. • Anticonvulsants (e.g. carbamazepine, phenytoin, phenobarbital): May decrease DRV efficacy. • Statins (especially simvastatin, lovastatin): Risk of increased statin levels leading to toxicity. • Oral contraceptives: May reduce contraceptive effectiveness. • St John's wort: Contraindicated because of cytochrome P450 3A4 enzyme (CYP3A4) induction.	• Avoid co-administration with Rifampicin and St John's wort. • Switch anticonvulsants to alternatives with fewer interactions (e.g. valproic acid or levetiracetam). • Use alternative statins such as atorvastatin or pravastatin with dose adjustments. • Advise additional or alternative contraceptive methods for women using hormonal contraception.	• *Common:* Diarrhoea, nausea, headache, rash and abdominal pain. • *Metabolic:* Lipid abnormalities and hyperglycaemia. • *Hepatic:* Elevated liver enzymes, particularly in patients with HBV or HCV co-infection. • *Serious (rare):* Severe skin reactions (e.g. Stevens–Johnson syndrome), hepatotoxicity. • *NB:* Monitor liver enzymes and lipid profile periodically, particularly in patients with viral hepatitis co-infection or metabolic comorbidities.

Source: Nthuseni Sharon Murudi-Manganye, adapted and tabulated from the National Department of Health (2023) ART clinical guidelines, the University of Liverpool HIV Drug Interactions resource, Medscape Drug Interaction Checker and relevant medicine product information. Additional information on clinically important interactions between antiretroviral medicines and corticosteroids was obtained from Cadet (2021).

*Note: Abacavir (ABC) is no longer recommended in most international adult antiretroviral (ARV) therapy guidelines because of associations with increased cardiovascular risk, but remains in limited paediatric use in South Africa.

Key: 3TC, lamivudine; AIDS, acquired immunodeficiency syndrome; ATV, atazanavir; AZT, azidothymidine; COBI, cobicistat; CYP3A4, cytochrome P450 3A4 enzyme; DNA, deoxyribonucleic acid; DTG, dolutegravir; DRV, darunavir; EFV, efavirenz; FTC, emtricitabine; HBV, hepatitis B virus; HCV, hepatitis C virus; HIV, human immunodeficiency virus; HIV-1, dominant global form of human immunodeficiency virus; INSTI, integrase strand transfer inhibitor; LPV, lopinavir; NNRTI, non-nucleoside reverse transcriptase inhibitor; NRTI, nucleoside reverse transcriptase inhibitor; NVP, nevirapine; OTC, over-the-counter; PI, protease inhibitor; PLHIV, people living with human immunodeficiency virus; QT, Q and T wave intervals; QTc, Q and T wave intervals corrected; RTV, ritonavir; TDF, tenofovir disoproxil fumarate; TLD, tenofovir disoproxil; ZDV, zidovudine; ART, antiretroviral therapy.

Patient adherence and retention in care

The increasing number of adults and children living with HIV in both rural and urban areas of South Africa highlights the urgent need to strengthen treatment literacy to support patient adherence and retention in care (NDoH 2022; UNAIDS 2023). Treatment literacy enables PLHIV to understand the significance of consistent ART adherence and remaining engaged in care. Remaining engaged in HIV care is essential for continuity of ART, VL monitoring and sustained viral suppression. National evidence from South Africa nevertheless shows that estimates of retention vary substantially depending on whether patient transfers between facilities are correctly identified and incorporated into programme data (Fox et al. 2018).

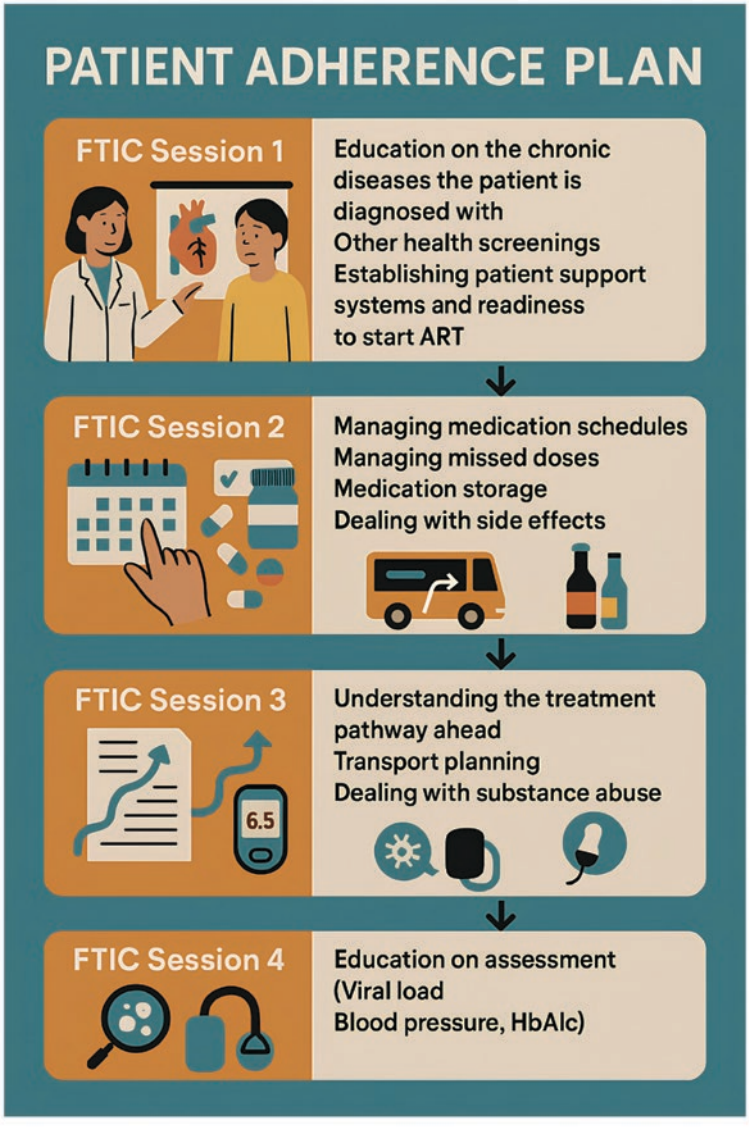
Evidence suggests that sustained adherence to ART leading to viral suppression can reduce the risk of sexual transmission of HIV by more than 99%, supporting the undetectable = untransmittable (U = U) message (Cohen et al. 2016; Eisinger et al. 2019). To encourage adherence, South Africa has introduced several strategies, including behaviour change interventions, such as the use of illustrative B-OK bead bottles for medication reminders, the implementation of a case management model, and alignment with national ART guidelines (Mohololа et al. 2025; South African National AIDS Council [SANAC] 2022).

However, the effectiveness of treatment literacy is influenced by PLHIV's attitudes towards their HIV diagnosis and their level of understanding of the treatment process (Simbayi et al. 2019). Internalised stigma, misinformation or emotional distress can all negatively impact adherence (Turan et al. 2017; Sineke et al. 2022). In addition, PHC professionals may face challenges in adopting these strategies because of resource constraints, inadequate training and systemic limitations (Makhado et al. 2020; Crowley, Mokoka & Geyer 2021).

Despite these barriers, evidence from previous studies shows that both PHC providers and PLHIV play a central role in fostering adherence and ensuring retention in health care. There is a significant opportunity to strengthen and scale up these interventions to improve clinical outcomes and QoL for individuals living with HIV in South Africa.

A patient adherence plan is a helpful tool used for both adults and children living with HIV, whether they live in rural or urban areas. It includes key topics that health care professionals and community health care workers (CHCWs) can use to assess whether a person is likely to follow their HIV or chronic disease (such as diabetes or hypertension) treatment plan. In addition, the adherence guidelines are designed to help both clinic staff and CHCWs gain the skills they need to support patients in staying connected to care, taking their treatment correctly and continuing care over time. When used effectively, these plans help improve patients' health by ensuring they adhere to their treatment and do not drop out of care.

Beyond the consideration of adults and children living with HIV as the key population group in HIV and other NCDs, there is an opportunity to engage adults and children in the process of adherence counselling. Figure 5.3 is drawn from the adherence guidelines supplied by the NDoH (2020) for HIV, TB and NCDs. The figure outlines the structure of steps or sessions covered



Source: Nthuseni Sharon Murudi-Manganye, adapted and originally visualised from the National Adherence Guidelines for HIV, TB and NCDs (National Department of Health 2020).
Key: ART, antiretroviral therapy; FTIC, fast-track initiation and counselling; HbA1c, haemoglobin A1c (glycated haemoglobin); NCDs, noncommunicable diseases; TB, tuberculosis.

FIGURE 5.3: Fast-track initiation and counselling patient adherence plan, adopted from the National Adherence Guidelines for human immunodeficiency virus, tuberculosis and noncommunicable diseases (National Department of Health 2020).

in adherence counselling. In Session 1, patients are educated about the chronic diseases they have been diagnosed with, on planning for their treatment appointment date and establishing the support system they will have during their treatment journey. Session 2 covers aspects patients may experience during treatment, such as managing missed doses, using reminder strategies, storing medicine and managing side effects (NDoH 2020).

Session 3 focuses on enhancing the patient's understanding of their HIV treatment journey and includes a dedicated component on substance abuse. This inclusion is deliberate, as excessive use of substances such as alcohol and drugs is a well-documented barrier to adherence to ART and NCD treatment (NDoH 2020). Substance abuse can impair judgement, disrupt daily routines and contribute to forgetfulness or intentional skipping of medication doses, ultimately leading to poor treatment outcomes and increased risk of viral resistance. Furthermore, individuals who misuse unhealthy substances may also have reduced engagement with health care services and diminished motivation to remain in care (NDoH 2020). Session 3 covers the patient's understanding of the treatment journey and substance abuse. Lastly, Session 4 covers education on monitoring the treatment outcomes of the disease the patient is experiencing (NDoH 2020).

The information from different sessions can be summarised in one clinic visit and emphasised during each subsequent visit. The adherence guidelines also outline standard operating procedures (SOPs), namely (1) fast-track initiation and counselling, (2) enhanced adherence counselling (EAC), (3) child and adolescent disclosure counselling, (4) repeat prescription collection strategies, (5) drug switches and (6) tracing and re-engagement in care, which must be adhered to by health care professionals to improve the retention in care of patients living with HIV and NCDs (NDoH 2020). Human immunodeficiency virus treatment guidelines recommend that PLHIV maintain a treatment adherence rate of at least 80% to achieve and sustain viral suppression. Adherence at this level is critical to prevent drug resistance, improve health outcomes and reduce HIV transmission. Adherence may be assessed using complementary measures such as patient self-report, pharmacy refill records, pill counts, appointment attendance and VL monitoring (NDoH 2023; WHO 2025). To determine whether PLHIV are adhering to treatment, various tools and measures, such as pill counts, pharmacy refill records and self-reported adherence, are used in accordance with national and international standards.

In research contexts, both adults and children (with their caregivers' support) can participate in tracking and reporting their treatment adherence and retention in care. Actively involving PLHIV in such research processes not only strengthens the quality of the data collected but also enhances their understanding of the importance of adherence.

Moreover, it empowers them to take ownership of their health and to serve as advocates for behaviour change within their communities.

Health care professionals and workers can utilise Patient Adherence Guidelines as a tool to improve adherence concurrently, as each tool complements the other. Standard operating procedures are designed to guide the integration of HIV and NCD treatment adherence for patients in PHC facilities. To further ensure that PLHIV and those with NCDs are retained in health care, there is a need to screen their mental health for psychosocial support. The adherence guidelines also offer guidance on providing enhanced counselling for patients struggling with adherence and retention in care. It is important to provide patients with mental health education and advice to help them cope with any symptoms they may be experiencing. Explain to the patient that the signs and symptoms they are facing could indicate a need for additional support to address and improve their mental health condition. This approach helps patients understand the connection between mental and physical health, encouraging them to seek the support they need to maintain adherence and overall wellbeing (NDoH 2020).

Enhanced adherence counselling sessions

According to the 'National Adherence Guidelines for HIV, TB and NCDs' (NDoH 2020), EAC should be provided to improve HIV treatment outcomes for a person who is unstable on ART because of various reasons. This counselling comprises two sessions, namely (1) initial EAC and (2) EAC for persistently non-adherent patients. During each consultation, the health care provider must clearly explain the purpose of the session and communicate assessment results to the patient in a manner that is understandable. These assessments typically include key indicators such as VL, blood pressure (BP) and HbA1c levels. Educating patients about these results is essential to support informed decision-making and promote adherence to treatment.

An abnormal VL is generally defined as a VL above 50 copies/mL, indicating that the virus is still detectable in the blood. If the VL is above 1,000 copies/mL, it may suggest treatment failure or nonadherence and require urgent intervention. A suppressed or undetectable VL (i.e. below 50 copies/mL) reflects good adherence and effective ART.

For BP, a reading above 140/90 mmHg is considered hypertension, which increases the risk of cardiovascular complications. Elevated BP may indicate poor control of comorbid conditions and highlights the need for lifestyle modifications, medication review or improved adherence to antihypertensive therapy.

In patients with diabetes, the HbA1c test reflects average blood glucose levels over the past two to three months. An HbA1c level above 6.5%

(on two separate occasions) confirms a diagnosis of diabetes, while a level above 7% in patients already diagnosed suggests poor glycaemic control, which increases the risk of complications and may also affect the body's ability to respond to HIV treatment.

In addition to discussing these clinical results, the health care provider should explore the patient's experiences with treatment and collaborate with the patient to identify feasible strategies to overcome adherence barriers. These may include simplifying medication schedules, providing reminder support, addressing adverse effects, strengthening social support and adapting follow-up arrangements where appropriate (NDoH 2022; WHO 2025). Mental health screening should be integrated into routine HIV care because depression, anxiety, substance use and other mental health conditions may negatively affect medication adherence, engagement in care and viral suppression (Jonsson et al. 2013; WHO 2025).

Enhanced adherence counselling is an intensified, person-centred intervention for patients experiencing adherence difficulties, particularly those with an unsuppressed VL or repeated treatment interruptions. It involves identifying individual barriers, developing feasible corrective strategies and monitoring the patient's adherence and virological response. Patients newly initiating ART should receive routine treatment preparation and adherence support but do not require EAC solely because they are initiating treatment (NDoH 2022; WHO 2025).

Adherence support should be responsive to the particular needs of adolescents, pregnant and breastfeeding women, people with TB or NCD comorbidities, people experiencing mental health or substance-use difficulties, and individuals facing significant socioeconomic or structural barriers. The intensity and content of counselling should be determined by the patient's clinical circumstances and identified barriers rather than by population category alone (NDoH 2022; WHO 2025). Where adherence barriers extend beyond medication-taking behaviour, support may require collaboration among clinicians, nurses, counsellors, pharmacists, social workers, community health workers and mental health professionals (NDoH 2022; WHO 2025).

Patients receiving EAC should be monitored through scheduled clinical follow-up, adherence assessment and repeat VL testing in accordance with national guidelines. Telephone calls, short message service (SMS) reminders, mobile applications and other digital interventions may supplement counselling and adherence support where they are accessible, acceptable and implemented with appropriate privacy protections. However, evidence of their effectiveness is mixed, and they should complement rather than replace person-centred clinical care (Griffee et al. 2022; Shah et al. 2019; WHO 2025). Counselling should be culturally and contextually appropriate,

use the patient's preferred language where possible, and take into account health literacy, social circumstances, beliefs about illness and treatment, and available support systems (Moloko-Phiri, Sepeng & Sebaeng 2022; WHO 2025). Enhanced adherence interventions should be evaluated using measures such as counselling completion, medication access, retention in care, VL suppression and patient-reported acceptability. Feedback from patients and health care providers should inform continuing quality improvement (NDoH 2022; WHO 2025).

Conclusion

This chapter provides evidence-based treatment and management guidelines for HIV and NCDs, detailing common medication interactions, side effects and strategies to support adherence and retention in care for PLHIV. The author highlights the evolution of South Africa's ART programme and its regimens aimed at improving clinical outcomes and the quality of care. Antiretroviral therapy remains the cornerstone of HIV treatment, effectively reducing complications, prolonging life expectancy and minimising transmission.

In the context of comorbid HIV and serious NCDs, the health care system increasingly emphasises integrated service delivery. Patients are often managed at PHC clinics, especially in rural areas, where routine HIV and NCD care are co-delivered. However, those with complex or advanced conditions may require referral to tertiary health centres or centres of excellence, where multidisciplinary teams can address complications and manage polypharmacy risks. The relationship between rural clinics and tertiary centres is critical, often guided by standardised referral protocols and supported by telemedicine, mHealth, outreach specialist visits or coordinated care pathways. Strengthening this link is vital to ensuring continuity of care, timely interventions and equitable access to specialist services for rural populations. Given the dynamic nature of clinical guidelines, ongoing engagement and training of health care professionals at all levels remain essential to delivering responsive, high-quality care for PLHIV with comorbid NCDs.

Declarations

Ethical considerations

This chapter synthesises existing clinical guidelines literature and publicly available sources. No human or animal participants were involved; therefore, it did not require ethical approval.

Consent

Not applicable.

Authors' contributions

Conceptualisation, NS Murudi-Manganye; *data curation*, NS Murudi-Manganye; *formal analysis*, NS Murudi-Manganye; *investigation*, NS Murudi-Manganye; *methodology*, NS Murudi-Manganye; *project administration*, NS Murudi-Manganye and L Makhado; *resources*, NS Murudi-Manganye; *validation*, NS Murudi-Manganye; *visualisation*, NS Murudi-Manganye; *writing – original draft*, NS Murudi-Manganye; *writing – review and editing*, NS Murudi-Manganye and L Makhado.

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Disclaimer

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Chapter 6

Prevention and control of HIV and noncommunicable diseases

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Abstract

This chapter addresses the prevention and control of human immunodeficiency virus (HIV) and noncommunicable diseases (NCDs), highlighting the importance of national guidelines and achieving global targets, such as the 90–90–90 and 95–95–95 HIV targets. It emphasises the importance of early detection, diagnosis and continuous monitoring in

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primary care facilities. It highlights the critical role of the World Health Organization's 'Best buys' survey and the United Nations' Sustainable Development Goals as outlined in the *2030 Agenda for Sustainable Development* in identifying cost-effective interventions and strategies for prevention and control. The chapter discusses the integration of HIV and NCD management within a comprehensive primary health care (PHC) approach, indicating the necessity of a multisectoral strategy to address the dual burden of these diseases. It also outlines the levels of prevention, ranging from primordial to tertiary, and emphasises the need for ongoing research and funding to enhance prevention strategies. The chapter concludes by advocating for a multisectoral approach and health promotion at all levels of prevention to reduce mortality and morbidity from HIV and NCDs.

Introduction

Many countries have developed national policies, strategies or clinical guidelines addressing human immunodeficiency virus (HIV) and noncommunicable diseases (NCDs). However, the availability, comprehensiveness and implementation of integrated HIV–NCD guidance vary considerably between countries and health care systems (World Health Organization [WHO] 2023a, 2024). The WHO provides evidence of progress on the 95–95–95 targets, which focus on increasing access to HIV testing and treatment (WHO 2017a). Early detection, diagnosis and monitoring of HIV and NCDs – including HIV testing, viral load (VL) testing and measurements of height, weight, blood glucose, blood pressure (BP), total cholesterol and urine – are available in primary care facilities across the public health sector (National Department of Health [NDoH] 2023b; WHO 2023a). The WHO's 'Best buys' survey assesses country actions on NCDs and related risk factors, providing guidance on strengthening national responses (WHO 2017a). The United Nations' (UN) Sustainable Development Goal (SDG) 3, focused on good health and wellbeing, is crucial for addressing both HIV and NCDs. Subgoals 3.3 and 3.4 are particularly relevant: Subgoal 3.3 targets the elimination of HIV and other communicable diseases by 2030, while Subgoal 3.4 aims to reduce premature mortality from NCDs and address risk factors such as alcohol and tobacco use (UN 2020).

The global effort is focused on reducing premature mortality from NCDs by one-third by 2030 and ending the mortality and morbidity associated with HIV. In this chapter, the SDG Subgoals 3.3 and 3.4 will be examined, as they are essential in the prevention and control of HIV and NCDs. In the WHO (2017a) survey, 10 years of comparable data on various factors related to HIV and NCD prevention and control are

presented. The goals outlined in the WHO (2013) Global plan of action on NCDs, along with South Africa's National Strategic Plans (NSPs) for HIV, tuberculosis (TB), sexually transmitted infections (STIs) and the prevention of NCDs (NDoH 2022, 2023b), align with these efforts. These plans aim to reduce the burden of both communicable and NCDs, ensuring that national strategies are in place to meet the targets set by the WHO and the SDGs, particularly Subgoals 3.3 and 3.4 (WHO 2017b).

Global voluntary NCD targets address major modifiable risk factors and health-system responses, including reducing tobacco use, harmful alcohol consumption, physical inactivity and population salt intake; halting the rise in diabetes and obesity; reducing the prevalence of raised BP; expanding access to essential NCD medicines and technologies; and improving cardiovascular risk management to prevent heart attacks and strokes (WHO 2013, 2023b).

The overarching target for Subgoal 3.3 is to end the HIV epidemic by 2030 through the provision of safe services and treatment, ensuring broader access to HIV care (UN 2020). Human immunodeficiency virus and NCD management require a comprehensive approach that includes assessing risk factors, early detection of high-risk status or disease, a combination of behavioural and pharmacological treatments, long-term follow-up with regular monitoring and promoting treatment adherence. This approach is best supported by a comprehensive primary health care (PHC) model. As the *Declaration of Astana* highlights, PHC is the most effective, efficient and equitable way to improve health (WHO 2018). It forms the foundation for achieving universal health coverage (UHC). Universal health coverage is a priority objective of the WHO (2021) and is a specific target within SDG 3 (Subgoal 3.8), aiming to ensure that all people have access to necessary health care services, including prevention, promotion, treatment, rehabilitation and palliation (UN 2020). These services must be of sufficient quality to be effective, while ensuring that users do not face financial hardship (Pillay & Barron 2012; WHO 2018, 2021).

Key objectives of the World Health Organization Global Action Plan for the prevention and control of noncommunicable diseases 2013–2020

The WHO (2013) developed the Global Action Plan for the prevention and control of NCDs 2013–2020 to provide a comprehensive roadmap for countries aiming to tackle the growing burden of NCDs. This plan outlines strategic objectives to reduce the incidence, morbidity and mortality of

NCDs through global cooperation, national commitment and the strengthening of health care systems. Below are the six key objectives that form the foundation of the plan (WHO 2013):

- *Objective 1*: Prioritise the prevention and control of NCDs in global, regional and national development agendas by enhancing international cooperation and sustained advocacy to achieve internationally recognised development goals.
- *Objective 2*: Strengthen national capacity, leadership, governance, multisectoral collaboration and partnerships to accelerate country responses to NCD prevention and control.
- *Objective 3*: Reduce modifiable risk factors for NCDs and address social determinants of health (SDoH) by creating environments that enable and promote healthy behaviours.
- *Objective 4*: Strengthen and reorient health care systems to address the prevention and control of NCDs and their underlying SDoH through people-centred PHC and UHC.
- *Objective 5*: Promote and support national capacity for high-quality research and development aimed at the prevention and control of NCDs.
- *Objective 6*: Monitor and evaluate progress in reducing premature mortality from NCDs and improve accountability through robust surveillance and data systems.

In addition to the WHO (2013) global NCD plan and SDG Subgoal 3.4 (UN 2020), the South African NDoH (2022) has adopted the Joint United Nations Programme on HIV/AIDS (UNAIDS) 90–90–90 HIV targets, which have now been adjusted to 95–95–95 (UNAIDS 2022). The UNAIDS targets appear in the South African NSP to prevent and control NCDs (NDoH 2022). According to this NSP, the proposed 90–60–50 cascade for diabetes and hypertension is the initial step towards enhancing the early detection and treatment of NCDs. The identified cascades for both HIV and NCDs are presented in Table 6.1.

TABLE 6.1: Human immunodeficiency virus 95–95–95 targets vs 90–60–50 for diabetes and hypertension.

UNAIDS 95–95–95 HIV targets	Proposed 90–60–50 cascade for diabetes and hypertension
1st 95%: Identification and re-engaging PLHIV who are not in care	1st 90%: All individuals over 18 years should be aware of whether they have elevated BP and/or blood glucose levels
2nd 95%: Increasing retention in care and adherence to HIV treatment as a key focus for improving long-term health outcomes for PLHIV	2nd 60%: People with elevated BP or glucose should receive appropriate intervention to manage and control these conditions
3rd 95%: Achieving long-term viral suppression to improve QoL among PLHIV	3rd 50%: People receiving interventions for diabetes and hypertension should have their conditions effectively controlled

Source: Adapted from the National Department of Health (NDoH) (2022, 2023b), tabulated by Nthuseni S Murudi-Manganye & Lufuno Makhado.
Key: BP, blood pressure; HIV, human immunodeficiency virus; PLHIV, people living with human immunodeficiency virus; QoL, quality of life; UNAIDS, Joint United Nations Programme on HIV/AIDS.

The development of the NSP on NCDs is based on lessons learnt from the HIV and acquired immunodeficiency syndrome (AIDS) 90–90–90 targets, which promote an integrated, patient-centred approach to improving self-management and treatment literacy at the local or community level (NDoH 2022). Historically, NCD prevention has been structured into three levels: Primary, secondary and tertiary prevention. Many countries have made significant progress in implementing the 95–95–95 targets for HIV, which focus on improving prevention, testing and treatment outcomes for PLHIV. For example, South Africa achieved at least 93% identification and re-engagement of PLHIV who are not in care, 76% retention in care for HIV treatment and 90% viral suppression by 2021 (NDoH 2023b).

The multisectoral approach in the prevention of HIV and noncommunicable diseases

The NDoH introduced the PHC re-engineering approach with three streams in 2011. One of the streams is the ward-based outreach teams, which focus on health promotion, preventing ill-health, providing information and education to communities and households on a range of health and related matters, early detection and intervention of health problems and illnesses and follow-up and support to persons with health problems, including treatment adherence (Pillay & Barron 2012).

Implementing a patient-centred approach and integrated services is included in the *National Health Insurance Act 20 of 2023* (Republic of South Africa [RSA] 2024). South Africa's move towards UHC through the *NHI Act* reflects a commitment to transforming the health care system into one that is equitable, people-centred and responsive to the burden of disease. Central to the NHI framework is the strengthening of PHC and the delivery of coordinated health services through accredited providers operating according to approved clinical protocols and referral pathways (RSA 2024). South Africa's pursuit of health-system transformation has long emphasised equity, PHC strengthening and improved coordination across levels of care (Schneider, Barren & Fonn 2007). More recently, these objectives have been incorporated into the legislative framework established by the *NHI Act* (RSA 2024). The *NHI Act* positions PHC as the foundation for achieving integrated care, aligned with the WHO's health care system strengthening SDGs. It recognises the need for a multisectoral response involving health, education, agriculture, social development and the private sector to address the SDoH that underpin the dual epidemic of HIV and NCDs (Ataguba & Akazili 2010; WHO 2017b).

Integrated services under the NHI aim to reduce care delivery fragmentation, enabling patients to receive screening, treatment, counselling and follow-up for multiple conditions within a single facility.

For example, a patient accessing HIV care at a clinic should simultaneously receive screening for hypertension, diabetes, TB and mental health. This model is crucial for improving health outcomes and alleviating the time and cost burden on patients, particularly those from low-income households. Despite its promise, implementing a fully integrated, patient-centred health care system under the *NHI Act* is constrained by deep economic challenges. South Africa faces persistent inequality, high unemployment and fiscal constraints that limit the capacity to fund infrastructure upgrades, hire adequate staff and procure essential medicines and diagnostic tools (Blecher et al. 2017; Rispel 2016). Under-resourced clinics, especially in rural provinces, struggle with long waiting times, staff shortages and frequent stockouts of medication, undermining the quality of care and continuity necessary for managing chronic diseases.

Moreover, the parallel burden of HIV and NCDs places enormous strain on PHC services, which were historically designed to focus on episodic rather than chronic care. Integrating HIV and NCD services under these conditions requires investment in workforce development, facility management, health information systems, medicines, diagnostic capacity and supportive governance. Progress in these areas remains uneven, particularly across under-resourced districts and rural facilities (Blecher et al. 2017; NDoH 2021; Rispel 2016). Social realities further complicate the implementation of integrated, patient-centred care. Many people living in informal settlements or rural areas face transportation barriers, low health literacy and stigma, particularly around HIV, which reduce access and adherence to care (Mojapelo & Musarurwa 2022). Gender dynamics, cultural beliefs and competing economic priorities (e.g. choosing between a clinic visit and a day's wage) also limit patients' ability to engage meaningfully in care, even when services are technically available.

Furthermore, mental health conditions, substance use and food insecurity, which frequently interact with HIV and NCD outcomes, require coordinated action extending beyond the health sector. Although national policies recognise the importance of multisectoral collaboration, effective implementation requires clearly defined responsibilities, governance structures, financing and accountability mechanisms (NDoH 2022, 2023b; RSA 2024). To achieve the goals of the *NHI Act*, reorienting the PHC is essential. Strengthening ward-based outreach teams, community health care workers (CHCWs), school health services and mobile clinics can bring services closer to communities, addressing both prevention and follow-up care (NDoH 2021). These platforms offer opportunities for health promotion, risk screening and adherence support for both HIV and NCDs.

In other words, the individual, the family, the community, the district, the province and other governmental institutions at the national level are responsible for implementing a universal, equitable, people-centred and

integrated approach. The *NHI Act* aims to fundamentally transform the health care system by promoting equitable access to quality health care services for all citizens. A central component of the *NHI Act* is its focus on patient-centred care, which is crucial in the prevention and management of both HIV and NCDs (RSA 2024). Patient-centred care focuses on providing health care services tailored to the individual patient's preferences, needs and values. It prioritises respect for the patient as a unique person and aims to involve them actively in their own care decisions, ensuring that their views and choices are integral to the treatment process.

This approach is particularly significant in managing chronic conditions such as HIV and NCDs, where continuous and personalised care is essential for effective disease prevention and management. The *NHI Act* promotes a comprehensive, patient-centred approach to health care by integrating preventive services with ongoing care. For HIV prevention, the *NHI Act* supports increased access to early testing and continuous monitoring, critical for early diagnosis, effective treatment and reducing HIV-related complications. By requiring health care providers to follow standard treatment protocols and referral pathways, the *NHI Act* ensures continuity of care and supports improved adherence to antiretroviral therapy (ART). Although not explicitly stated, patient-centred care within this framework allows for tailored health advice, including safer sex practices and regular screening, which are essential in reducing HIV transmission. These provisions are outlined in Section 39(2)(c)(ii) and Section 39(2)(c)(iv) of the *NHI Act*, which require accredited providers to deliver care in line with established clinical guidelines and structured referral systems (RSA 2024, pp. 44–46).

In the context of NCDs, the *NHI Act* promotes a similar focus on individualised care. The *NHI Act* outlines strategies for early detection and management of risk factors for diabetes, hypertension and cardiovascular diseases. Patient-centred care within the *NHI Act* includes personalised lifestyle counselling, regular health screenings and customised treatment plans that address each patient's specific needs (RSA 2024). This approach is designed to improve adherence to treatment regimens and lifestyle modifications, thereby reducing the incidence and progression of NCDs (Beichler, Grabovac & Dorner 2023). Incorporating patients' preferences, circumstances and treatment goals into care planning can strengthen the acceptability, continuity and responsiveness of chronic disease services. Person-centred integrated care is particularly important for people living with multimorbidity who require ongoing management across multiple health conditions (Beichler et al. 2023). The emphasis on patient-centred care aligns with global best practices for chronic disease management and prevention. By ensuring that health care services are more accessible and tailored to individual needs, the *NHI Act* aims to create a more responsive

and equitable health care system. This approach not only supports the prevention of HIV and NCDs but also fosters a more inclusive and effective health care environment, ultimately improving health outcomes across the population (NDoH 2023b).

Furthermore, both the NSP for HIV, TB and STIs 2023–2028 and the NSP for the Prevention and Control of NCDs 2022–2027 (NDoH 2022, 2023b) promote a multisectoral approach, emphasising the importance of coordination, management and institutional arrangements. This approach is designed to ensure a sustainable response to the prevention and treatment of chronic and life-threatening health conditions. Among others, this requires the availability of funding to revitalise the intervention through building the capacity of human resources (through training) at the PHC level to procure diagnostic equipment and treat HIV and NCDs.

Evidence of integration in terms of communicable diseases and NCDs is of interest. In many recent publications (Brennan et al. 2023; Kivuyo et al. 2023; McCombe et al. 2022; Murudi-Manganye, Makhado & Sehularo 2020), there is confirmation (not exhaustive) of the integration of health care for coronavirus disease 2019 (COVID-19), HIV, diabetes, hypertension and mental health. In addition, the goals in the NSPs support this integration. Table 6.2 outlines the goals to be achieved in the two NSPs mentioned, which align with the WHO (2017b) objectives.

As illustrated in Figure 6.1, there is a link between SDG Subgoal 3.4 (UN 2020), the WHO (2013) Global Action Plan for NCDs, the NSP for HIV, TB and STIs 2023–2028 and the NSP for the Prevention and Control of NCDs 2022–2027 (NDoH 2022, 2023b). The words 'integrate' or 'integration' appear in all the goals, objectives and sub-objectives.

TABLE 6.2: National Strategic Plan for human immunodeficiency virus, tuberculosis and sexually transmitted infections 2023–2028 and National Strategic Plan for the Prevention and Control of noncommunicable diseases 2022–2027 goals.

National Strategic Plan goals: Communicable diseases (HIV, TB and STIs)	National Strategic Plan goals: Prevention and control of NCDs
Break barriers to achieving outcomes for HIV, TB and STIs	Prioritise prevention and control of NCDs
Maximise equitable and equal access to services and solutions for HIV, TB and STIs	Promote and enable health and wellness across the life course
Build resilient systems for HIV, TB and STIs that are integrated into health institutions, social protection and pandemic response.	Ensure PLWNCDs receive integrated, people-centred health care services to prevent and control NCDs
Fully resource and sustain an efficient NSP led by revitalised, inclusive and accountable institutions	Promote and support national capacity for high-quality research and development to prevent and control NCDs
-	Monitor strategic trends and determinants of NCDs to evaluate progress in prevention and control

Source: Adapted from National Department of Health (2022, 2023b) data by Nthuseni S Murudi-Manganye and Lufuno Makhado.
Key: HIV, human immunodeficiency virus; NCDs, noncommunicable diseases; PLWNCDs, people living with noncommunicable diseases; STIs, sexually transmitted infections; TB, tuberculosis.

Source: Created by Nthuseni Sharon Murudi-Manganye and Lufuno Makhado. Adapted from the National Strategic Plan for the Prevention and Control of NCDs 2022–2027 (National Department of Health [NDoH] 2022); National Strategic Plan for HIV, TB and STIs 2023–2028 (NDoH 2023b); 2030 Agenda for Sustainable Development (United Nations [UN] 2015); WHO (2013) Global Action Plan for NCDs; and WHO (2023b) Implementation Roadmap 2023–2030 for the Global Action Plan for NCDs.
Key: HIV, human immunodeficiency virus; NCDs, noncommunicable diseases; NSP, National Strategic Plan; SDG, Sustainable Development Goal; STIs, sexually transmitted infections; TB, tuberculosis; WHO, World Health Organization.

FIGURE 6.1: The link between the United Nations' Sustainable Development Goal 3 (with a focus on Subgoal 3.4), World Health Organization Global Action Plan for noncommunicable diseases, South African National Department of Health National Strategic Plan for human immunodeficiency virus, tuberculosis and sexually transmitted infections and the National Strategic Plan for noncommunicable diseases.

Research highlights the growing challenge of managing both communicable diseases like HIV and NCDs. This dual burden impacts health outcomes and amplifies the need for enhanced health care services, policies and integrated management approaches to support prevention and self-management (WHO 2021). Additionally, by building on existing policies, guidelines and plans, the integrated management of HIV and NCDs can be enhanced, as many countries face overlapping challenges from these dual burdens (Murudi-Manganye et al. 2020; Oni et al. 2015).

Strategies for prevention and control of HIV and noncommunicable diseases

In many sub-Saharan countries, the United States President's Emergency Plan for AIDS Relief (PEPFAR) has been a leader in funding programmes aimed at reducing HIV-related mortality. Non-governmental organisations (NGOs) are supporting health departments in planning effective responses by providing human resources and reviewing policies and guidelines to address the needs of all key priority populations impacted by HIV, both directly and indirectly. In September 2022, PEPFAR (2022) released a strategic directive to reimagine how to end the HIV pandemic by 2030 in countries, which was aimed to be supported by the United States of America (USA). However, the strategy is similar to all other policies and strategic plans mentioned previously. The most important message about re-imagining the strategic direction for PEPFAR is the Strategic pillars and enablers for improving HIV treatment outcomes (PEPFAR 2022). This strategic direction aligns with the NSPs. The key pillars of PEPFAR (2022) include:

- Health equity for priority populations
- Sustaining the response
- Strengthening public health care systems and security
- Fostering transformative partnerships
- Following scientific evidence.

Despite the strategic alignment of PEPFAR with national HIV response frameworks and its emphasis on health equity, system strengthening and evidence-based programming, recent disruptions in PEPFAR funding highlight the fragility of progress in HIV prevention and control. Since its inception, PEPFAR has invested substantially in sub-Saharan Africa (SSA), including over US$8 billion in South Africa and more than US$120 billion globally, supporting over 20 million people on HIV treatment in 55 countries, including approximately half a million children (Grimsrud et al. 2025). Its programmes have expanded access to HIV prevention and care through large-scale testing, prevention of mother-to-child transmission (PMTCT), pre-exposure prophylaxis (PrEP) and support for orphans and vulnerable children, while also directly strengthening health care systems through the support of hundreds of thousands of health care workers.

In many SSA countries, these investments have underpinned access to ART, HIV testing and diagnosis, comprehensive prevention services for adolescent girls and young women (AGYW) and broader community-based support delivered through partnerships between governments and NGOs. Funding interruptions have contributed to delays in service delivery, increased pressure on human resources for health (HRH) and an increased risk of treatment disruption. The WHO has warned that prolonged gaps in HIV financing could increase AIDS-related morbidity and mortality,

potentially reversing gains made over previous decades (Maxmen 2025). These developments underscore the importance of sustained and predictable financing, as well as resilient and integrated health care systems capable of maintaining essential HIV and NCD services during periods of uncertainty, to safeguard long-term prevention and control efforts in the region. Grimsrud et al. (2025) further note:

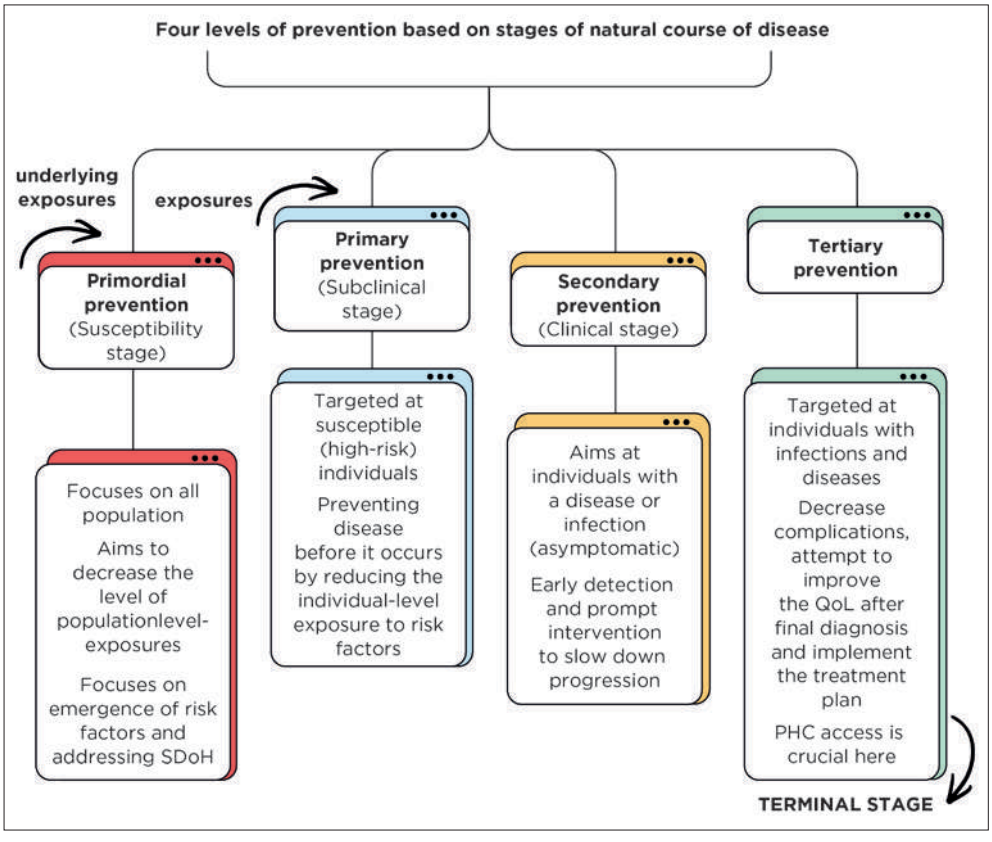
> Over PEPFAR's 22-year history, the global HIV epidemic has evolved, and significant progress has been made. HIV treatment is now very effective and provided in a single, once-a-day pill. Life expectancy for people living with HIV who are on treatment is comparable with those without HIV. People living with HIV who are on treatment and have an undetectable viral load have zero risk of transmission to sexual partners, and minimal risk of transmission from mother to child. In addition, there have been huge strides made with primary HIV prevention. In the absence of an effective HIV vaccine, antiretroviral PrEP – where a single pill is taken regularly prior to HIV exposure – can effectively prevent HIV acquisition. Besides oral PrEP, we now have the capability to offer less-frequently dosed and longer-acting PrEP modalities, which add even more capability in reducing transmission. (p. 5)

This highlights the importance of community-based health care responses, including the role of home-based and PHC workers. Communities can collaborate with smaller, targeted programmes that support training, sustainability, health care availability, infrastructure and resource provision, as well as the placement of specialised services in resource-restrained clinics.

Identification of risk factors for HIV and noncommunicable diseases

As the dual burden of HIV and NCDs is growing in many countries, there is a need for the provision of a wide range of implementation activities. Disease prevention and control principles rely on four prevention levels: Primordial, primary, secondary and tertiary prevention (Kisling & Das 2018). Additionally, the implementation of disease control strategies can extend beyond prevention to include elimination and eradication. Figure 6.2 depicts the levels of disease prevention according to Kisling and Das (2018).

Risk factor identification and management of HIV and NCDs through integrated health care systems are key to the prevention of HIV and NCDs. This involves the systematic screening of individuals for both HIV and common NCD risk factors, such as hypertension, diabetes and obesity. PEPFAR (2022) emphasises the importance of early detection through routine health checks and targeted screening tools, which are essential for identifying individuals at high risk of these conditions. By incorporating NCD risk assessments into HIV care settings, the comorbidities that often exacerbate the health challenges faced by individuals living with HIV are addressed (PEPFAR 2022; UN 2020; WHO 2023a).



Source: Nthuseni S Murudi-Manganye and Lufuno Makhado, adapted from Kisling and Das's (2018) four levels of prevention based on stages of the natural course of disease.
Key: QoL, quality of life; SDoH, social determinants of health.

FIGURE 6.2: Four levels of prevention based on the stages of the natural course of disease.

Primordial level of prevention

Primordial prevention addresses the social, economic and environmental conditions that contribute to the emergence of disease risk factors. Unlike primary prevention, which reduces established risk factors among populations or individuals, primordial prevention seeks to prevent these risk factors from becoming socially or environmentally embedded. In the context of HIV and NCDs, this includes addressing poverty, gender inequality, limited access to education, unhealthy food environments, tobacco and alcohol marketing, unsafe living conditions and other structural determinants that shape exposure and vulnerability (Kisling & Das 2025; NDoH 2022; WHO 2023b). Primordial prevention therefore involves creating and sustaining environments that reduce the likelihood of exposure to the conditions that foster these diseases (Kisling & Das 2018).

For HIV, primordial prevention includes broad public health initiatives that aim to create safe and supportive environments that discourage

behaviours leading to HIV transmission. This can involve promoting social and structural changes that reduce the stigma associated with HIV, thereby encouraging more people to seek testing and treatment. It also includes advocating for policies that ensure access to education from an early age about safe sexual practices, improving the availability of preventive measures such as condoms and ensuring that communities have access to resources that support healthy behaviours (Cabecinha & Saunders 2022).

In the context of HIV prevention, protecting the girl child from older men and addressing the crisis of teenage pregnancy are critical public health priorities, especially because of their strong link to increased HIV risk among AGYW. In South Africa, AGYW account for a disproportionate number of new HIV infections, largely driven by structural and social determinants, such as poverty, gender inequality, limited access to education and age-disparate sexual relationships (Dellar, Dlamini & Karim 2015; UNAIDS 2022). Primordial prevention focuses on addressing these upstream determinants before behavioural risk factors emerge. This includes implementing child protection laws, offering social protection interventions, such as cash transfers and school retention initiatives, and ensuring the availability of comprehensive sexuality education (CSE) that equips girls with the knowledge and life skills they need (Hallfors et al. 2011; UNESCO 2018). Community-driven programmes that engage men, traditional leaders and families in challenging gender norms and promoting the empowerment of AGYW are also essential. Moreover, establishing youth-friendly health services and safe spaces enhances AGYW's access to care and information in non-judgemental environments (Chandra-Mouli, Lane & Wong 2015). Despite these efforts, the persistently high rates of adolescent pregnancy and HIV among AGYW suggest ongoing challenges in policy implementation, service accessibility and societal norms.

In the case of NCDs, primordial prevention focuses on creating environments that minimise the risk of developing lifestyle-related risk factors, such as poor diets, physical inactivity and the use of tobacco or alcohol (NDoH 2022). This approach aims to address the broader social and environmental factors that contribute to these harmful behaviours, thereby preventing the onset of NCDs before risk factors even arise. This can include urban planning that promotes physical activity by ensuring access to parks and recreational facilities, food policies that encourage healthy eating and public campaigns to reduce tobacco and alcohol consumption (WHO 2017b). For example, implementing policies that limit the advertising of unhealthy foods to children and creating incentives to produce and consume healthy foods are critical strategies for reducing the population's exposure to risk factors for NCDs (Brown, Smith & Green 2019). This level of prevention targets individuals and entire populations, emphasising health promotion and addressing the SDoH. It aims to ensure that people living with HIV and

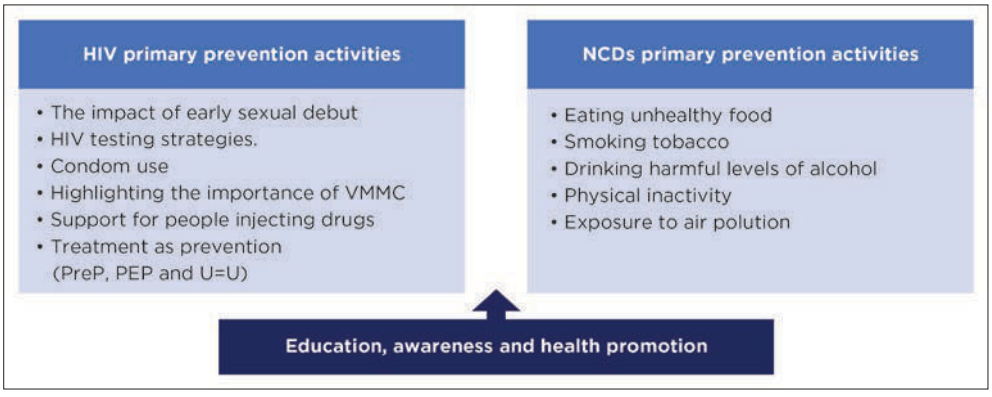
NCDs, along with their families, are empowered to access and utilise information and services effectively, supporting the promotion and maintenance of good health and overall wellbeing.

To ensure the maximum impact of primordial prevention, countries must establish laws, policies, regulations and guidelines that promote good health and social wellbeing. For instance, the regulations on tobacco and alcohol use in South Africa are responding to the primordial prevention of NCDs, while the Life Orientation subject, which covers HIV education in primary and secondary schools and availability of treatment literacy on ways to prevent HIV, is responding to the primordial prevention of HIV. In collaboration with the Ministry of Health, policymakers should support the development and dissemination of appropriate key information, education and communication (IEC) messages and materials for all population groups (NDoH 2023b; WHO 2023a).

Primary level of prevention

Primary prevention focuses on preventing the onset of disease by reducing or eliminating existing risk factors in individuals or populations before illness develops. Primary prevention occurs before the onset of a disease and aims to protect the general population by reducing exposure to risk factors, thereby preventing the disease from occurring. For example, Health for All campaigns aim to decrease susceptibility following exposure to HIV and NCDs and to increase health-seeking behaviours (Kisling & Das 2018; Van Seventer & Hochberg 2017). According to Cabecinha and Saunders (2022), primary prevention methods are essential in the fight against HIV, focusing on reducing the risk of transmission and acquisition. These strategies include promoting safer sex practices, such as the consistent use of condoms and addressing societal norms and values, which are effective in reducing direct exposure to the virus.

Comprehensive education on sexual and reproductive health (SRH) plays a critical role in informing individuals about the risks of HIV and empowering them to make safer choices. Moreover, biomedical interventions like PrEP and voluntary medical male circumcision (VMMC) offer additional protective measures against HIV transmission, having a vital function in enhancing prevention strategies. In South Africa, the leading risk factors contributing to mortality and morbidity are tobacco use, alcohol consumption, unhealthy diets, physical inactivity and air pollution (NDoH 2022). Education, awareness and health promotion are key drivers of reducing morbidity and mortality by addressing the critical social, behavioural and structural determinants of health. In addition, health promotion messages should be standardised across the board. Figure 6.3 lists examples of primary prevention targets for HIV and NCDs.



Source: Nthuseni S Murudi-Manganye and Lufuno Makhado.
Key: HIV, human immunodeficiency virus; NCDs, noncommunicable diseases; PEP, post-exposure prophylaxis; PrEP, pre-exposure prophylaxis; U=U, undetectable = untransmittable; VMMC, voluntary medical male circumcision.

FIGURE 6.3: Primary prevention strategies for human immunodeficiency virus and noncommunicable diseases.

Long-acting injectable pre-exposure prophylaxis for HIV prevention

Long-acting PrEP is one of the most important recent developments in biomedical HIV prevention. It provides an alternative for people who may have difficulty initiating, adhering to or persisting with daily oral PrEP because of pill burden, stigma, privacy concerns or other personal and structural barriers. Long-acting formulations therefore expand prevention choice and may improve effective PrEP coverage among populations with substantial HIV-acquisition risk. Long-acting formulations therefore expand prevention choice and may improve effective PrEP coverage among populations with substantial HIV-acquisition risk. They should nevertheless be implemented as part of combination prevention rather than as replacements for condoms, oral PrEP, HIV testing, SRH services or structural interventions (WHO 2022b).

Adolescent girls and young women continue to account for a disproportionate share of new HIV infections in SSA. In the HPTN 084 trial involving women in SSA, injectable cabotegravir was superior to daily oral tenofovir disoproxil fumarate–emtricitabine in preventing HIV acquisition (Delany-Moretlwe et al. 2022; UNAIDS 2022; WHO 2022b). In South Africa, long-acting cabotegravir (CAB-LA) and lenacapavir are relevant to national HIV-prevention priorities because they expand prevention choice for populations experiencing substantial HIV risk. Their phased implementation should nevertheless be guided by local epidemiology, community engagement, affordability, equitable access, health-system readiness and national clinical guidance (NDoH 2025; Pike, Rousseau & Bekker 2023; WHO 2025).

In appropriately equipped South African services, NIMART-trained professional nurses may contribute to CAB-LA delivery after receiving

product-specific training in eligibility assessment, HIV testing, injection procedures, adverse-event management and follow-up. Implementation must remain aligned with national scope-of-practice requirements and clinical guidance (Pike et al. 2025). Positioned within integrated service platforms, long-acting injectable PrEP strengthens both individual-level prevention and broader public health responses to HIV.

Secondary level of prevention

Secondary prevention focuses on stopping the progression of infections or chronic diseases at their early, often symptomless stages. The goal is to prevent further progression or reduce the severity of the condition, thereby improving individual outcomes and reducing the transmission of infectious agents and the progression of chronic illnesses. Examples of secondary prevention are the early diagnosis of HIV and NCDs, provision of active treatment and screening of people at risk of HIV and NCDs (NDoH 2022, 2023b). Secondary prevention concerns early disease detection, targeting individuals who appear healthy but have underlying pathological changes detectable during clinical visits (WHO 2022a). The NSP for the prevention of NCDs supports screening high-risk groups to improve early detection, diagnosis and access to NCD treatment (NDoH 2022). In the context of HIV, secondary prevention focuses on identifying individuals living with HIV to provide timely treatment, prevent complications and reduce transmission risk. This includes access to HIV testing through outreach programmes, contact tracing and management, and ensuring linkage to treatment services (NDoH 2023b; WHO 2022a).

Secondary prevention plays a crucial role in the early detection and management of HIV and NCDs, aiming to reduce disease progression and improve health outcomes through early intervention. In the context of HIV, secondary prevention strategies focus on regular screening and timely initiation of ART for individuals who are HIV-positive but asymptomatic. Early diagnosis through routine testing enables prompt treatment, which is essential for reducing VL, preventing disease progression and minimising the risk of transmission to others (WHO 2021). ART has been shown to effectively suppress HIV replication, thereby enhancing immune function and reducing the incidence of opportunistic infections (OIs) (Swinkels, Nguyen & Gulick 2025).

Similarly, secondary prevention of NCDs involves the early detection and management of asymptomatic disease and elevated risk. Routine BP measurement, blood glucose or HbA1c testing and cardiovascular risk assessment can identify individuals requiring lifestyle interventions, clinical monitoring or pharmacological treatment before complications develop (NDoH 2022; WHO 2023b). Early interventions, including dietary

modification, physical activity, tobacco cessation, reduction of harmful alcohol use and appropriate medication, are central to controlling NCD risk factors and preventing or delaying complications (NDoH 2022; WHO 2023b).

Both HIV and NCDs benefit from integrated secondary prevention approaches that combine routine screening, patient education and follow-up care. For HIV, this involves not only medical treatment but also behavioural interventions to reduce risky practices and support adherence to ART (Kisling & Das 2018). In the case of NCDs, patient education on the importance of regular check-ups and adherence to prescribed treatments is essential for effectively managing chronic conditions and preventing further deterioration in health (Beichler et al. 2023). Secondary prevention thus represents a proactive approach to health care that focuses on early detection and management, which is crucial for improving long-term health outcomes and reducing the overall burden of HIV and NCDs.

Tertiary level of prevention

Tertiary prevention is a critical aspect of the health care continuum, focusing on mitigating the impact of established diseases within individuals. This stage of prevention is primarily aimed at minimising the severity of disease, preventing complications and improving patients' overall quality of life (QoL). Unlike secondary prevention, which targets early detection to prevent disease onset, tertiary prevention is implemented after the disease has manifested. It seeks to manage and rehabilitate individuals to maximise their functional capacity and reduce adverse outcomes (WHO 2022a).

Tertiary prevention encompasses various strategies aimed at managing the clinical progression and long-term outcomes of a disease. These strategies are typically employed in symptomatic patients who have already been diagnosed with a disease, such as chronic conditions or progressive illnesses. The primary goals are to reduce disease severity, prevent further deterioration and enhance the patient's QoL (Kisling & Das 2018). This form of prevention is crucial in managing complex health conditions, including NCDs and HIV, where the focus shifts from curing the disease to managing its consequences and improving daily functioning.

One of the key components of tertiary prevention is rehabilitation, which aims to restore the highest possible level of functionality and independence to patients. Rehabilitation efforts may include physical therapy, occupational therapy and psychological support, all tailored to the individual's specific needs and condition. For example, patients with severe chronic diseases may benefit from rehabilitation programmes that help them regain mobility, manage pain and adapt to new limitations (Van Seventer & Hochberg 2017). This strategy not only reduces the disease's impact but also significantly improves overall QoL.

In addition to rehabilitation, tertiary prevention includes palliative care, which focuses on alleviating the symptoms and stress associated with serious illness. Palliative care focuses on enhancing the comfort and QoL of individuals with advanced disease, providing support that addresses their physical, emotional and spiritual needs. This care is particularly important for patients with progressive diseases where curative treatments are no longer viable (WHO 2022a). Palliative care teams collaborate closely with patients and their families to honour the patient's wishes and ensure that their QoL is preserved throughout the progression of their illness (WHO 2020; Kuosmanen et al. 2021).

Another critical aspect of tertiary prevention is the prevention of over-medicalisation, which can arise when patients with chronic diseases receive excessive or inappropriate medical interventions. Identifying patients at risk of over-medicalisation involves careful assessment and management to ensure that interventions are both necessary and beneficial. This approach helps to avoid potential harm from unnecessary treatments and ensures that resources are used effectively to support patient wellbeing (Kisling & Das 2025). For instance, patients who are on chronic treatment may decide to buy over-the-counter (OTC) medication without consulting their health care providers. Comprehensive or integrated care models for HIV and NCDs are essential in this regard, as they emphasise the importance of individualised treatment plans and patient-centred approaches (Beichler et al. 2023).

Tertiary prevention plays a vital and ethically grounded role in the long-term management of diseases such as HIV and NCDs by offering holistic, person-centred care. This level of prevention focuses on reducing the burden of chronic illness through interventions that prioritise not only clinical treatment but also rehabilitation, palliative support and psychosocial wellbeing (Brown et al. 2019; WHO 2022a). For example, in HIV care, tertiary prevention involves sustained ART, management of comorbidities and interventions to enhance QoL. For NCDs, this includes helping patients make meaningful lifestyle changes and supporting them through disability or the management of complications.

The principle of 'avoiding unnecessary medical interventions' is not a withdrawal of care but a commitment to ethical, evidence-based decision-making that prioritises patient safety, dignity and autonomy. Such decisions are made within established clinical governance structures, involve multidisciplinary teams and adhere to national and international ethical standards. Importantly, tertiary prevention does not shift focus away from the control or eradication of diseases like HIV but rather acknowledges that many individuals live with long-term conditions requiring ongoing, coordinated care. Ensuring this care is ethical, appropriate and subject to continual evaluation is a fundamental part of the health care professional's responsibility.

Conclusion

The importance of implementing effective prevention strategies for HIV and NCDs cannot be overstated. As we face growing health challenges globally, it is imperative that health ministries prioritise funding research initiatives to refine and enhance these strategies. A multisectoral approach that incorporates input from communities, health care professionals and policymakers fosters a comprehensive understanding of individual and collective health needs. Fostering awareness and promoting health at both individual and community levels can effectively engage the population in prevention efforts. Collaborative work among diverse stakeholders is essential to developing and implementing targeted interventions that address the specific factors driving high mortality rates.

Moreover, an emphasis on health promotion not only empowers communities to take charge of their wellbeing but also establishes a solid foundation for long-term health improvements. As we unite in our efforts to combat these pressing health issues, we build resilience within our communities and pave the way for a healthier future. By investing in prevention strategies today, we can significantly reduce the burden of HIV and NCDs, ultimately leading to a decrease in health disparities and an enhancement in the QoL for all individuals. Together, with commitment and cooperation, we can turn the tide against these preventable diseases and lay the groundwork for a healthier, more sustainable tomorrow.

Declarations

Ethical considerations

The chapter relies on programme monitoring frameworks and published literature. No human or animal participants were involved; therefore, it did not require ethical approval.

Consent

Not applicable.

Authors' contributions

Conceptualisation, NS Murudi-Manganye and L Makhado; *data curation*, NS Murudi-Manganye; *formal analysis*, NS Murudi-Manganye; *investigation*, NS Murudi-Manganye and L Makhado; *methodology*, NS Murudi-Manganye and L Makhado; *project administration*, L Makhado; *resources*, NS

Murudi-Manganye and L Makhado; *validation*, L Makhado; *visualisation*, NS Murudi-Manganye and L Makhado; *writing – original draft*, NS Murudi-Manganye and L Makhado; *writing – review and editing*, NS Murudi-Manganye and L Makhado.

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Chapter 7

Strengthening health care systems for integrated care of HIV and noncommunicable diseases in southern Africa: An in-depth analysis

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Abstract

In southern Africa, the dual burden of human immunodeficiency virus (HIV) and noncommunicable diseases (NCDs) presents a significant challenge to public health outcomes. This chapter provides a comprehensive analysis of the region's current health care system landscape, emphasising the need for integrated management to address infectious and chronic diseases effectively. It examines a range of

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care integration models, including task shifting, integrated clinics, community-based models, vertical integration and coordination between HIV and NCD programmes. These models offer valuable insights into strengthening health care integration, which is essential for improving health outcomes and reinforcing health care systems in the region. The chapter also discusses key challenges and lessons learnt in coordinating HIV and NCD care, emphasising the importance of evidence-based management approaches. The role of policy in advancing health care integration is demonstrated, with recommendations to adopt a phased approach to service integration, leverage existing infrastructure and prioritise cost-effectiveness and feasibility assessments. Overall, the chapter lays the foundation for a more effective response to the dual epidemic and contributes to improved regional public health outcomes.

Introduction

Achieving universal health coverage (UHC) and improved health outcomes in southern Africa remains a pressing challenge, particularly in the face of dual burdens such as the human immunodeficiency virus (HIV) and noncommunicable diseases (NCDs). One promising response is the integrated management of health services (IMHS), an approach that aligns different levels of health care, sectors and actors to provide continuous, coordinated care throughout the life course (Murudi-Manganye & Makhado 2020). Integrated management of health services spans health promotion, disease prevention, diagnosis, treatment, chronic care, rehabilitation and palliative support, aiming to improve outcomes while maximising the efficiency of overstretched systems.

However, this vision is emerging amid significant uncertainty. In early 2025, the termination of United States Agency for International Development (USAID)-funded health projects and the disruption of other United States President's Emergency Plan for AIDS Relief (PEPFAR)-supported activities significantly altered the HIV financing and service delivery environment in South Africa. The Joint United Nations Programme on HIV/AIDS (UNAIDS) reported that approximately 40 USAID-funded health projects received termination notices on 26 February 2025, affecting thousands of personnel involved in HIV testing, treatment support, data management and community services. These disruptions reinforce the need for urgent transition planning, increased domestic financing and diversified partnerships, while protecting the continuity of essential HIV services (Grimsrud et al. 2025; UNAIDS 2025).

Although prior efforts have attempted integration in various forms, evidence reveals persistent systemic weaknesses: fragmentation of services, siloed funding, medication stockouts and workforce shortages (Gausi et al. 2021; McCombe et al. 2021). For example, a 2022 cross-country review in the region found that fewer than 35% of rural health facilities could deliver HIV and hypertension care under one roof (Chireshe, Manyangadze & Naidoo 2024). These gaps underscore the need to transition from aspiration to actionable reform.

This chapter presents a realistic, evidence-informed roadmap for advancing HIV–NCD integration in southern Africa. It draws on recent implementation research, case studies and policy analyses to identify scalable strategies, implementation bottlenecks and feasible financing models. The aim is not only to advocate for integration but also to articulate how it can be implemented effectively, ethically and sustainably in a rapidly evolving funding and epidemiological environment.

To address the dual burden of HIV and NCDs and to strengthen health care systems, it is essential to build on the foundational infrastructure originally established through HIV-focused programmes led by national Ministries of Health. These systems were significantly supported by global health initiatives such as PEPFAR and the Global Fund to Fight AIDS, Tuberculosis and Malaria. However, following the discontinuation of USA bilateral funding mechanisms, such as PEPFAR and USAID, in February 2025, there is an urgent need to recalibrate health care system strengthening strategies. This shift highlights the importance of transitioning to locally driven models, increasing domestic investment and diversifying partnerships to sustain progress in HIV and NCD integration. Regional collaboration, South–South cooperation and continued multilateral support will be vital to maintaining service delivery, protecting vulnerable populations and ensuring that the gains made over the past two decades are not reversed. This approach would leverage the experiences and resources from HIV programmes to create an integrated chronic health care (ICHC) model that can sustainably provide care for infectious diseases like HIV and for NCDs (Chireshe et al. 2024).

The integrated management of HIV and NCDs requires a comprehensive approach encompassing health promotion, disease prevention, diagnosis, treatment, disease management and ongoing health care support (Murudi-Manganye & Makhado 2020). Furthermore, this analysis emphasises the need to carefully consider how the success of health care systems strengthening can be assessed, highlighting that the integrated management of HIV and NCDs necessitates a holistic approach encompassing various aspects of health care delivery and support.

Strengthening health care systems in southern Africa: An integrated approach for managing HIV and noncommunicable diseases

The health care systems in southern Africa face a unique challenge because of the coexistence of HIV and NCDs, requiring a comprehensive and integrated approach for effective management. To address the dual burden of infectious and chronic diseases, health care systems must be strengthened to provide comprehensive care, including medical treatment, economic support and counselling, while acknowledging the social and structural determinants of health (Aantjes, Quinlan & Bunders 2014; Angwenyi et al. 2020; Brault et al. 2021; Kintu et al. 2020; Lazarus et al. 2021; Murudi-Manganye & Makhado 2020).

Many health care systems in the region lack essential elements such as financing, integrated services, governance structures, leadership capacity and a stable workforce, which are crucial for effective health care provision (Janse van Rensburg & Fourie 2016). Integrating mental health services into existing health care systems is critical under these circumstances, as it can strengthen overall health care provision (Kintu et al. 2020).

The rise of NCDs alongside mental disorders has increased the burden on southern African populations because of factors such as population growth and ageing (Kintu et al. 2020). Addressing comorbidities like depression with other illnesses is necessary to improve outcomes for affected individuals (Brault et al. 2021). Establishing an integrated framework that combines mental health care services with NCD care within existing health care systems is crucial; prevention measures should also be emphasised.

Developing sustainable domestic funding sources while reducing reliance on external aid will ensure the provision of continuous, high-quality care for those with complex needs. Strengthening governance structures within health care settings in the region can enhance coordination, resource allocation and accountability. Urgent investments in training programmes and retention strategies are required because of high turnover among the health care workforce. Highlighting the connections between poverty, cultural beliefs and gender disparities in access demonstrates the importance of addressing intersectional tensions within familial, geographical and governmental contexts.

Overall, strengthening health care systems in southern Africa is essential for addressing the complex interplay between infectious diseases and NCDs, including mental health conditions (Tapela et al. 2019). Mitigating the impact of economic and cultural diversity within the local context will involve collaborating with traditional healers and incorporating culturally

relevant approaches to mental health care services. Additionally, community engagement and education are vital components for reducing the stigma surrounding mental health and promoting help-seeking behaviours. Public health interventions should aim to increase access and promote effective utilisation of services for both HIV and mental health, through the integration of care delivery platforms.

Notably, South Africa's significant pool of unemployed or underutilised medical doctors presents an opportunity to address persistent workforce shortages in primary health care (PHC), mental health and integrated service delivery. If mobilised through innovative task-shifting frameworks, contract-based employment or community-based outreach models, this underused human resource could play a transformative role in closing gaps in service availability, particularly in rural and underserved areas. Harnessing this workforce requires strategic planning, sustainable financing and coordination among government, academia and civil society. Ultimately, integrating these efforts with stigma-reduction strategies at the individual, family and community levels is crucial for ensuring equitable and effective service uptake.

By leveraging transformative approaches, we can develop groups that address the multidimensional health care needs of the entire population (Ibeneme et al. 2020; Sambo & Kirigia 2014). This can help evolve health care systems to serve all people, mitigating immediate concerns and facilitating long-term resilience (Ayanore et al. 2019; Brault et al. 2021; Ibeneme et al. 2020). Implementing proactive strategies at various levels will enhance the overall capacity of the system, addressing social, economic and educational dimensions to foster a more cohesive and inclusive society (Brault et al. 2021; Kintu et al. 2020; Nigatu 2012).

Strengthening health care systems in southern Africa is crucial for addressing barriers to treatment, reducing stigma and increasing access to services for HIV. This lays the foundation for a more effective response to the epidemic and paves the way for improved regional public health outcomes.

Integrated management of HIV and noncommunicable diseases: A holistic approach for southern Africa

Utilising an integrated management approach for HIV and NCDs in southern Africa is imperative to address the growing burden of these health issues effectively (Ayanore et al. 2019). Public health interventions should focus on increasing access to and utilisation of services for both HIV and NCDs while also addressing stigma at individual, family and community levels (Brault et al. 2021).

An integrated service delivery model, inspired by the South African experience, can effectively respond to the co-occurrence of infectious diseases like HIV and NCDs in the region. This approach would not merely 'piggyback' on HIV infrastructure but rather build on its tested strengths, such as decentralised chronic care systems, differentiated service delivery (DSD) and established community engagement mechanisms. For example, HIV clinics already managing large cohorts of patients can be expanded to include routine screening and treatment for hypertension, diabetes and depression using standardised protocols.

However, the implementation of integration must now account for the discontinuation of the USA financial support through programmes such as PEPFAR and USAID, effective as of February 2025. This funding shift indicates the need for a pragmatic, state-led financing model, grounded in domestic resource mobilisation, budget reallocation and blended financing strategies involving both the public and private sectors. Ministries of Health must actively embed HIV–NCD integration into national health care strategic plans, establish costed operational frameworks and explore regional support mechanisms such as the African Medicines Agency and Southern African Development Community (SADC) coordination platforms.

Buy-in from pre-existing HIV support teams is both necessary and achievable. Early evaluations suggest that nurses, clinicians and community health care workers (CHCWs) generally support integration, especially when it enhances continuity of care and streamlines service delivery (Ignoffo et al. 2024; Lalani & Marshall 2022; Sultan et al. 2025; Zeydani et al. 2023). However, successful implementation will require structured retraining, expanded scopes of practice, workforce incentives and protection against role overload (Brault et al. 2021). These changes must be underpinned by health care system strengthening efforts, including improved supply chains, electronic record harmonisation and supervisory support.

Although integration has long been discussed, this discussion presents an actionable roadmap rather than an aspirational vision. Key near-term steps include:

- Mapping service readiness at the facility level
- Piloting integration in high-burden districts with HIV and NCD overlap
- Developing financing models that incentivise multi-disease care
- Creating national indicators to monitor integrated service quality and equity.

The integration of HIV and NCD services is urgently needed, given the dual burden of disease and the persistent fragmentation of service delivery across the region (Ayanore et al. 2019; Nigatu 2012). While contextual factors may influence the rollout pace, a growing body of evidence confirms

that integrated models can be cost-effective and yield substantial clinical benefits (Brault et al. 2021).

Finally, integrating HIV and NCD services offers opportunities to optimise the investments made through programmes such as the Global Fund to Fight AIDS, Tuberculosis and Malaria and the now-concluded PEPFAR initiative, leveraging existing physical infrastructure, health care worker (HCW) capacity and patient trust. With coordinated leadership, well-defined planning and sustainable financing, integration can shift from a policy ambition to a workable, measurable and ethical care model that meets the real health needs of southern African populations.

Challenges in coordinating HIV and noncommunicable disease care: Navigating the complexities

One of the primary challenges in coordinating HIV and NCD care is ensuring that the expansion of NCD prevention and treatment services does not compromise the achievements made in HIV treatment. The HIV chronic disease management programme has been well-funded, organised and informed, providing valuable insights for expanding NCD services. However, finding the balance between expanding NCD services and retaining focus on HIV treatment is essential (Nigatu 2012).

Integrated management of HIV and NCDs in southern Africa requires careful consideration of how to expand both services within a resource-constrained environment. Policymakers in southern Africa urgently need evidence to guide cost-effective, acceptable changes to these integrated health care services (Brault et al. 2021). Moreover, the integration of HIV and NCD care poses challenges related to resource constraints, which can impact the availability and quality of care.

There is a pressing need for further research into the feasibility and cost-effectiveness of different integration models in low- and middle-income countries (LMICs), including in southern Africa. To guide this process, a structured research agenda is essential. First, comparative implementation studies should assess various integration strategies, such as one-stop-shop models, service co-location and referral-based coordination, and their impact on service quality, continuity of care and patient satisfaction. Second, health economic analyses must explore the long-term costs, funding mechanisms and potential cost savings of integrated service delivery compared to vertical models, especially in settings transitioning away from donor dependency.

Third, feasibility and acceptability studies are needed to evaluate workforce readiness, infrastructure constraints and community perceptions

of integrated HIV–NCD care. Fourth, research should examine how financing mechanisms, such as performance-based budgeting, National Health Insurance (NHI) or pooled procurement, can sustainably support integrated services. Finally, policy impact evaluations are crucial to determine whether existing integration efforts improve equity, clinical outcomes and health care system efficiency.

This structured approach to evidence generation will not only inform national strategic planning but also ensure that integration models are context-appropriate, ethically grounded and financially viable in the long term. Furthermore, research will help inform evidence-based decision-making and guide the adoption of integrated approaches to managing HIV and NCDs in ways that are financially sustainable, context-appropriate and responsive to population needs. Addressing the operational, financial and human resource challenges identified through such studies is essential for achieving meaningful integration in southern Africa. Nevertheless, the potential benefits are considerable: improved health outcomes, optimised use of existing health care system infrastructure and a more sustainable, patient-centred model of care. By strategically integrating NCD services into platforms originally developed for HIV – many of which are already trusted, decentralised and highly utilised – countries can extend service reach, reduce duplication and ensure more efficient use of limited resources. If guided by sound implementation research and committed leadership, this integrated approach offers a viable path to strengthening health care systems and expanding access to quality care for all.

Strategies for integrating health care services: Enhancing coordination and access

Achieving effective HIV–NCD integration requires coordinated changes in service delivery, workforce organisation, financing, supply chains and health information systems. Integration strategies should therefore be deliberately designed to improve access, continuity and quality of care while protecting the performance of established HIV services. The strategies covered in this section outline how countries in southern Africa can translate the available evidence into phased and context-responsive implementation (Brault et al. 2021; McCombe et al. 2021; Moyo-Chilufya et al. 2025).

A differentiated strategy may include designing modular service platforms where care for conditions such as diabetes and hypertension is embedded within primary-level HIV service points. This approach not only extends HIV services but also introduces dedicated NCD care components, thereby allowing for independent monitoring and expansion. The use of

digital tools, such as shared electronic health records, mobile decision-support systems and triage systems assisted by artificial intelligence (AI), can further strengthen this integrated architecture by enhancing coordination and continuity of care.

Task-sharing initiatives must not solely replicate strategies effective in HIV care; they should also explore and develop new roles for lay counsellors, pharmacists and patient navigators to bridge service silos and improve PHC delivery. Decentralisation efforts should incorporate integrated supply chains and diagnostic capacities rather than simply redistributing personnel.

Implementing a phased integration plan, starting in high-burden districts and informed by real-time learning, is crucial for managing complexity and mitigating risks. Co-designing these models with input from patients, frontline providers and policymakers will ensure they are clinically sound and contextually appropriate. Ultimately, a successful model for integrating HIV and NCD care in southern Africa should represent an evolution rather than a duplication of existing HIV care systems. It must reflect the realities of dual disease burdens, economic constraints and shifting donor landscapes, culminating in a uniquely African model for integrated chronic care that is scalable, equitable and resilient.

Translating this vision into actionable outcomes requires a clear and structured phased implementation plan. Recent evidence from southern Africa emphasises the necessity of moving beyond aspirational frameworks towards the development of context-sensitive, resource-appropriate and ethically grounded service delivery models that effectively address the intertwined challenges posed by HIV and NCDs (Moyo-Chilufya et al. 2025).

Challenges and lessons learnt in integrating HIV and noncommunicable disease care in southern Africa

Integrating HIV and NCD care in southern Africa presents several challenges that must be carefully navigated to ensure the success of integrated health care services. One of the main challenges is maintaining the quality and accessibility of HIV services while expanding NCD prevention and treatment services. Integration can place additional demands on already constrained services if expansion is not accompanied by adequate staffing, training, medicines, diagnostics and supply-chain capacity. Implementation should therefore be phased and monitored to ensure that the addition of NCD services does not undermine the quality or continuity of established HIV care (Brault et al. 2021; Kintu et al. 2020). Similarly, in Malawi, pilot programmes integrating HIV and diabetes

services revealed that without adequate retraining, HCWs defaulted to prioritising HIV over NCD services, or vice versa, leading to uneven care delivery (Mwagomba et al. 2018).

On the other hand, successful models, such as South Africa's National Department of Health (NDoH) Integrated Chronic Disease Management (ICDM) framework, demonstrated that with phased rollout, co-location of services and dedicated NCD drug procurement lines, antiretroviral therapy (ART) adherence remained stable and even improved in some facilities (Murudi-Manganye & Makhado 2020; NDoH 2020). These examples underscore the importance of carefully planned integration, backed by targeted investment, to ensure that service expansion enhances rather than erodes the foundations of HIV care.

Resource constraints pose another significant challenge. As health care systems in the region are already struggling to deliver care for both HIV and NCDs, integrating these services necessitates careful consideration of how to efficiently utilise limited resources without compromising the quality of care (Brault et al. 2021).

Policymakers in southern Africa also urgently need evidence to guide cost-effective and acceptable changes in integrated health care services. This shows the importance of conducting thorough research and feasibility studies to inform policy decisions and ensure the sustainability of integrated care models (Brault et al. 2021).

From previous integration efforts, several lessons have been learnt. A key lesson is to consider context-specific factors when designing and implementing integrated care models. This includes understanding the unique health care needs of the population, cultural nuances and the existing health care infrastructure (Nigatu 2012).

Another critical lesson is the need for adequate training and support for health care providers. As task shifting and decentralisation of services become more prevalent in integrated care models, ensuring that lower-level HCWs are adequately trained and supported is essential for delivering high-quality, integrated care (Brault et al. 2021).

The engagement of key stakeholders – including government officials, health care providers, community leaders and patients – are vital to the design and implementation of integrated HIV and NCD care services. This collaborative approach helps ensure that the integrated care models are tailored to meet the community's specific needs and are more likely to be accepted and adopted by all stakeholders (Brault et al. 2021).

To address these challenges and incorporate the lessons learnt, a phased approach to integrating HIV and NCD services is recommended. This approach involves piloting and evaluating integrated models of care in

selected settings before scaling up to a larger population. Such a strategy enables the identification of potential issues and the refinement of care models to ensure their effectiveness and sustainability (Brault et al. 2021; Ibeneme et al. 2020; Mahomed, Asmall & Freeman 2014; McCombe et al. 2021; Tshililo et al. 2019; Uebel et al. 2011).

While integrating HIV and NCD care in southern Africa presents challenges, the lessons learnt from previous efforts provide valuable insights for overcoming these obstacles. By adopting a phased approach and considering context-specific factors, southern Africa can move towards more integrated and effective health care systems that address the growing burden of HIV and NCDs.

Regional analysis of health care system performance in sub-Saharan Africa: Addressing the challenges of HIV and noncommunicable disease integration

In sub-Saharan Africa (SSA), the integration of HIV and NCD care presents a promising solution to address the rising burden of NCDs while leveraging the existing infrastructure and resources from HIV programmes. These programmes – supported by international organisations like PEPFAR, the Global Fund to Fight AIDS, Tuberculosis and Malaria, and the Centers for Disease Control and Prevention (CDC) – have laid the foundation for an ICHC model that can deliver both infectious and NCD care sustainably and cost-effectively (Garrib et al. 2018).

The integration of HIV and NCD services can draw upon the experience and success of existing HIV programmes, including chronic care models. This approach is essential for improving health outcomes, optimising resources and strengthening health care systems in the region. The successful integration of HIV and NCD care in southern Africa is recognised as a crucial step towards enhancing the overall quality of health care and addressing the complex health care needs of the population (Brault et al. 2021).

However, implementing low-cost NCD prevention and treatment interventions has been limited in southern Africa, posing a significant challenge for health care delivery. To overcome this challenge, it is essential to adopt evidence-based approaches to HIV and NCD management that build upon the success and lessons learnt from existing HIV programmes. By integrating services, health care systems can leverage existing infrastructure and resources to deliver comprehensive care for infectious diseases and NCDs more efficiently.

The regional analysis of health care system performance in SSA highlights the importance of integrating HIV and NCD care to address the growing burden of NCDs. Policymakers and health care providers must prioritise the development and implementation of integrated care models that are sustainable, cost-effective and responsive to the population's needs.

Evidence-based approaches to HIV and noncommunicable disease management: Leveraging integration for improved outcomes

An evidence-based and increasingly adopted approach to HIV and NCD management in southern Africa is the integration of services, which can build upon the tested success and operational structures of long-standing HIV prevention and care management programmes (Brault et al. 2021). By combining HIV and NCD service delivery, health care systems can improve continuity of care, reduce duplication of effort, and optimise workforce and supply chain resources.

In South Africa, real-world examples already demonstrate both the feasibility and impact of this approach. The ICDM model, implemented across multiple provinces, has resulted in improvements in clinical efficiency and reductions in patient waiting time, with some districts noting a 25% reduction in missed appointments and stable ART adherence rates, even as hypertension and diabetes care were introduced at the same service points (Mahomed & Asmall 2015; Murudi-Manganye & Makhado 2020; Sokhela 2024). In another study, patients attending co-located HIV–NCD clinics in the Gauteng and KwaZulu-Natal provinces in South Africa reported higher satisfaction rates (82%) compared to those in separate care streams as well as fewer visits and improved provider communication (Van der Mannen et al. 2024). To strengthen and scale these gains, strategies that are grounded in both data and operational feasibility are recommended, as discussed in the following subsections.

Adopting integrated care models

Integrated service models, such as South Africa's NDoH ICDM framework and Malawi's Integrated Non-Communicable Disease programmes, continue to demonstrate significant benefits in strengthening PHC delivery. Building on the initial NCD pilot described by Mwagomba et al. (2018), subsequent evaluations have confirmed sustained improvements in-service readiness, patient follow-up and health outcomes through integrated NCD–HIV care models. For instance, a large cohort analysis by Wroe et al. (2020) reported improved retention and blood pressure (BP) control among rural patients in integrated clinics. Further national assessments, using Malawi's 2019

Harmonised Health Facility Assessment, showed marked improvements in NCD service preparedness, workforce capacity and the availability of essential medicines (Ahmed et al. 2024). More recent work has highlighted ongoing policy support and system-level adaptations that have enabled the integration of multimorbidity management across chronic conditions, including mental health, HIV and NCDs (Banda-Mtaula et al. 2025; Sansbury et al. 2023). Collectively, these studies indicate that the integrated NCD service model in Malawi has not only been sustained but expanded, reinforcing its relevance as a scalable model for chronic care delivery in low-resource settings.

In Malawi's integrated chronic care model, favourable clinical outcomes were observed among patients receiving HIV and NCD care. Among patients with HIV who had a viral-load result recorded after 12 months of ART, 85% had an undetectable viral load and 94% had a viral load below 1,000 copies/mL. Significant improvements were also observed in clinical outcomes among patients with hypertension, diabetes, asthma and epilepsy, although the results varied by condition and outcome measure (Wroe et al. 2020).

These results highlight the potential of integrated models to provide comprehensive care that addresses multiple health issues simultaneously. By streamlining services and fostering collaboration among health care providers, these programmes not only improve individual patient outcomes but also enhance the overall efficiency and effectiveness of health care systems (Chilufya 2024; Mwagomba et al. 2018).

☐ Strengthening health information systems

The implementation of TIER.Net, South Africa's national HIV electronic health record system, has laid a strong foundation for digital health integration. In recent years, pilot projects have extended the use of TIER.Net to include modules for NCDs, with early adoption reported in the Free State, North West and Gauteng provinces. These pilots demonstrated improved coordination of care and reductions in patient data fragmentation, particularly when health care workers were trained to input multi-disease data in unified digital formats (Huber et al. 2022; White 2016; Zharima, Griffiths & Goudge 2023). However, challenges remain with infrastructure disparities, interoperability and workforce readiness, which require further system strengthening and stakeholder buy-in.

☐ Building health care workforce capacity

Task-shifting policies endorsed by South Africa's NDoH have continued to strengthen the country's PHC workforce. Since the initial implementation

reported by Mahomed and Asmall (2015), more recent evidence confirms that over 30,000 nurses and clinical associates have now been trained and supported to manage hypertension, diabetes and HIV within integrated chronic care platforms.

Follow-up evaluations of the ICDM and related nurse-led interventions show sustained improvements in clinical competence and patient outcomes. For instance, Fairall et al. (2016) demonstrated that educational outreach and mentorship significantly improved chronic disease management in PHC. More recent analyses, including Moulton et al. (2024) and Toniolo et al. (2024), confirm that nurse-led task-shifting models remain central to delivering integrated NCD and HIV care in SSA, with outcomes comparable to those of physician-led care.

A global systematic review by Tesema et al. (2025) further supports this trend, noting that South Africa continues to lead in institutionalising task-shifting as a sustainable strategy to address workforce shortages while maintaining high-quality care for NCD and HIV patients.

☐ Engaging patients and communities

In integrated community adherence clubs piloted in the Western Cape, retention in care after 12 months exceeded 90% across both HIV and NCD cohorts, with patients reporting improved self-management skills and fewer stigma-related barriers (Grimsrud et al. 2016).

☐ Conducting research and evaluation

Rigorous evaluations of integration pilots are ongoing across the Limpopo, Mpumalanga and Eastern Cape provinces of South Africa. These studies are capturing metrics such as medication adherence, cost-effectiveness, patient load and time-to-treatment across disease categories (Van der Mannen et al. 2024).

By rooting integrated HIV–NCD care in field-tested models, national policy alignment and measurable outcomes, South Africa and its regional partners are not merely theorising integration; they are building a reproducible foundation for it. This shift from vertical programming to a patient-centred, chronic care continuum is not only evidence-based but also responsive to the epidemiologic and economic realities of the region.

It is important to recognise that many of the implementation strategies outlined, such as task shifting, electronic medical records (e.g. TIER.Net) and adherence clubs, have been in place for over a decade in South Africa's HIV programme, supported by long-standing NDoH policy and international investment. This historical success demonstrates both the feasibility and the government's commitment to service innovation.

However, integrating NCD services into this HIV infrastructure is not a matter of duplication; it requires deliberate adaptation. The clinical workflows, medication regimens and monitoring tools for hypertension or diabetes differ significantly from those of HIV. Moreover, NCDs often require more frequent diagnostics, lifestyle counselling and non-pharmaceutical interventions that fall outside the scope of traditional ART-focused care.

South Africa's experience provides a strong platform, but not a finished blueprint. Integration demands rethinking how teams are trained, how data are shared across vertical systems, and how procurement models evolve to support communicable and noncommunicable care. In a resource-constrained environment, especially in light of recent donor withdrawals, this shift is not just technical; it is strategic and economic. As such, while the government's historical commitment to innovative HIV delivery is clear, the challenge ahead lies in scaling that capacity across a broader, more complex disease landscape.

The role of policy in enhancing health care integration: A strategic approach for southern Africa

The role of policy is fundamental in enhancing the integration of health care services for HIV and NCDs in southern Africa. Effective integration of care for these conditions within the constraints of limited resources requires policymakers to be guided by solid evidence. This evidence should identify cost-effective and widely accepted health care service modifications that seamlessly integrate HIV and NCD care.

Such evidence-based guidance is crucial for shaping policies that advocate for the integration of HIV and NCD services. When policies are well-informed and effectively implemented, they ensure that the health care systems in southern Africa are better prepared to tackle the increasing prevalence of NCDs. Moreover, these policies ensure the provision of holistic care for individuals who are living with both HIV and NCDs, thereby enhancing the overall quality of health care in the region. To achieve this, policymakers must take the steps described in the rest of this section.

Prioritise research and evidence

Policymakers in southern Africa urgently require evidence to inform cost-effective, acceptable changes to integrated health services (Brault et al. 2021). Fortunately, emerging research from LMICs, including countries like Malawi, Kenya, Uganda and South Africa, has begun to document the feasibility, acceptability and early outcomes of integrated care models.

For instance, the SEARCH study in Uganda and Kenya demonstrated that integrating HIV and NCD screening and treatment increased population-level viral suppression and improved hypertension control with no additional staffing and at modest incremental cost (approximately US$20 per additional patient treated) (Hickey et al. 2025). Similarly, in Malawi, an evaluation of an HIV–diabetes integration pilot revealed improved medication adherence, reduced clinic visits and positive provider feedback on shared workflows (Mwagomba et al. 2018).

In South Africa, facilities participating in the ICDM model reported improved patient flow, reduced appointment burden and stable ART adherence rates, alongside increased screening and management of hypertension and diabetes (Mahomed & Asmall 2015). These studies underscore that integrated care is not only feasible but also scalable in LMIC contexts, provided that systems are appropriately adapted to local infrastructure and workforce realities.

Leverage existing infrastructure

The integration of HIV and NCD services can be significantly strengthened by leveraging the physical infrastructure and technical expertise developed through HIV programmes like PEPFAR and the Global Fund to Fight AIDS, Tuberculosis and Malaria, and also the data, field knowledge and operational insights generated by non-governmental organisations (NGOs) active in South Africa. Organisations such as Right to Care, Médecins Sans Frontières (MSF) and the Treatment Action Campaign (TAC) have actively piloted, evaluated and refined integrated care models for over a decade, with a growing emphasis on chronic care.

Evidence suggests that NGO-led programmes have contributed to the incorporation of NCD screening and treatment into HIV clinics, generating valuable implementation data that has already informed national and district-level planning (Obeagu & Obeagu 2025). For instance, Right to Care's partnership with the South African NDoH and PEPFAR in the Free State province includes a digital data-sharing platform that captures HIV and hypertension outcomes across integrated clinics. These data are regularly disseminated through provincial health review forums and shared with academic institutions for evaluation (Chiliza 2020).

Moreover, civil society's engagement in the Global Fund Country Coordinating Mechanism ensures that NGO-generated data directly informs national health financing and service integration strategies (Coutinho et al. 2012). This collaboration is a key asset for achieving evidence-informed, context-sensitive integration of HIV and NCD services across South Africa.

Adopt a phased approach

It is recommended that a phased approach be adopted for integrating HIV and NCD services in southern Africa. This approach would involve piloting and evaluating integrated models of care in selected settings before scaling up to a larger population. This ensures that the integration process is manageable and allows for adjustments based on initial outcomes.

Address resource constraints

The integration of HIV and NCD care poses challenges related to resource constraints. Policymakers must address these challenges by developing strategies for sustainable funding, efficient resource allocation and effective utilisation of available resources.

The role of policy in enhancing health care integration in southern Africa is critical. By prioritising evidence-based decision-making, leveraging existing infrastructure, adopting a phased approach and addressing resource constraints, policymakers can facilitate the effective integration of HIV and NCD services, ultimately leading to improved health outcomes and a more robust health care system in the region.

Integrated care models for HIV and noncommunicable disease management in sub-Saharan Africa: A comprehensive approach

Several integrated care models for HIV and NCD management have been developed and implemented in SSA, aiming to address the growing burden of NCDs among PLHIV and leverage the existing infrastructure and resources of HIV programmes. These models offer a comprehensive understanding of how to effectively integrate HIV and NCD services, providing valuable insights into approaches that can enhance health care integration in the region.

Task shifting

Task shifting has been operationalised in South African HIV care for more than a decade through nurse-initiated management of antiretroviral therapy (NIMART), which enables appropriately trained professional nurses to initiate and manage ART under national clinical guidance. Evidence from the Streamlining Tasks and Roles to Expand Treatment and Care for HIV (STRETCH) intervention and subsequent NIMART

mentoring programmes supports the feasibility of nurse-led ART delivery without compromising important clinical outcomes (Fairall et al. 2012; Jones & Cameron 2017; Uebel et al. 2011). Pharmacist-initiated management of antiretroviral therapy (PIMART) is a more recent task-sharing model under which appropriately trained and accredited pharmacists may provide specified HIV-testing, prevention and first-line treatment services in accordance with approved protocols and regulatory requirements (South African Pharmacy Council [SAPC] 2021; Supreme Court of Appeal of South Africa 2025). Together, these models demonstrate how appropriately trained and regulated health professionals can expand access to HIV services and provide a potential foundation for broader integrated chronic-care roles.

Studies have confirmed that NIMART training and mentoring improve ART initiation rates, clinical outcomes and patient satisfaction nationwide (Jones & Cameron 2017). Similarly, large-scale reviews have demonstrated that NGO-supported NIMART initiatives consistently collect valuable data featured at donor annual general meetings, ensuring robust monitoring and evaluation at both operational and policy levels (Fatti 2020; Mboweni & Makhado 2023).

Additionally, members of the Southern African HIV Clinicians Society (SAHCS) and South African academic institutions have conducted multiple implementation science studies that assess NIMART's outcomes and feasibility for broader service expansion, including for hypertension and diabetes care (Green 2013). These local initiatives and evaluations confirm that task shifting is not speculative in South Africa; it is embedded in clinical reality, supported by national policy, NGO implementation and academic validation. As such, its extension to NCD services offers a practical, evidence-based strategy to strengthen integrated chronic care.

☐ Integrated clinics or facilities

In this approach, HIV and NCD services are provided in a single setting to enhance coordination and continuity of care. This model facilitates a seamless patient experience, ensuring that individuals receive comprehensive care for both conditions.

☐ Community-based models

Community health workers play a crucial role in delivering integrated HIV and NCD services to individuals in their homes or communities. This model extends care beyond traditional health care settings, bringing care to patients in their environments and promoting accessibility.

Vertical integration

This model integrates HIV and NCD services within the same health care system or facility. It ensures that services are streamlined and patients can access all necessary care at one location.

Coordination between HIV and noncommunicable disease programmes

Separate programmes work collaboratively to provide integrated care for individuals with both conditions. This model emphasises the importance of communication and collaboration between health care providers and programmes.

It is essential to assess the feasibility and cost-effectiveness of these different models of integration before pursuing integrated management of HIV and NCDs in LMICs (Nigatu 2012). This assessment should consider each region's needs and resources as well as the potential impact on patient outcomes and health care system efficiency.

The integrated care models for HIV and NCD management in SSA hold promise for improving health outcomes and strengthening health care systems. By adopting a comprehensive approach that considers the region's unique challenges and opportunities, health care providers and policymakers can work towards a more integrated and effective health care delivery system.

Strengthening health care systems for integrated management of HIV and noncommunicable diseases

Strengthening health care systems remains pivotal in managing the dual burden of HIV and NCDs in southern Africa (Brault et al. 2021). Integrated care models that combine HIV and NCD services have shown strong potential to improve continuity of care, resource utilisation and patient outcomes. These models not only enhance service efficiency but also offer a platform for mutual capacity-building between vertical HIV programmes and broader care system interventions.

While such initiatives have historically relied on robust support from international partners like PEPFAR and the Global Fund to Fight AIDS, Tuberculosis and Malaria, the recent withdrawal of direct USAID funding as of February 2025 calls for immediate diversification of funding sources. In this context, BRICS+ nations (Brazil, Russia, India, China, South Africa + Saudi Arabia, Egypt, United Arab Emirates, Ethiopia, Indonesia and Iran) (BRICS 2025; Kamga Wambo 2023) have emerged as strategic partners capable of both financial support and technology transfer in global health governance.

Recent literature highlights the increasing commitment of BRICS+ nations to health care system integration, research investment and UHC across member and allied countries. Notably, BRICS+ countries have expressed interest in leading financing alternatives to traditional Global North donors, with China and India expanding South–South cooperation mechanisms to fund the production of essential medicines, NCD responses and digital health infrastructure (Liu et al. 2023; Sahoo, Rout & Jakovljevic 2023).

Moreover, the BRICS Health Cooperation Strategy, discussed at multiple summits, advocates integrating HIV, NCDs and maternal-child health into a broader public health investment agenda (Harmer & Buse 2014). These initiatives provide a viable platform for financial diversification and technical assistance that South Africa and its regional partners can increasingly tap into. Evaluating cost-effectiveness, scaling pilot programmes and aligning with South–South collaborative strategies must be central to any sustainable integrated care model going forward.

Conclusion and recommendations

The integration of HIV and NCD services is essential for addressing the dual burden of infectious and chronic diseases in southern Africa. However, its successful implementation in South Africa is not guaranteed. Progress will depend on the country's ability to navigate complex social, financial and practical challenges, including the readiness of health care systems, communities and policy structures to adopt and sustain such an approach.

While this chapter highlights the potential of integrated models to enhance efficiency, coordination and quality of care, it also recognises that implementation will require careful adaptation to local realities. Achieving meaningful integration will depend on strong leadership, adequate and sustained financing, effective governance and continued commitment to workforce development and community participation.

To create a more effective health care system, policymakers and health care providers must take a collaborative, evidence-based approach. This begins with the adoption of integration models that are tailored to the unique contexts of local communities, drawing inspiration from successful regional practices. Strengthening domestic health financing and governance structures is crucial to ensuring that these initiatives are sustainable and accountable, allowing for long-term success.

A key aspect of this integration is building the capacity of the health care workforce. This can be achieved through cross-training programmes and fostering multidisciplinary collaboration, ensuring that health care

providers are well-equipped to manage both HIV and NCDs. Enhancing health information systems is equally important, as they enable better coordination and data sharing, facilitating the monitoring of integrated care outcomes.

Moreover, the involvement of patients and communities in the design and implementation of health services is vital. This approach promotes patient-centred care that is equitable and sensitive to the cultural contexts in which health care services are delivered. Finally, research and evaluation should be supported to continuously assess the effectiveness, scalability and cost-efficiency of these integrated models in real-world scenarios. By incorporating these recommendations, the health care system can evolve to better meet the needs of the population it serves.

Ultimately, integrating HIV and NCD services offers a transformative opportunity to strengthen the health care system in South Africa and the broader SSA region. Realising this vision will require innovative, context-sensitive approaches, strong political will and long-term investment to translate policy aspirations into sustainable practice.

Declarations

Ethical considerations

This chapter is based on a literature review and secondary sources. No human or animal participants were involved; therefore, it did not require ethical approval.

Consent

Not applicable.

Author's contribution

Conceptualisation, L Makhado; *data curation*, L Makhado; *formal analysis*, L Makhado; *funding acquisition*, N/A; *investigation*, L Makhado; *methodology*, L Makhado; *project administration*, L Makhado; *resources*, L Makhado; *software*, L Makhado; *validation*, L Makhado; *visualisation*, N/A; *writing – original draft*, L Makhado; *writing – review and editing*, L Makhado.

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Disclaimer

The views expressed in this chapter are those of the author and do not necessarily represent the official views of their affiliated institutions or those of the publisher.

Chapter 8

Monitoring and evaluation of the integrated management of HIV and noncommunicable diseases

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Abstract

The integrated management of health care for human immunodeficiency virus (HIV) and noncommunicable diseases (NCDs) is critical in addressing the dual burden of these chronic conditions. This chapter explores the vital role of monitoring and evaluation (M&E) in assessing the effectiveness and impact of integrated management programmes for HIV and NCDs. Emphasising the importance of systematic data collection, analysis and feedback, the chapter outlines how M&E processes facilitate informed decision-making, programme improvement and accountability. By establishing robust M&E frameworks, integrating qualitative and quantitative data and engaging stakeholders, health care systems can enhance service delivery, optimise resource allocation and achieve better health outcomes for affected populations. The chapter also highlights the challenges and mitigation strategies in implementing M&E in resource-limited settings, underscoring the need for continuous improvement and adaptation to meet evolving health care needs. Ultimately, effective M&E is essential for ensuring that integrated management programmes are responsive, equitable and capable of improving the overall wellbeing of individuals living with HIV and NCDs.

Introduction

The integrated management of human immunodeficiency virus (HIV) and noncommunicable diseases (NCDs) is a crucial approach to address the growing burden of these diseases. Monitoring and evaluation (M&E) play a vital role in assessing the effectiveness and impact of integrated management programmes. This chapter focuses on the key aspects of M&E in the context of integrated management of HIV and NCDs, highlighting the importance of data collection, analysis and feedback for programme improvement and achieving desired outcomes.

Monitoring and evaluation

Monitoring and evaluation is a systematic process that involves collecting, analysing and using data to assess the performance, progress, effectiveness and impact of projects, programmes, policies or interventions (World Bank Independent Evaluation Group [IEG] n.d.). Monitoring focuses on the continuous collection of data to track the implementation of activities and progress towards objectives, while evaluation provides a more in-depth and periodic assessment of the relevance, effectiveness, efficiency and impact of interventions (United Nations Committee of Experts on Public Administration [UN CEPA] 2021; World Bank IEG n.d.).

Monitoring and evaluation provides a structured framework for measuring and tracking the implementation of activities, outputs, outcomes and impacts over time, enabling organisations to determine whether objectives are being achieved and how results are produced (International Organization for Migration [IOM] n.d.; UN CEPA 2021). The main purpose of M&E is to inform evidence-based decision-making, improve programme effectiveness, ensure accountability and transparency, and facilitate organisational learning and knowledge generation (Organisation for Economic Co-operation and Development [OECD] n.d.; UN CEPA 2021).

Monitoring involves continuously measuring and tracking activities, outputs and outcomes against predetermined targets or indicators. It involves regular data collection, analysis and reporting to assess whether activities are being implemented as planned, resources are utilised effectively and outputs are produced. Monitoring provides programme managers with real-time information to make informed decisions, identify challenges and take corrective actions as needed (World Health Organization [WHO] 2023).

On the other hand, *evaluation* is a more in-depth and systematic assessment of a project or programme's effectiveness, efficiency, relevance and sustainability. It involves systematically collecting and analysing data to determine the extent to which the intended outcomes and impacts have been achieved. Evaluations are typically conducted at specific points or at the end of a project or programme and provide a comprehensive assessment of its performance. According to the WHO (2025), the lack of comprehensive data hinders the effective M&E of HIV and NCD programmes.

Both M&E are iterative processes that use data and evidence to inform decision-making. They help identify gaps, challenges and strengths, providing insights into what works and what does not, enabling adjustments and improvements. The findings from M&E activities inform programme planning, resource allocation, policy development and the design of future interventions. Monitoring and evaluation are essential components of effective HIV and NCD programme management. They provide a systematic and evidence-based approach to assess progress, measure impact and ensure accountability, ultimately leading to more informed decision-making and improved outcomes.

Objectives of monitoring and evaluation

In the context of South Africa's dual burden of infectious diseases and NCDs, robust M&E systems are indispensable for the success of integrated

health care service delivery. As the country strives to streamline the management of HIV, tuberculosis (TB) and chronic NCDs, M&E emerges as a critical tool not only for tracking programme performance but also for informing data-driven policy, improving patient outcomes and ensuring accountability across governance levels. The complexity of managing comorbidities in resource-constrained settings underscores the need for an adaptive, unified M&E framework that transcends siloed disease programmes. By enabling real-time insights into service delivery gaps, adherence trends and treatment outcomes, integrated M&E systems support the development and refinement of adherence guidelines, foster intersectoral collaboration and ultimately bridge the operational disconnect between national directives and local health care system realities. This section outlines the core objectives of M&E in integrated HIV–NCD care, highlights systemic challenges and proposes strategic pathways towards a more cohesive and effective monitoring architecture.

Monitoring and evaluation of integrated management programmes

Monitoring and evaluation helps gauge the performance of integrated management programmes, including service delivery, adherence to guidelines and target achievement (Alfvén et al. 2014; Jain & Zorzi 2016). This promotes the integrated delivery of services and the development of integrated adherence guidelines to achieve programme outcomes. Most countries have overlapping M&E programmes for HIV, TB and NCDs (Duffy et al. 2017; Grépin 2011; Legido-Quigley et al. 2012). The South African National Department of Health (NDoH) has achieved some progress in developing and implementing integrated adherence guidelines for HIV and TB (Churchyard et al. 2014; Dowdy, Powers & Hallett 2020; Murudi-Manganye, Makhado & Sehularo 2020; NDoH 2022; Pascoe et al. 2020; Scott et al. 2010). These guidelines aim to improve treatment outcomes and reduce the burden of these diseases in the country; however, the NDoH must develop an integrated M&E system that can monitor all these conditions. South Africa has one of the highest HIV and TB burdens globally. Ensuring treatment adherence is thus crucial for the successful management and control of these diseases (Engelbrecht et al. 2017; Kalonji & Mahomed 2019; Mpagama et al. 2023; Naidoo et al. 2017; Pascoe et al. 2020).

The Adherence Guidelines for HIV, TB and NCDs were developed to help health care providers manage these diseases and infections concurrently, as many patients in South Africa experience more than one of these conditions (NDoH 2022). These guidelines were developed through collaboration between the government, clinical experts and other key stakeholders, who worked together to update and align national recommendations for HIV, TB and NCDs. They provide standardised

instructions for managing treatment and improving patient adherence across these conditions. The same collaborative approach and team can be used to design an M&E framework to track progress and strengthen the implementation of these integrated programmes.

Integrated development of guidelines does not guarantee integrated implementation and management of these programmes. The fragmented implementation of health care guidelines across the district, provincial and national levels in South Africa continues to undermine the country's efforts towards integrated care for clients living with both HIV and NCDs. As highlighted in studies by Mboweni and Makhado (2020a) and Murudi-Manganye et al. (2020), although a common set of national guidelines exists, they are frequently implemented in silos across different governance tiers, leading to a wide and concerning gap in service cohesion and policy implementation.

This siloed approach stems from several systemic failures. Firstly, there is a lack of integrated communication and data-sharing systems among the three levels of governance. Districts often utilise localised reporting platforms that do not synchronise with provincial or national systems, resulting in fragmented data flows and limited capacity to coordinate care effectively. Secondly, inconsistent use of M&E indicators across programme levels leads to gaps and variations in data, making it difficult to assess programme effectiveness and prioritise interventions.

A further challenge is the limited involvement of lower levels of governance in the national planning and budgeting processes. Provincial and district stakeholders are often relegated to implementing decisions made at higher levels, without adequate contextualisation or adaptation to local health care system realities. Consequently, resources may not align with local needs and accountability becomes diffused. The lack of formal structures to mandate and oversee vertical integration exacerbates this issue, allowing each level to function in relative isolation.

To overcome these challenges and foster a more integrated health care system, it is imperative to establish a unified M&E framework supported by a centralised and interoperable data system. Such a platform would not only facilitate real-time monitoring of patient care and programme performance but also enable the timely identification of service delivery gaps. Additionally, institutionalising intergovernmental planning platforms would enable more inclusive, collaborative decision-making, with district, provincial and national voices contributing equally to programme design and implementation.

The development of an explicit policy on integrated HIV–NCD care, with clearly delineated roles, responsibilities and accountability mechanisms across all levels, is another essential step. This would be supported by

multidisciplinary task teams comprising representatives from each governance level, tasked with harmonising implementation strategies and strengthening oversight. Ultimately, cross-level training and capacity-building initiatives are necessary to ensure a consistent understanding and application of integrated care principles.

In the long term, addressing these structural and operational gaps will enable South Africa to present a coordinated and unified approach to the care of people living with HIV (PLHIV) who also have NCDs. This will advance the broader goals of equity, continuity and quality in health care delivery. Streamlining M&E systems will further strengthen the integration of HIV, TB and NCD services, ensuring that patient monitoring, treatment response assessments, side effect management and psychosocial support are delivered in a comprehensive and cohesive manner.

☐ Assessing programme performance

Assessing programme performance is critical to effective M&E in the integrated management of HIV and NCDs. It requires systematically measuring and analysing programme implementation, outputs and outcomes to determine effectiveness, efficiency and sustainability (Jain & Zorzi 2016; Kasaie et al. 2020; Nugent et al. 2018).

Integration between HIV and TB services has progressed considerably over the past decade, supported by shared clinical approaches, overlapping patient populations, and compatible diagnostic platforms, such as GeneXpert, viral load (VL) and cluster of differentiation 4 (CD4) testing (Boyd et al. 2020a, 2020b; Hanrahan & Van Rie 2017). These technologies have strengthened joint monitoring systems and improved treatment outcomes through harmonised service delivery and patient support.

In contrast, integration between HIV and NCD care remains more challenging. Unlike TB, most NCDs, such as diabetes, cardiovascular diseases and chronic respiratory conditions, require diagnostic tools, such as electrocardiograms (ECGs), X-rays and echocardiography, and specialist management, which are not routinely available at the primary health care (PHC) level. This limits the feasibility of full integration, particularly in rural and resource-constrained settings, where both workforce capacity and access to technology are limited.

Evidence from HIV–NCD integration studies and broader NCD health-system assessments suggests that implementation is constrained by fragmented service delivery, limited provider training, weak monitoring systems and insufficient infrastructure. These challenges indicate that, while HIV–NCD integration is conceptually well supported, its operational rollout should be phased and aligned with clinical capacity, infrastructure

and system readiness (Manne-Goehler et al. 2019; McCombe et al. 2022; Muddu et al. 2020; Van Hout et al. 2023).

Thus, rather than suggesting that complete integration is imminent, this discussion underscores the need for phased, context-sensitive approaches that strengthen monitoring, cross-training and data linkage between programmes. These steps will help align health care system performance measurement with the growing burden of multimorbidity, laying the groundwork for more comprehensive, patient-centred care over time.

Key considerations and approaches for assessing programme performance

Establishing clear objectives and indicators

Indicators and objectives are essential to effective M&E in the integrated management of HIV and NCDs (Fadel et al. 2021; Nash 2019; Nigatu 2012; Özdemir & Çakır 2021). Establishing clear programmatic objectives and developing relevant indicators provide a framework for measuring progress, outcomes and the impact of interventions. These metrics are also essential for guiding course corrections and ensuring accountability within integrated service delivery models.

However, for M&E systems to be reliable and sustainable, it is essential to recognise that data management is a specialised function. Expecting frontline clinicians, such as nurses and doctors, to manage sophisticated data collection, analysis and reporting systems alongside their already demanding clinical duties is unrealistic. This not only risks overburdening staff but also compromises data quality and utility.

Building robust M&E systems for integrated HIV–NCD care is an essential but resource-intensive and technically demanding process. Effective implementation will require dedicated financial investment, specialised expertise and adequate time, particularly to address inequities between urban and rural health care systems. Rural areas, often the most vulnerable, face significant challenges because of limited infrastructure, insufficient human resources and restricted access to advanced diagnostic and information technologies.

It is therefore imperative that data management and analysis be led by professionals trained in health information technology (IT) systems, epidemiology or biostatistics. These individuals or teams should be embedded within health care facilities or district-level management structures to ensure real-time validation, interpretation and use of data. This approach strengthens the quality of M&E outputs while allowing clinical staff to focus on patient care, supported by reliable, actionable data insights (Hanrahan & Van Rie 2017; Nash 2019).

Before scaling up, preliminary feasibility and readiness assessments should be conducted to evaluate the operational and financial viability of integration. With only a few years remaining before the 2030 global target to end AIDS as a public health threat – as reflected in Agenda 2030 and United Nations (UN) Sustainable Development Goal (SDG) Subgoal 3.3 (UN 2015) – such studies are essential for identifying resource gaps, infrastructure needs and training requirements. Addressing this early will facilitate a phased and realistic rollout that aligns with national priorities and capacity constraints (Fadel et al. 2021; Kitson & Straus 2009; Mainz 2003).

Emerging digital and artificial intelligence (AI) technologies can also play a transformative role in bridging the rural–urban divide in health care system capacity. When responsibly integrated, AI-enabled tools can automate data capture and analysis, flag inconsistencies in reporting and support predictive analytics for disease surveillance and planning. Such innovations could strengthen M&E functions by compensating for workforce shortages and improving the timeliness and accuracy of data (Carini et al. 2020; Vedlūga & Mikulskienė 2017).

However, these efforts must be guided by strong, technically competent leadership. The establishment of dedicated oversight teams led by committed scientists, clinicians and data specialists, rather than political appointees, is critical to ensuring that M&E systems are implemented with integrity, accountability and scientific rigour. This leadership structure should prioritise transparency, intersectoral collaboration and capacity development across all tiers of the health care system (Collins et al. 2010; Hopkins, Doherty & Gray 2018; Nash 2019; Sharp et al. 2017; South African National AIDS Council [SANAC] 2023).

In designing indicators and setting targets, several key considerations must be emphasised:

- Relevance to integrated care goals where indicators should reflect the dual burden of HIV and NCDs and measure outcomes that span both domains
- Feasibility of data collection, in which indicators must align with existing infrastructure and human resource capacity
- Disaggregation potential wherein data should be broken down by age, sex, comorbidity status, socioeconomic group and facility level to promote equity in care delivery
- Actionability of information based on indicators that directly inform clinical, operational or policy-level decisions.

Objectives should be *specific*, *measurable*, *achievable*, *relevant* and *time-bound* (SMART) and aligned with the broader strategic goals of integrated HIV–NCD management (Hanrahan & Van Rie 2017; Nash 2019). Indicators must capture critical dimensions such as service utilisation, patient outcomes

and quality of care, while maintaining a balance between feasibility and aspiration. Evidence-based benchmarks derived from rigorous research and national or international standards should guide target-setting to ensure contextual appropriateness and expected impact trajectories (Ahonkhai et al. 2012; Mahy et al. 2019; Sherwood et al. 2017; Zhao et al. 2019).

Targets should be tiered across national, regional and programme levels, ensuring alignment with strategic health care objectives. Indicators should also capture multiple performance domains, including process, output, outcome and impact dimensions (Fadel et al. 2021; Liberati et al. 2020; Vedlūga & Mikulskienė 2017). Combining proximal indicators (short-term outputs and outcomes) and distal indicators (long-term impacts influenced by broader factors) provides a more complete picture of programme performance and sustainability (Carini et al. 2020; Fadel et al. 2021).

Equity considerations are central to M&E design. Indicators must be disaggregated by key demographic and social variables, such as age, sex, geographic location, socioeconomic status and key population groups to identify disparities and guide targeted interventions (Esariti & Sabana 2019; Liberati et al. 2020; Özdemir & Çakır 2021; Pega et al. 2017). Regular review and updating of indicators are equally critical to ensure continued relevance as policies, evidence and contexts evolve (Ahonkhai et al. 2012; Mahy et al. 2019; Sherwood et al. 2017; Zhao et al. 2019).

Finally, the entire process must be realistic, feasible, ethically grounded and implemented under the supervision of competent, committed professionals guided by public health care priorities rather than political expediency. A phased, evidence-based approach, supported by innovative technologies and strong leadership, will ensure that integrated M&E systems for HIV and NCDs are not only technically sound but also equitable, sustainable and impactful.

Establishing clear baselines and targets

Apart from establishing integrated programme objectives and indicators, it is crucial to set baselines and targets for each indicator at the onset of a programme (Mothupi, Knight & Tabana 2020). Baselines provide a reference point for measuring progress (Ewell & Jones 1994; Liberati et al. 2020; Lockhart et al. 2013). Specific targets that are ambitious yet *achievable*, *time-bound* and aligned with programme objectives should be set for each indicator. Targets can be based on national guidelines, international standards or evidence-based best practices.

Utilising established guidelines and standards

Established guidelines, frameworks or standards must be referred to when selecting indicators. These may include national policies, international

recommendations or evidence-based best practices. Adhering to established guidelines ensures consistency, comparability and alignment with global or national priorities.

Data collection and management

Implementing robust data-collection systems to capture accurate and reliable data is essential for effective M&E programmes. Data cleaning, preparation and organisation should be the first steps in data management. This includes checking for data completeness, accuracy and consistency, and addressing missing values, outliers and inconsistencies. Data should be appropriately coded and formatted to ensure it is ready for analysis. All data cleaning and preparation steps should be documented to support transparency and reproducibility.

This process can be strengthened by developing clear data management standard operating procedures (SOPs) and processes. In practice, this may involve the use of electronic health records (EHRs) or other digital tools, standardised data collection instruments, and regular reporting mechanisms to enable efficient, timely data capture and management.

The data collection process should be conducted consistently and promptly. A study by Mboweni and Makhado (2023) argued that poor data management is one of the challenges influencing poor M&E and the implementation of HIV, TB and NCD programmes. Data and facility managers should be part of the M&E team to ensure that data captured at the facility level is cleaned and verified for quality. Furthermore, facility managers should emphasise to the clinical team that incomplete clinical records negatively impact M&E; therefore, it is of great importance to conduct weekly and monthly clinical records quality audits to identify gaps and address them with the team before data capture. On the other hand, the data team should also report incomplete clinical records to facility managers to ensure that the issue is addressed.

Standard operating procedures and processes for data management should be developed and communicated to all team members in the facility or institution. Proper data management practices, including data quality assurance (QA) and security, should be followed throughout the process. This includes developing and implementing a reliable integrated district health care information system to provide real-time data to enable real-time M&E processes.

Quantitative analysis

Selecting analytical techniques and methods that are suitable for the type of data collected and the evaluation objectives is crucial. Standard analytical

techniques used in programme evaluation include descriptive statistics, inferential statistics, regression analysis, content analysis, thematic analysis and qualitative coding frameworks (Figueredo et al. 2013; Siyag 2013; Spiel, Schober & Bergsmann 2015). A combination of quantitative and qualitative methods should be considered for comprehensive analysis. Quantitative analysis involves systematically examining numerical data to assess programme performance. This may include analysing indicators against predetermined targets, tracking trends over time, and comparing data across different geographic areas or subpopulations. Statistical methods, such as descriptive statistics, regression analysis and data visualisation techniques, can be employed to derive meaningful insights from the data.

Simple descriptive statistical data, presented in charts, can be made available to all team members, providing insights into the integrated programme's performance and enabling them to address gaps comprehensively. A quantitative retrospective study was conducted by Mboweni and Makhado (2019) to ascertain the impact of nurse-initiated management of antiretroviral therapy (NIMART) training and implementation. The research revealed that despite the high number of professional nurses trained on NIMART and the high number of PLHIV initiated on antiretroviral therapy (ART) in PHC, quality remained a challenge. This was evidenced by the high number of treatment interruptions, low VL suppression, and the unsatisfactory completion rate (Mboweni & Makhado 2019). Therefore, quantitative data can help in the M&E of HIV, TB and NCDs programmes.

It is imperative to apply *appropriate* statistical techniques to analyse quantitative data. This may involve calculating frequencies, means, medians and proportions, or conducting statistical tests such as *t*-tests, chi-square (X^2) tests or regression analysis. Statistical software packages such as the Statistical Package for the Social Sciences (SPSS) (IBM), Stata (StataCorp) or R (R Foundation) are used to perform the analysis. Explore data relationships, trends and patterns to address the evaluation questions. Prepare a comprehensive report that clearly and concisely communicates the evaluation findings.

Qualitative assessment

As a complement to quantitative analysis, qualitative assessment methods can be used to gain a deeper understanding of programme performance. For example, to enhance the effects of NIMART training and implementation, a qualitative study examined the challenges encountered by professional nurses who were trained to deliver NIMART (Mboweni & Makhado 2020a). Nurse-initiated management of antiretroviral therapy training is an HIV management short course for nurses, aligned with WHO task shifting, in

which nurses, rather than doctors, initiate ARV treatment to increase access. This training includes TB, sexually transmitted infections (STIs), and adult primary care (APC), including the management of NCDs (Mboweni & Makhado 2019, 2020a). Qualitative approaches, such as interviews, focus group discussions and observations, provide rich insights into the experiences, perceptions and contextual factors that shape programme implementation and outcomes (Muddu et al. 2020; Skivington et al. 2021; Van Hout et al. 2023). These methods help uncover underlying barriers and facilitators, adding depth to understanding and informing targeted improvements (Muddu et al. 2020; Skivington et al. 2021).

To ensure a comprehensive evaluation, it is essential to balance quantitative and qualitative indicators. While quantitative data enables statistical tracking of performance and outcomes, qualitative data reveals the 'why' and the effectiveness behind the numbers, offering context, meaning and lived experience.

Appropriate qualitative analysis methods should be applied, including systematic coding of transcripts and categorisation of responses to identify themes and patterns. Tools such as NVivo or ATLAS.ti (both Lumivero products) can support efficient data organisation and analysis. The results should be synthesised into descriptive or thematic summaries that clearly communicate actionable insights for programme refinement and policy development.

A triangulation approach can be used, which involves integrating multiple data sources or methods, such as interviews, surveys and document reviews, to compare and cross-validate findings. Triangulation enhances the validity and reliability of evaluation results by reducing bias and capturing a more complete picture of programme performance.

This task is typically coordinated by the evaluation lead or team leader, who ensures methodological rigour and consistency in the synthesis of data. The leader is responsible for overseeing the integration of qualitative and quantitative findings, aligning them with the evaluation questions and objectives.

Interpreting the analysed data should involve identifying patterns, trends and relationships and linking them to the established evaluation criteria and indicators. It is also important to situate findings within the programme context, acknowledge limitations and consider plausible alternative explanations to ensure balanced, credible conclusions.

☐ *Comparisons and benchmarks*

Comparing the programme performance against relevant benchmarks, standards, or best practices can provide valuable insights. This may involve

comparing programme outcomes with national or international targets across different sites or regions or benchmarking against similar programmes or interventions. Comparisons can help identify areas with better or worse performance, uncover best practices, and promote learning and knowledge sharing among programme implementers. Such comparisons help identify areas of success and areas that require improvement. Districts and provinces or states can share best practices during M&E meetings, helping address gaps more quickly. Therefore, M&E are valuable tools for equipping the health care team with evidence-based practices. Comparisons can also help identify variations and disparities in outcomes, informing targeted interventions.

Feedback and reflection

Monitoring and evaluation provide essential feedback on progress and outcomes to programme implementers, health care providers and other stakeholders. Regular feedback sessions, held weekly or monthly, can help identify strengths and weaknesses, address challenges and promote accountability. These meetings create opportunities for reflection and discussion on collected data, allowing stakeholders to interpret findings and inform programme improvements.

Effective communication of changes made, results achieved and their impact on programme performance is vital. Lessons learnt can be shared through reports, presentations, case studies or knowledge-sharing platforms. By establishing mechanisms for feedback and reflection, such as review meetings, knowledge-sharing platforms and capacity-building initiatives, programmes can ensure that insights from M&E activities drive continuous learning and improvement.

Ultimately, integrating feedback and learning is crucial for effective programme management. This involves gathering and analysing stakeholder input, reflecting on performance, and utilising insights to improve overall programme effectiveness (Auh et al. 2018; Henderson et al. 2019; McLoughlin & Thoms 2015; Norum et al. 2004; Synowiec et al. 2023). The following are key considerations and approaches to consider for feedback and learning:

- It is essential to set up structured feedback mechanisms to capture the perspectives and experiences of stakeholders. This can include surveys, focus group discussions, suggestion boxes, complaint mechanisms or regular meetings with stakeholders.
- Ensure feedback channels are accessible, confidential and inclusive, allowing for open and honest input.
- Regular feedback should be actively sought at different stages of programme implementation. Gather feedback during programme planning, implementation and evaluation.

- Encourage stakeholders to provide feedback on various aspects, such as programme design, service delivery, communication strategies and stakeholder engagement. Regular feedback allows for timely adjustments and course corrections.
- Analyse the feedback received to identify common themes, patterns, insights and areas of concern. Examine strengths, weaknesses, gaps and opportunities for improvement evident in the data.
- Utilise both qualitative and quantitative analysis techniques to interpret the feedback data effectively.
- Consider using feedback analysis tools or software to streamline the process.
- Foster a culture of learning and continuous improvement. Reflecting on and learning from the feedback and programme performance helps to gain insights.
- Engage in critical self-assessment and evaluation of programme activities, outcomes and impacts.
- Consider the feedback in light of the programme's goals, objectives and intended outcomes. Reflect on what worked well and what could be improved.
- Do not leave anyone behind by involving stakeholders in the learning process. Share the feedback findings and engage stakeholders in discussions and reflections. Seek their perspectives on the feedback and encourage them to contribute their insights and suggestions for improvement.
- Promote a collaborative learning environment that values diverse perspectives and encourages dialogue.
- Based on the feedback and learning, develop actionable recommendations for programme improvement.
- Prioritise the recommendations based on their potential impact and feasibility.
- Ensure the recommendations are SMART. Involve stakeholders in formulating recommendations to enhance ownership and buy-in.
- Create an action plan that outlines the steps, responsibilities and timelines for implementing the recommended improvements.
- Assign clear roles and responsibilities to individuals or teams accountable for implementing the actions.
- Ensure that the action plan aligns with the programme's goals, available resources and organisational priorities.
- Monitor progress and provide support as needed.
- Establish M&E mechanisms to track the implementation of the action plan and assess its effectiveness.
- Monitor key performance indicators (KPIs) and milestones to gauge progress.

- Evaluate the impact of the implemented improvements on programme outcomes and stakeholder satisfaction.
- Adjust the action plan if needed based on ongoing M&E.

Feedback and learning provide valuable insights for programme management and improvement. By actively seeking feedback, reflecting on programme performance, and using insights to drive change, programmes in the integrated management of HIV and NCDs can enhance their impact, responsiveness and sustainability.

Stakeholder feedback

Engaging various stakeholders, including health care providers, programme managers, beneficiaries, partners, donors or funders and community representatives, to gather their perspectives on programme performance is critical to M&E. This can be done through surveys, interviews or feedback mechanisms, including monthly M&E performance review meetings at the facility level and quarterly at the district, provincial and national levels. It is important to identify gaps and barriers as soon as possible and develop a quality improvement plan (QIP) rather than waiting until the end of the fiscal year, as there will be no time to act.

All stakeholders should be involved from the project's initiation phase and encouraged to participate actively in the development of the project activities and M&E. Team members can include community health care workers (CHCWs), community-based organisations (CBOs), PLHIV, people with chronic diseases and TB, partners, the data team, administrators, support staff, and the clinical team. Stakeholder feedback provides valuable insights into the strengths and weaknesses of the programme, identifies gaps in service delivery, and helps prioritise areas for improvement. A study conducted by Mboweni and Risenga (2023) affirms that ignoring people with chronic diseases during the coronavirus disease 2019 (COVID-19) pandemic resulted in a massive setback in terms of the performance and progress made on HIV, TB and NCDs programmes. This was because of the inadequate involvement of partners, communities, CBOs and chronic disease programme managers.

Engaging relevant stakeholders fosters collaboration, ownership and participation in M&E. It is a critical component of programme planning, implementation and evaluation in the integrated management of HIV and NCDs. It actively involves individuals, groups, organisations and communities with a stake or interest in the programme. Meaningful stakeholder engagement ensures that diverse perspectives are considered, it builds ownership and support, and improves the relevance and effectiveness of the programme. The points below describe key considerations and approaches for stakeholder engagement.

- *Identify the key stakeholders relevant to the programme*: This may include government agencies, health care providers, CBOs, advocacy groups, affected populations, researchers, donors and policymakers. Consider stakeholders at various levels, from local to national, and those directly or indirectly influencing the programme. Assess and understand each stakeholder's interests, needs and expectations. This can be done through stakeholder analyses or consultations to gather insights into their perspectives, priorities and concerns regarding the programme. The information collected will help tailor engagement strategies and ensure stakeholder interests are taken into account.
- *Define the objectives and desired outcomes of stakeholder engagement*: This helps to determine the aim to achieve through engagement activities, such as gathering input for programme design, fostering collaboration, building awareness or ensuring accountability. Clear objectives will guide the selection of appropriate engagement methods and help measure the effectiveness of engagement efforts.
- *Select engagement methods appropriate to the specific stakeholder groups and objectives*: This may include individual interviews, focus group discussions, surveys, workshops, town hall meetings, online platforms or participatory approaches. Use a mix of methods to accommodate diverse stakeholder preferences and ensure inclusivity.
- *Foster opportunities for open dialogue and transparent communication channels for stakeholders to express their views, share information and engage*: Encourage active participation and respect diverse perspectives. Provide opportunities for stakeholders to ask questions, seek clarification and contribute their expertise and experiences. Create a safe and inclusive space for discussion and collaboration.
- *Involve stakeholders in decision-making*: Seek meaningful involvement of stakeholders in decision-making processes related to the programme. This may include involving them in the planning, implementation and M&E stages. Solicit input on key programmatic decisions, policy development, resource allocation, or priority setting. Empower stakeholders to influence the programme's direction and outcomes. Build partnerships and foster collaboration with stakeholders to strengthen the programme's impact. Engage stakeholders in joint planning, resource mobilisation and implementation of activities. Leverage their expertise, networks and resources to maximise programme effectiveness. Promote a sense of shared ownership and collective responsibility among stakeholders.
- *Establish mechanisms for communication and provide regular feedback to stakeholders on the programme's progress, achievements and challenges*: Communicate evaluation findings, results and lessons learnt in a timely and accessible manner. Ensure stakeholders receive updates on how their input has been considered and integrated into decision-making processes.

- *Adapt or tailor engagement strategies to stakeholders' specific context, cultural norms and preferences*: Consider the literacy levels, language barriers and accessibility needs of diverse stakeholder groups. Be sensitive to power and gender dynamics and the potential for marginalisation or exclusion. Ensure that engagement processes are inclusive, equitable and respectful of diversity.
- *Continuously evaluate the effectiveness of stakeholder engagement efforts and learn from experiences*: Seek stakeholder feedback on the engagement process and use it to improve future engagement activities. Reflect on challenges, successes and lessons learnt to refine and enhance stakeholder engagement strategies.

Stakeholder engagement builds trust, fosters collaboration and ensures that programmes are responsive to the needs and aspirations of the communities they serve. By actively engaging stakeholders throughout the programme cycle in this manner, health care providers can strengthen the relevance, effectiveness and sustainability of integrated HIV and NCD management.

Regular reporting and communication

Developing regular reporting and communication processes is critical in M&E. This helps to summarise the findings from programme performance assessments. Analysing data collected through monitoring activities and generating regular reports facilitates evidence-based decision-making and programme improvement. Reports should be concise, accessible and disseminated to relevant stakeholders.

The health care system should develop standardised, electronic reporting tools to ensure effective, high-quality weekly and monthly reporting. The COVID-19 pandemic has exposed many gaps in managing HIV, TB and NCDs, including in reporting systems that restricted travel or movement (Chappell et al. 2023; Karim & Baxter 2022; Mbithi et al. 2021; Roberts et al. 2021; Thekkur et al. 2021). It also exposed the weaknesses of information and communication technology (ICT) that make reporting and communication difficult, especially in rural areas. Therefore, it is essential to strengthen the ICT system to enhance regular reporting and communication. This was supported by studies by Mboweni and Makhado (2020b) and Mboweni and Risenga (2023), which found that poor facility infrastructure, such as ICT, is a serious challenge in implementing HIV, TB and NCD programmes. These reports should be concise, accessible and tailored to the needs of different stakeholders; however, they should be integrated to avoid duplication and waste of resources. Examples include the development of an integrated screening tool and reporting mechanism for HIV, TB, STI, mental health and NCDs. This will effectively communicate

the findings to programme managers, policymakers and relevant stakeholders, facilitating evidence-based decision-making, promoting transparency and fostering accountability. Ongoing reporting and communication can provide real-time and near-real-time data. Real-time data systems can provide instant feedback on key indicators, allowing for timely decision-making and course correction (Barnett et al. 2019; Dunaway et al. 2017; Girsang & Prabowo 2019; Lubell-Doughtie et al. 2013; Wolniak 2023). This can be particularly valuable in rapidly evolving contexts or during emergencies. Reports can be structured with an executive summary, introduction, methodology, findings, conclusions and recommendations. Use graphs, tables, charts or visualisations to present data in a visually appealing and accessible format. Tailor the report to the needs and preferences of different stakeholders. Data analysis and reporting are crucial steps in evaluating programmes in the integrated management of HIV and NCDs. They involve transforming collected data into meaningful information and communicating the findings to stakeholders.

Here are key considerations and approaches for data analysis and reporting:

- Communicate effectively by presenting the findings in an understandable and relevant way to the target audience. Use plain language and avoid jargon or technical terms whenever possible.
- Highlight key findings, trends and significant insights.
- Provide contextual information to help stakeholders understand the implications of the findings.
- Use visual aids, infographics, or storytelling techniques to enhance engagement and comprehension.
- Seek feedback from stakeholders on the findings and recommendations. Engage in discussions to clarify any points of confusion or address additional questions.
- Disseminate the evaluation report widely to relevant stakeholders, including programme managers, policymakers, funders and affected communities. Consider various dissemination channels such as presentations, workshops, webinars, newsletters, or online platforms to reach different audiences.
- Encourage stakeholders to use the evaluation findings for decision-making, programme improvement and policy development.
- Support stakeholders in translating the findings into actionable steps and monitoring their implementation. Foster a culture of evidence-based decision-making and learning from evaluation results.
- Reflect on the evaluation learning cycle's data analysis and reporting process.
- Assess the strengths and limitations of the analysis methods employed. Identify areas for improvement in future evaluations.

- Incorporate stakeholder feedback to enhance the quality and relevance of future data analysis and reporting efforts.

By following these guidelines, one can ensure a rigorous and informative data analysis and reporting process in evaluating programmes in the integrated management of HIV and NCDs. The analysis and reporting phase transforms raw data into valuable insights, enabling evidence-based decision-making and programmatic improvements.

☐ Continuous improvement

Continuous improvement is critical in implementing the integrated programme, data management, reporting and M&E. The use of findings from programme performance assessments informs continuous improvement efforts. Identify areas requiring interventions or adjustments in programme design, implementation strategies, or resource allocation. Implement quality improvement initiatives based on the assessment results to enhance programme effectiveness, efficiency and impact. Scholars affirm that QIP is vital to improving the implementation of the integrated management of HIV, STIs, TB and NCD programmes (Byabagambi et al. 2017; Duffy et al. 2017; Flax et al. 2020; Lebina et al. 2019; Mboweni & Makhado 2020b; Murudi-Manganye et al. 2020; Nigatu 2012; Xiao et al. 2017).

Such projects track prevention, screening, testing, treatment, management, VL suppression, completion rate, and retention in care and they can be used at any level of care. Monitoring progress towards set targets and assessing whether adjustments are needed is a crucial part of M&E. This is achieved by analysing data, conducting trend analysis and comparing progress against targets to identify areas of success or challenge. This information and findings can and must be used to inform programme adjustments, resource allocation and decision-making.

Continuous improvement integrates feedback and learning into routine programme management processes. Feedback mechanisms can be regularly revisited and updated to ensure their relevance and effectiveness. Stakeholders may be encouraged to engage through ongoing feedback loops to maintain open lines of communication. To address emerging challenges and opportunities, health care providers can continuously learn from feedback, adapt strategies and innovate their approach.

By selecting appropriate indicators and setting meaningful targets, stakeholders in the integrated management of HIV and NCDs can effectively monitor progress, assess impact and demonstrate accountability. Indicators and targets provide a roadmap for programme evaluation, guide resource allocation and enable evidence-based decision-making to improve health outcomes.

Identifying gaps and challenges through the monitoring and evaluation process

Gaps and challenges can be identified systematically by collecting and analysing data and M&E, enabling programme managers to make informed decisions and interventions.

Identifying gaps and challenges is essential in M&E for the integrated management of HIV and NCDs. It systematically assesses programme implementation, service delivery and outcomes to identify areas where performance falls short or barriers and challenges exist. By identifying gaps and challenges, stakeholders can take targeted actions to address them and improve programme effectiveness (Bose et al. 2019; Bukachi, Onyango-Ouma & Siso 2014; Matee et al. 2023; Nyamtema 2010; Silvestro 2005; Skivington et al. 2021; Tilahun 2015; Zerfu & Kebede 2013). The steps for identifying gaps and challenges will be further discussed in this section. Figure 8.1 illustrates the steps as an M&E cycle.

Source: Created by Sheillah Hlamalani Mboweni, Lufuno Makhado and Thendo Gertie Makhado.
Key: M&E, monitoring and evaluation.

FIGURE 8.1: Steps for identifying gaps and challenges through monitoring and evaluation.

Review programme objectives and targets

Start by reviewing the programme's objectives and targets. Compare the actual programme outcomes and outputs against the planned targets to identify gaps or deviations (Nyamtema 2010). This helps to identify areas where the programme is not achieving its intended goals or falling short of expectations.

Analyse quantitative data

Analyse quantitative data collected through routine monitoring systems and surveys to identify gaps and challenges (Bose et al. 2019). Look for trends, patterns and variations in the data that may indicate areas of concern. Examine service utilisation, health outcomes and quality-of-care indicators. Identify gaps in coverage, access to services and health disparities among different populations.

Explore qualitative insights

Complement quantitative analysis with qualitative data to better understand the underlying factors contributing to gaps and challenges (Skivington et al. 2021). Qualitative methods, such as interviews, focus group discussions and observations, can help uncover barriers, facilitators and contextual factors affecting programme implementation. Engage with health care providers, programme staff and beneficiaries to gather their perspectives and experiences.

Conduct gap analysis

Conduct a systematic gap analysis to identify areas where there is a difference between the current situation and the desired state (Bukachi et al. 2014). This can involve comparing programme performance against established standards, guidelines or best practices. Identify gaps in service coverage, quality of care, adherence to protocols, resource availability or coordination among stakeholders.

Assess health care system factors

Evaluate health care system factors that may contribute to gaps and challenges in the integrated management of HIV and NCDs (Silvestro 2005). This includes assessing the availability of trained health care providers, access to diagnostic and treatment services, essential medicines, functional referral networks and supportive policies and guidelines. Identify system-level bottlenecks and weaknesses that hinder effective programme implementation.

Engage stakeholders

Involve stakeholders, including health care providers, programme managers, policymakers and community representatives, in identifying gaps and challenges (Zerfu & Kebede 2013). Conduct consultations, workshops or focus group discussions to gather diverse perspectives. Stakeholders can provide valuable insights into the realities on the ground, highlight issues they encounter and suggest potential solutions.

Utilise data visualisation techniques

Utilise data visualisation techniques, such as charts, graphs and maps, to present data in a visually appealing and accessible manner (Matee et al. 2023). Visual representations can help identify patterns, outliers and gaps that may not be immediately apparent in raw data. Visualisation can facilitate a better understanding of complex data and support evidence-based decision-making.

Regularly review and update indicators

Regularly review and update M&E indicators to ensure they capture relevant aspects of managing HIV and NCDs (Tilahun 2015). As the programme evolves and new challenges emerge, indicators may need to be modified or additional indicators added. This ensures that M&E efforts remain aligned with the programme's changing needs and priorities.

By systematically identifying gaps and challenges, stakeholders can gain insights into areas that require targeted interventions and improvements. This process helps inform programme planning, resource allocation and the development of strategies to overcome barriers, enhance service delivery, and improve health outcomes in the integrated management of HIV and NCDs.

Key elements of monitoring and evaluation

Effective M&E serves as the backbone of a successful health care system, particularly in settings where integrated health care for HIV and NCDs is essential. As the health burden in many low- and middle-income countries (LMICs) becomes increasingly dual, marked by the coexistence of infectious and chronic conditions, establishing a comprehensive M&E framework becomes imperative. For integrated HIV–NCD programmes to succeed, they must be grounded in robust data systems that not only track progress and performance but also drive real-time decision-making, accountability and continuous improvement (UN CEPA 2021; WHO 2023, 2025).

Key elements of an M&E framework include precise data collection, reliable data management, secure data handling and actionable data analysis. When executed effectively, these components empower policymakers, health care providers and programme managers to respond to evolving health care needs, allocate resources efficiently and deliver patient-centred care that is both equitable and sustainable. The following section unpacks these key elements, providing a structured approach to ensure that M&E practices in integrated care are evidence-based, ethically sound and strategically aligned with long-term health goals (Synowiec et al. 2023; WHO 2023).

Data collection and management

Establishing robust systems for data collection, ensuring data accuracy, completeness and confidentiality, and using appropriate tools and technologies for data management are essential. Data collection and management are critical components of M&E in integrated HIV and NCD management. Effective data collection and management processes ensure that reliable and relevant information is collected, organised, analysed, quality-controlled and utilised to inform decision-making and programme improvement (WHO 2025; Zhao et al. 2019). This section discusses key considerations and approaches for data collection and management.

Define data needs and indicators

Data needs and indicators that align with programme objectives and goals should be clearly defined. Identify the specific information required to track progress, outcomes and impact. Select indicators that are measurable, feasible to collect and aligned with national or international standards. Ensure data collection efforts focus on capturing the most essential information (Ahonkhai et al. 2012; Liberati et al. 2020; WHO 2023).

Standardise data collection methods

Standardisation of data collection methods is necessary to ensure consistency and comparability of data across different locations and time periods. This can be done by developing data collection tools, such as questionnaires, surveys and checklists, that are clear, concise and user-friendly. Moreover, it is important to train data collectors on how to use the tools correctly to safeguard data quality and reliability (WHO 2025; Xiao et al. 2017).

Train data collectors

Provide comprehensive training to data collectors to ensure they have the necessary skills and knowledge to collect data accurately and consistently.

Train them on the purpose of data collection, the importance of data quality, ethical considerations and specific data collection techniques. Regularly update the training to address emerging issues and improve data collection practices (UN CEPA 2021; WHO 2025).

☐ Ensure data quality

Implementing measures to safeguard data quality throughout the data collection process is crucial in M&E. This includes data validation checks, data cleaning procedures and periodic QA checks. Those managing data collected should verify the accuracy, completeness and reliability of the data. This also includes conducting regular data audits and validation exercises to identify and address data errors or inconsistencies (WHO 2025; Xiao et al. 2017; Zhao et al. 2019).

☐ Use technology for data collection

Leverage technology, such as mobile data collection tools or EHR systems, to streamline data collection processes. Digital platforms can improve data accuracy, reduce data entry errors and expedite data analysis. Explore the use of mobile applications (apps) or web-based platforms to collect real-time or near-real-time data, enabling timely decision-making and responses.

☐ Data security and privacy

Ensure that data collection and management processes adhere to principles of data security and privacy. Protect the confidentiality of individuals and sensitive information. Implement data protection measures, including secure storage, restricted access to data and anonymisation or pseudonymisation of personal identifiers. Comply with relevant data protection regulations and ethical guidelines. Health care providers in each country should comply with their version of data-protection legislation, regulations and policies, such as the *Protection of Personal Information Act 4 of 2013* (PoPIA) (Republic of South Africa [RSA] 2013) in South Africa.

☐ Data analysis and interpretation

Developing a systematic approach to data analysis and interpretation is crucial. This can be achieved by utilising appropriate statistical methods, data visualisation techniques and qualitative analysis to derive meaningful insights from the collected data. Analyse trends, patterns and associations to identify successes, challenges and areas for improvement. This also includes translating data into actionable recommendations for programme management and decision-making (UN CEPA 2021; Synowiec et al. 2023).

☐ Data dissemination and utilisation

Disseminating data to relevant stakeholders in a timely and user-friendly manner is crucial in M&E. The team must prepare reports, dashboards or infographics that summarise key findings. It is also important to tailor information to the needs of different stakeholders, such as programme managers, policymakers, health care providers and communities. To promote data utilisation, the health team and other stakeholders can organise feedback sessions, workshops or meetings to discuss findings and facilitate evidence-based decision-making (McLoughlin & Thoms 2015; Synowiec et al. 2023).

☐ Long-term data management

Establish a long-term data management plan to ensure data sustainability and accessibility. Develop data repositories or databases to store and archive data securely for future reference and analysis. Implement data backup and disaster recovery mechanisms to prevent data loss. Consider data-sharing agreements and collaborations with other relevant stakeholders to maximise the use of data for research and programme improvement (UN CEPA 2021; WHO 2025).

☐ Continuous monitoring and improvement

Continuously monitoring and improving data collection and management processes are crucial in M&E. This can be achieved through regular reviews of data collection methods, indicators and tools to ensure they remain relevant and aligned with programme objectives. This includes seeking feedback from data collectors and users to identify areas for improvement. Incorporating lessons learnt into revised data collection and management protocols can improve the process (McLoughlin & Thoms 2015; Synowiec et al. 2023).

By implementing robust data collection and management practices, programmes in the integrated management of HIV and NCDs can generate reliable, timely and actionable information. This enables evidence-based decision-making, programme improvement and ultimately, better health outcomes for individuals living with HIV and NCDs.

■ Evaluation frameworks

Developing an evaluation framework with clear evaluation questions, methods and timelines provides a structured approach to assessing the impact and effectiveness of integrated management programmes. Developing an evaluation framework is a systematic process that involves planning and designing the evaluation of a programme in the integrated management of

HIV and NCDs. An evaluation framework provides a structure for assessing the programme's effectiveness, efficiency, relevance and sustainability (OECD n.d.; Skivington et al. 2021; Synowiec et al. 2023. The subsections hereunder describe the key steps to develop an evaluation framework.

Clarify the purpose and scope

Clearly define the evaluation's purpose and scope. Determine the specific objectives and questions the evaluation aims to answer. Identify the stakeholders who will use the evaluation findings and consider their information needs. Define the timeframe and boundaries of the evaluation, including the programme components or interventions to be evaluated (OECD n.d.; UN CEPA 2021).

Identify evaluation criteria

Determine the criteria against which the programme will be evaluated. Common evaluation criteria include effectiveness, efficiency, relevance, sustainability and equity. Tailor the criteria to the specific context and objectives of the programme. Ensure that the criteria are measurable and aligned with the programme's goals and desired outcomes (OECD n.d.; Skivington et al. 2021).

Select evaluation methods

Select appropriate evaluation methods to gather data and assess the programme's performance against the identified criteria. This may include quantitative methods such as surveys, programme data reviews or statistical analysis. Qualitative methods such as interviews, focus group discussions or case studies can provide in-depth insights. Consider mixed-method approaches to capture a comprehensive understanding of the programme's impact (Skivington et al. 2021; Synowiec et al. 2023).

Develop evaluation questions

Develop a set of evaluation questions that align with the programme objectives, criteria and methods. Evaluation questions should be SMART. They should address stakeholders' information needs and guide data collection and analysis efforts. Consider both broad overarching questions and more specific sub-questions (Liberati et al. 2020; Skivington et al. 2021).

Define data sources and collection methods

Identify the data sources required to answer the evaluation questions. This may include programme data, surveys, interviews, existing literature or

other relevant sources. Determine the data collection methods, tools and instruments needed to gather the required information. Ensure that data collection processes align with ethical guidelines and data protection requirements (Synowiec et al. 2023; UN CEPA 2021).

Develop a data analysis plan

Outline the data analysis plan, specifying how the collected data will be analysed to answer the evaluation questions. Define the statistical techniques, qualitative analysis methods or data synthesis approaches to be used. Consider any subgroup analyses, data disaggregation or comparative analyses that may be relevant. Ensure that the analysis plan aligns with the evaluation criteria and objectives (Skivington et al. 2021; Synowiec et al. 2023).

Plan for data interpretation and reporting

Develop a plan for interpreting the evaluation findings and reporting the results. Determine how the data will be synthesised, analysed and presented in a meaningful way. Consider the needs of different stakeholders and tailor the reporting format and style accordingly. Outline the key messages, recommendations and actions that will be derived from the evaluation findings (McLoughlin & Thoms 2015; UN CEPA 2021).

Allocate resources

Assess the resources required for the evaluation, including personnel, time and budgets. Determine the expertise required, such as evaluation specialists or data analysts. Allocate resources accordingly to ensure the successful implementation of the evaluation. Identify any potential challenges or limitations that may arise and develop strategies to address them (OECD n.d.; UN CEPA 2021).

Ensure stakeholder engagement

Involve relevant stakeholders throughout the development of the evaluation framework. Seek their input and feedback on the evaluation questions, methods and data sources. Engage stakeholders in interpreting and utilising the evaluation findings to promote ownership and foster the use of evaluation results for decision-making (Mothupi et al. 2020; Skivington et al. 2021).

Monitor and adapt

Continuously monitor the progress of the evaluation process and make necessary adaptations based on emerging needs or challenges. Regularly

review and refine the evaluation framework as new information becomes available or the programme context evolves. Ensure that the evaluation remains responsive and relevant throughout its implementation (McLoughlin & Thoms 2015; Synowiec et al. 2023).

By following these steps, health care providers can develop a comprehensive evaluation framework for the integrated management of HIV and NCDs. The framework will guide the evaluation process, provide a clear structure for data collection and analysis and enable the generation of evidence to inform programme improvement and decision-making (Skivington et al. 2021; Synowiec et al. 2023).

Challenges influencing monitoring and evaluation and mitigation strategies

Monitoring and evaluation processes for integrated HIV and NCD management programmes may face several challenges, including limited resources, data quality issues, and coordination among stakeholders. Strategies such as strengthening data collection systems, investing in capacity-building, fostering collaboration and coordination, and ensuring the sustainability of M&E efforts should be implemented to address these challenges. Some common challenges and mitigation strategies are outlined in this section (UN CEPA 2021; WHO 2025; Zhao et al. 2019).

Limited data availability

In the pursuit of integrated HIV and NCD equitable and accessible health care, the availability of reliable, timely and actionable data remains one of the most persistent and consequential challenges, especially in resource-constrained settings. Limited data availability undermines health care systems' ability to monitor progress, evaluate programme impact and make informed decisions that enhance patient outcomes and system performance. This constraint is often compounded by fragmented data systems, inadequate infrastructure and a lack of trained personnel to support comprehensive data collection and analysis. Addressing these gaps requires a strategic blend of investment in data infrastructure, capacity-building and innovation. By leveraging technology, strengthening stakeholder collaboration and formalising data-sharing mechanisms, health care programmes can overcome critical data limitations and lay the foundation for evidence-driven service delivery. The following pragmatic strategies mitigate data scarcity and foster a culture of data-informed decision-making in integrated care environments (Nyamtema 2010; WHO 2025; Zhao et al. 2019):

- Invest in strengthening data systems by improving data collection, management and reporting systems. Enhance data quality by training and building data collectors' capacity.
- Explore the use of innovative data collection methods that employ technology, such as mobile data collection tools or EHRs, to streamline data collection and improve data availability.
- Engage and foster collaboration with relevant stakeholders to ensure data sharing and availability.
- Establish data-sharing agreements and protocols to facilitate access to necessary data in line with the institution's data management policy or SOPs (Lubell-Doughtie et al. 2013; Nyamtema 2010; WHO 2025).

Insufficient resources

Robust M&E systems are pivotal for the success of integrated HIV and NCD programmes. However, the persistent challenge of insufficient financial and human resources severely impedes their effective implementation, particularly in resource-limited settings. Health care systems grappling with high disease burdens often struggle to allocate sufficient funds and skilled personnel to support comprehensive M&E functions. This limitation undermines the ability to track progress, assess impact and make evidence-informed decisions.

To overcome these constraints, it is essential to prioritise high-impact indicators aligned with programme goals, strategically allocate available resources and invest in building the capacity of M&E personnel. Furthermore, forging partnerships with technical experts and international donors can unlock new avenues of support. By adopting these measures, health programmes can strengthen their M&E frameworks, maximise the use of available resources and ensure accountability and effectiveness despite operational constraints (UN CEPA 2021; WHO 2023). The following points should also be borne in mind when dealing with insufficient resources:

- Prioritise M&E activities by focusing on key indicators and outcomes that align with programme goals and objectives
- Allocate resources based on the importance and feasibility of collecting and analysing data for those indicators
- Build capacity by training M&E staff and programme implementers
- Enhance data collection, analysis and interpretation skills to maximise the use of limited resources
- Leverage partnerships and collaboration with external organisations or experts that can provide technical and financial support for M&E activities
- Seek funding opportunities and grants specifically dedicated to M&E in the health care sector (Collins et al. 2010; UN CEPA 2021).

Poor data quality and reliability

Ensuring the quality, reliability, accuracy and completeness of data presents a significant challenge in many fields. One major concern is the reliability of data, especially when it comes from self-reported sources or relies on retrospective accounts. This type of data can be subject to biases, inaccuracies or incomplete information, which can ultimately affect the validity of the findings. To address these issues, several mitigation strategies can be implemented. These may include using standardised data collection methods, validating self-reported data by cross-referencing with objective sources, conducting QA and providing participants with training to improve the accuracy of their responses. By taking these steps, confidence in the data and the conclusions drawn from it can be enhanced (WHO 2025; Xiao et al. 2017; Zhao et al. 2019):

- Standardisation of data collection by developing transparent and standardised data collection tools and protocols
- Provide training to data collectors to ensure consistent and accurate data collection practices
- Conduct regular data quality assessments through data audits, validations and spot checks
- Identify and address data quality issues promptly to improve reliability
- Incorporate data validation methods by using triangulation techniques by cross-referencing data from multiple sources to enhance data reliability and accuracy (WHO 2025; Xiao et al. 2017).

Limited stakeholder engagement

Engaging stakeholders in the M&E process can pose several challenges, potentially leading to incomplete or biased data. These challenges can arise from a variety of factors, including differing perspectives, communication barriers or varying levels of commitment among stakeholders. To address these issues and improve data quality, several mitigation strategies can be implemented. These strategies may include establishing clear communication channels, fostering a collaborative environment and ensuring that all stakeholders understand the importance of their contributions to the M&E process. Proactively addressing these challenges can enhance the effectiveness and reliability of the evaluation outcomes (Mothupi et al. 2020; Van Hout et al. 2023):

- Involvement and engagement with stakeholders from the beginning in the design and planning of the M&E framework to ensure their ownership and commitment
- Establishing clear roles and responsibilities for stakeholders in data collection, verification and interpretation

- Improving communication and capacity-building. This will foster a culture of participation and collaboration by providing clear communication channels, regular updates and feedback mechanisms
- Building stakeholders' capacity in M&E concepts and methods to enable effective engagement
- Offering incentives or recognition to stakeholders or participants who actively contribute to the M&E process
- Demonstrating the value and impact of their participation in programme improvement and decision-making (Mothupi et al. 2020; Skivington et al. 2021).

Poor or inadequate utilisation of monitoring and evaluation findings

Despite significant investments in M&E frameworks within integrated HIV and NCD programmes, a persistent challenge remains: the underutilisation of M&E findings to shape policy and enhance programme implementation. Far too often, valuable data is collected but fails to translate into meaningful action or strategic decision-making. This disconnect can stem from institutional inertia, limited stakeholder engagement or inadequate communication of results. Bridging this gap requires intentional strategies that embed M&E as a core driver of continuous improvement and adaptive management. It is not enough to generate data; health care systems must cultivate a culture that values evidence as a foundation for learning and action (McLoughlin & Thoms 2015; Synowiec et al. 2023; UN CEPA 2021).

To effectively address this, disconnected health care systems must adopt a holistic M&E approach that prioritises data collection and reporting while actively supporting the translation of evidence into tangible improvements. This can be achieved by implementing a suite of integrated mitigation strategies designed to strengthen the uptake and utilisation of M&E findings across all levels of the health care system. These strategies should foster an organisational culture of learning and responsiveness, enhance the clarity and accessibility of data outputs, promote inclusive stakeholder participation and institutionalise mechanisms that connect data with decision-making. When executed collectively, such measures empower programme managers, implementers and policymakers to draw meaningful insights from M&E processes and act on them with confidence and precision. The following strategies outline key areas of intervention to bridge the gap between data generation and programme enhancement:

- Fostering a learning culture by promoting a learning-oriented environment that values evidence for decision-making
- Encouraging programme managers and stakeholders to embrace a continuous improvement mindset

- Disseminating findings by communicating M&E findings through clear and accessible reports, presentations or dashboards
- Tailoring the communication of findings to different stakeholders, using language and formats that are easily understandable and actionable
- Engaging stakeholders in the interpretation and analysis of M&E findings
- Facilitating discussions and workshops to collectively analyse the data and develop action plans based on the findings (McLoughlin & Thoms 2015; Synowiec et al. 2023).

Lack of alignment between monitoring and evaluation activities with programme goals

Aligning M&E activities with programme goals and objectives is a cornerstone of effective health care system performance. Yet, shifting priorities, fragmented planning and a lack of clearly defined outcomes often compromise this alignment. In complex programmes that integrate HIV and NCD services, the challenge becomes even more pronounced, given the multifaceted nature of interventions, stakeholders and evolving health care needs. When M&E frameworks are misaligned or out of sync with programme objectives, the result is data disconnected from operational realities, undermining the ability to track progress, evaluate impact and inform evidence-based decisions (Liberati et al. 2020; UN CEPA 2021).

To overcome this challenge, it is essential to anchor M&E activities in a structured and responsive framework that is continuously calibrated to programme goals. This requires establishing a comprehensive M&E architecture that defines KPIs, outlines clear reporting pathways and sets parameters for how data will be used to assess effectiveness. Regular reviews of this framework help maintain relevance as programme conditions evolve. Just as importantly, fostering ongoing collaboration with programme implementers and decision-makers ensures that M&E systems remain adaptive, context-specific and strategically aligned. The mitigation strategies below offer targeted approaches to strengthen this alignment, positioning M&E not merely as a data collection exercise, but as a dynamic engine for strategic oversight and programme excellence. The mitigation strategies include:

- Establishing and developing a comprehensive M&E framework that aligns with the programme's goals and objectives
- Clearly defining KPIs, data sources and reporting mechanisms
- Conducting periodic reviews of the M&E framework to ensure its alignment with programme priorities
- Updating and adjusting indicators and data collection methods to capture relevant information, including M&E plans

- Maintaining constant communication, engagement and collaboration with programme managers and stakeholders to ensure that M&E activities remain relevant and responsive to programme needs (Liberati et al. 2020; Skivington et al. 2021; Synowiec et al. 2023).

When these challenges are addressed and implemented appropriately, the mitigation strategies and M&E processes in the integrated management of HIV and NCD programmes can effectively generate reliable data, facilitate evidence-based decision-making and contribute to programme improvement and impact (UN CEPA 2021; WHO 2023, 2025).

Conclusion

The effective management of HIV and NCDs hinges on robust M&E practices. These practices are not just about collecting data. They are crucial for understanding how programmes operate, evaluating their effectiveness and pinpointing areas for improvement. By implementing a systematic approach to M&E, stakeholders can gain valuable insights into the successes and challenges faced by integrated management programmes.

This ongoing assessment enables timely adjustments, ensuring that care for PLHIV and those with NCDs is both responsive and impactful. Moreover, a strong M&E framework fosters accountability among stakeholders, promoting transparency in how resources are allocated and used.

Ultimately, the goal of these measures is to enhance the quality of care and support, leading to improved health outcomes and overall wellbeing for individuals affected by these conditions. When integrated management programmes are carefully monitored and assessed, they can adapt more readily to the needs of the populations they serve, ensuring that patients receive the best possible care tailored to their unique circumstances.

A comprehensive M&E strategy is vital for the integrated management of HIV and NCDs. It not only strengthens current programmes but also lays the groundwork for future initiatives, fostering continuous improvement in health care systems and improving the lives of those affected by these challenges.

Declarations

Ethical considerations

This chapter is based on secondary data sources. No human or animal participants were involved; therefore, it did not require ethical approval.

Consent

Not applicable.

Authors' contributions

Conceptualisation, SH Mboweni, L Makhado and TG Makhado; *data curation*; SH Mboweni and L Makhado; *formal analysis*, SH Mboweni and L Makhado; *funding acquisition*, N/A; *investigation*, SH Mboweni and L Makhado; *methodology*, SH Mboweni and L Makhado; *resources*, SH Mboweni, L Makhado and TG Makhado; *software*, SH Mboweni and L Makhado; *supervision*, L Makhado; *validation*, SH Mboweni, L Makhado and TG Makhado; *visualisation*, SH Mboweni, L Makhado and TG Makhado; *writing – original draft*, SH Mboweni, L Makhado and TG Makhado; *writing – review and editing*, SH Mboweni, L Makhado and TG Makhado.

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Competing interests

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Data availability

No new data were generated.

Disclaimer

The views expressed in this chapter are those of the authors and do not necessarily represent the official views of their affiliated institutions or those of the publisher.

Chapter 9

Innovative technologies and approaches for integrated management of HIV and noncommunicable diseases

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Abstract

This chapter discusses the potential of innovative technologies to revolutionise the integrated management of human immunodeficiency virus (HIV) and noncommunicable diseases (NCDs) within resource-constrained health care settings. It explores the utilisation of electronic health (eHealth) services, including telemedicine, applications (apps) for mobile health (mHealth), and health information and communication systems, as pivotal components of a comprehensive approach to managing HIV and NCDs. The chapter also evaluates the multifaceted challenges and opportunities in implementing these eHealth services within low-resource settings. Key themes explored within this chapter encompass the imperative of community engagement in promoting the acceptance and adoption of digital health care solutions, aligning with insights on community participation and empowerment. Additionally, the chapter underscores the significance of conducting cost-benefit analyses to demonstrate the value and feasibility of digital health care investments. These insights align with the importance of evaluating the impact and cost-effectiveness of digital health care solutions and highlighting best practices. Moreover, this chapter emphasises the critical role of tailored training and capacity-building programmes for health care workers, who are essential to harnessing digital health care tools and addressing skills gaps effectively. These programmes are outlined in the section discussing the need to equip health care professionals with the skills and knowledge to navigate digital health care systems efficiently. Thus, this chapter explores the potential of innovative technologies to improve the integrated management of HIV and NCDs in low-resource settings, highlighting the need for holistic strategies that consider technical, social, cultural and economic dimensions to achieve optimal health care outcomes.

Introduction

Noncommunicable diseases (NCDs), which are frequently managed at primary health care (PHC) level, are more common in ageing populations with human immunodeficiency virus (HIV). Consequently, the coexistence of HIV and NCDs places additional pressure on health care systems, particularly in remote and resource-constrained settings (Cuadros et al. 2024; Murudi-Manganye et al. 2020; World Health Organization [WHO] 2023). This has compelled health care systems to develop innovative ways to manage this situation (Masupe et al. 2019). Such innovation includes the highly recommended integrated

management of dual diagnoses (Adeyemi et al. 2021; Murudi-Manganye et al. 2023). One of the advantages of the integrated management of HIV and NCDs is its ability to provide the patient with a one-stop treatment, including treatment of associated clinical conditions, which are often leading causes of death among patients with dual diagnoses. Furthermore, the integrated management of HIV and NCDs is pivotal in improving targeted health care delivery, especially in developing regions (Cuadros et al. 2024; Murudi-Manganye et al. 2023).

However, there seems to be concern that the integrated management of HIV and NCDs might compromise the successes recorded for HIV management. According to Juma et al. (2018), most of these challenges stem from poor perceptions of the integrated management of a dual diagnosis. Instead, the literature shows that the integrated management of HIV and NCDs can reduce the stigma attached to HIV management, as it is instead seen as any other chronic disease (Jordan & Harrison 2021). Thus, it contributes positively to the management of HIV. In the current era, the integrated management of this dual diagnosis involves utilising innovative technologies, such as eHealth, which encompasses telemedicine, mobile health (mHealth) and electronic health records (EHRs) (Zijlman 2020).

Therefore, in this chapter, the authors explore the role of innovative technologies and complementary approaches in advancing the integrated management of HIV and NCDs, particularly within low-resource settings. While integration is a widely endorsed concept, its success hinges on a health care system's ability to truly bring together the necessary disciplines, services and data systems under a cohesive, collaborative model of care. Without this structural and operational convergence, integration risks become a rhetorical ideal rather than a functional reality.

The chapter examines both the opportunities and challenges in using digital health tools, mHealth, task shifting and multidisciplinary teams to enhance coordination across HIV and NCD care pathways. It further discusses the practical implications and persistent implementation gaps, highlighting that achieving integration requires more than collocating services; it demands institutional alignment, shared accountability and investment in interoperable systems and skilled personnel. By critically assessing these dynamics, the chapter aims to offer actionable insights for strengthening integrated care in resource-constrained environments.

Innovative technologies and other approaches in the management of HIV and noncommunicable diseases

This section explores available innovative technologies and other approaches in the integrated management of HIV and NCDs in low-resource settings. The technologies described in this section include telemedicine, mHealth, EHRs, artificial intelligence (AI) and other emerging approaches.

Telemedicine

Telemedicine is an innovative technology system that provides health care services in situations where distance separates the primary and other levels of care. It incorporates synchronous communication between a health care provider and a specialist physician through electronic audiovisual aids for the purposes of health prevention, health promotion and curative and rehabilitative health care services (WHO 2023). This method of eHealth is widely used in low-resource settings in the integrative management of HIV and NCDs because of the scarcity of specialised personnel in these areas. It is used to improve the quality of health care in low-resource settings through teleconsultations, in which eHealth specialists liaise with health care providers to obtain a second opinion on complex clinical cases (Guinemer 2021; Leone et al. 2021). This enables providers in remote areas to consult with specialist-level colleagues about clients with unfamiliar or complex conditions (Leone et al. 2021). Thus, bridging the gap between PHC settings in low-resource areas and other levels of care. However, although the benefits of telemedicine seem obvious, several authors have cited its downsides, including potential contravention of the *Protection of Personal Information Act 4 of 2013* (PoPIA) (Republic of South Africa [RSA] 2013).

Although the benefits of telemedicine are noticeable, its full rollout has been met with challenges. The challenges of telemedicine are closely associated with its limited success in low-resource settings. Such challenges include:

- *The need for policy regulation in the use of telemedicine*: At present, the absence of explicit telemedicine regulations poses challenges in drafting clear, consistent and applicable standard operating procedures (SOPs) to guide its use (Holčapek, Šolc & Šustek 2023).
- *Mobilisation of human resources*: The successful implementation of mHealth requires dedicated human resources for its implementation, especially given the current shortage of health care professionals. This is because telemedicine consultations take longer than face-to-face consultations (Naves et al. 2021). In addition to mobilising human resources, it would be necessary to continuously capacitate these

educators to ensure they remain up to date with future developments. According to Sokhela (2024, p. 88), '[s]upportive supervision by PHC supervisors is an important role that assists health care workers in rendering quality health care, resulting in good health outcomes, and this strengthens the health care system'.

- *Mobilisation of financial and non-human resources*: Adequate financing is a critical enabling factor for the successful implementation of telemedicine, as it underpins human capacity development and the acquisition, development and maintenance of material and technological infrastructure (Yadav et al. 2022). Key infrastructural requirements include reliable internet connectivity, computers, smartphones, appropriate and affordable software platforms and ongoing technical support (Naves et al. 2021). However, in many low-resource settings, technological infrastructure remains inadequate, with persistent challenges of poor connectivity, limited access to digital devices and insufficient system maintenance.
- *Potential breach of privacy and data security*: Despite its benefits, telemedicine presents challenges related to patient privacy and data security. Digital health platforms are vulnerable to cyberthreats, including unauthorised access and data breaches, which may compromise confidential patient information. These risks highlight the need for robust data protection measures, secure digital systems and clear regulatory frameworks to safeguard patient privacy and maintain trust in telemedicine services.

Therefore, to mitigate this risk, investments in internet security, such as firewalls, phishing training, continuous internet safety awareness, multi-factor authentication (MFA) and password managers, are needed.

Mobile health

With the increased accessibility of mobile technology, both clients and health care providers can theoretically communicate regardless of distance. Consequently, the widespread availability of mobile phones and technological infrastructure has improved the viability of mHealth within the health sector compared to previous years (Eilu 2018). This implies that the accessibility of mobile phones can significantly improve health care systems and clinical outcomes (Sheik et al. 2016). By definition, mHealth utilises mobile phones or other portable digital devices to deliver and receive health-related services and information (Bhandari et al. 2021; Kiplagat et al. 2023). In the case of clients living with HIV and NCDs, such communication would include appointment reminders, lifestyle modification messages, health education messages, patient tracking and, at times, direct communication between patients and their health care providers (Zijlman 2020). This communication is intended to contribute positively to treatment uptake and retention in care.

A study by Bhandari et al. (2021) on mHealth found excellent acceptability among both patients and health care providers. Mobile health interventions are generally more accessible and cost-efficient than other digital health approaches, as they can operate on basic mobile devices and do not necessarily require advanced technical skills (Bhandari et al. 2021). However, their ability to meet patients' needs in a timely and effective manner is highly dependent on multiple factors, including reliable network connectivity, user digital literacy, language and cultural appropriateness, responsiveness of health care providers and integration within existing health care systems. Furthermore, the literature shows that mHealth can improve treatment adherence and viral suppression, especially when messages are tailored to patients and delivered in their language (Kiplagat et al. 2023). Customised messages make patients feel the message is directed to them rather than a general communication, which can sometimes feel impersonal.

Recent discussions about implementing mHealth in low-resource settings have highlighted two significant challenges: unstable network connectivity and privacy concerns:

- *Unstable network connectivity* is a significant barrier in many regions, particularly in underdeveloped areas. For instance, certain areas in South Africa face a complete lack of network coverage, preventing users from making calls or sending text messages. This situation arises from insufficient network towers and an unreliable electricity supply (Agbeyangi & Suleman 2024). Inconsistent connectivity not only disrupts communication but also diminishes the effectiveness of mHealth solutions that rely on stable networks to function properly.
- *Privacy concerns* present another significant threat to the successful implementation of mHealth. The broader discourse surrounding telemedicine underscores the risks of breaches in patient privacy and confidentiality. Vulnerabilities to hacking and unauthorised access can erode the trust that patients place in these health technologies. Such breaches could have serious consequences for patient safety and the integrity of health data (Duthely & Sanchez-Covarrubias 2020; Junker, Böhm & Krcmar 2024). In conclusion, while mHealth offers promising opportunities to improve health care access, it is essential to address the interconnected challenges of network reliability and data privacy protection. Only by overcoming these obstacles can one ensure the sustainable implementation of mHealth solutions in low-resource environments.

Artificial intelligence in integrated HIV and noncommunicable disease management

Artificial intelligence is increasingly being explored as an innovation to support integrated HIV and NCD management, particularly in

resource-limited settings where health care systems face diagnostic, operational and human resource constraints (Obi et al. 2024; Oladipo et al. 2024). Artificial intelligence systems incorporating machine learning, predictive analytics and digital automation have demonstrated potential to support data-driven health care delivery by improving risk stratification, decision support and programme monitoring rather than replacing clinical judgement.

Emerging evidence suggests that AI-based predictive models can assist in the early identification and management of NCDs and comorbid conditions among people living with HIV (PLHIV). For example, predictive modelling approaches using routinely collected clinical and demographic data have been applied to identify individuals at increased risk of hypertension, diabetes and cardiovascular complications, enabling targeted and proactive interventions (Eling 2025; Oronti 2023). These applications (apps) primarily support patient stratification and care planning, helping reduce the burden on overstretched PHC systems.

In the context of HIV programme monitoring and evaluation (M&E), AI has been applied to integrate fragmented data sources, including EHRs, laboratory information systems and mHealth platforms. This integration supports improved accuracy, timeliness and near-real-time monitoring of patient outcomes, viral load (VL) trends, drug resistance and service utilisation, thereby strengthening the health care system's responsiveness (Tshimula et al. 2024).

Artificial intelligence-driven decision-support tools have also demonstrated clinical utility in diagnostic support, particularly through automated image recognition and pattern analysis. Such apps have been used to assist in detecting tuberculosis (TB)-related lung abnormalities on chest radiographs, diabetic retinopathy and cardiovascular anomalies, especially in settings with limited access to specialist care (Daramola et al. 2021). In addition, AI-supported laboratory platforms are improving the efficiency and reliability of diagnostic processes for communicable diseases, including HIV, and NCDs by providing clinicians with faster feedback (Obi et al. 2024).

Despite these advances, the implementation of AI in integrated HIV and NCD care remains constrained by infrastructural limitations, data governance challenges and ethical considerations, including concerns about data privacy, algorithmic bias and inequitable access to technology (Oladipo et al. 2024; Pasipamire & Muroyiwa 2024; WHO 2021a). As such, scholars emphasise the need for phased, context-sensitive implementation approaches, beginning with pilot initiatives in well-resourced settings before broader scale-up (Daramola et al. 2021; Oladipo et al. 2024). When strategically and ethically implemented, AI can function as an enabling tool

to enhance diagnostics, monitoring and health care system efficiency within integrated HIV and NCD programmes.

Electronic health records

Electronic health records are crucial in enhancing the integrated management of HIV and NCDs through cutting-edge technologies. The effectiveness of such management greatly hinges on the accuracy and availability of patient health records (HRs). These records must be readily accessible to health care providers at every level of care to ensure seamless continuity of patient treatment. Consequently, the adoption of EHRs becomes imperative in health care systems.

Electronic health records come in various forms and functionalities tailored to specific health care contexts (Zijlman 2020). In South Africa, a notable EHR system is TIER.Net (by TIER.Net Technologies). This health information system serves as a repository for comprehensive patient data, particularly for individuals receiving antiretroviral therapy (ART), regardless of concurrent NCDs (Jacob et al. 2020). Importantly, this system is designed to be easily accessible across all levels of patient care, ensuring that health care providers have the information needed to make informed decisions about patient treatment.

Electronic health record systems like TIER.Net in South Africa facilitate the efficient and effective management of patients with HIV and NCDs. They enable health care providers to track and monitor patients' medical histories, treatments and outcomes, ultimately improving health care delivery and patient outcomes. This underscores the significance of EHRs in modern health care systems, where seamless information exchange is paramount for delivering high-quality, integrated care (Jacob et al. 2020; Zijlman 2020).

The challenges faced in low-resource health care settings extend beyond just unreliable infrastructure; they also encompass the inherent complexities of EHR systems (Agbeyangi & Suleman 2024). For instance, in South Africa, persistent instability in the electricity supply not only disrupts daily operations but also severely limits health care providers' ability to access crucial patient HRs. This lack of reliability compromises the continuity of care, leaving both patients and health care professionals in a precarious situation (Coleman, Herselman & Coleman 2012).

Moreover, the intricacies of the EHR systems themselves add another layer of difficulty. These systems are often burdensome and inefficient, requiring significant time and effort to navigate, especially when managing a high volume of patient HRs daily. As health care workers (HCWs) struggle to input and retrieve information, the risk of errors or incomplete documentation rises significantly. This situation is particularly perilous in emergencies, where every

second counts. Delays in accessing vital patient information because of system malfunctions can have dire consequences, potentially jeopardising patient lives and undermining trust in the health care system (Arikan et al. 2022).

Together, these challenges highlight the structural constraints on health care delivery in resource-limited settings, particularly regarding electricity reliability and digital infrastructure. Resilience measures may include solar or backup power systems, battery-supported devices, offline data capture and asynchronous data synchronisation. These measures can enable digital health and mHealth platforms to function more reliably in settings with intermittent electricity and network connectivity (Agbeyangi & Suleman 2024; Chib, Van Velthoven & Car 2015; WHO 2024). While the full potential of digital records and mHealth systems has yet to be realised, these adaptive strategies signal a growing commitment to building resilient, sustainable digital health solutions that can support continuity of care and improve patient outcomes over time.

Supplementary innovative approaches

Besides technologies, other innovative approaches for the integrated management of HIV and NCDs include developing policies and guidelines that support service integration, strengthening the health care system's capacity and infrastructure, training and empowering health workers and community health agents, and engaging patients and communities in the prevention and control of both conditions. These approaches can benefit resource-constrained contexts such as South Africa, where the dual burden of HIV and NCDs poses a challenge to the health care system and the population. The WHO (2023) provides guidance on integrating NCD prevention into HIV, TB and sexual and reproductive health (SRH) programmes to enhance health services and expand access to NCD care. Moreover, some studies have reviewed the existing policies and plans for the integrated management of HIV and NCDs in East Africa. They found that some countries have already taken steps towards integrating NCD care into HIV programmes, mostly by adopting person-centred differentiated delivery of services for PLHIV (Adeyemi et al. 2021; Murudi-Manganye et al. 2020). These studies highlight the need for close M&E of the integrated programmes and addressing the barriers and challenges that may hinder their implementation and effectiveness.

Support for HIV and noncommunicable diseases

To ensure better health outcomes for patients dealing with the dual diagnosis of HIV and NCDs, it is imperative to provide integrated support.

Integrated support involves the seamless coordination of care for these two conditions. Research has demonstrated that modern communication tools and platforms, such as mobile phones, text messages, mobile apps and even social media, play a crucial role in delivering this support to patients facing the challenge of dual diagnosis (Stokes et al. 2022). Through these various communication mediums, integrated support is realised in two key ways, *information sharing* and *adherence counselling* (Sheik et al. 2016; Stokes et al. 2022).

Information sharing involves providing patients with vital health education regarding the integrated management of both HIV and NCDs. This education equips patients with knowledge about their conditions, treatment options and lifestyle modifications necessary for better health. For instance, patients can receive periodic reminders for clinic appointments, guidance on lifestyle modifications to improve overall wellbeing, and information on when to consult a physician (Stokes et al. 2022).

The significance of this integrated support cannot be overstated. Managing both HIV and NCDs concurrently can be overwhelming for patients because each condition often requires different approaches to care. Integrating support across various communication channels helps patients navigate this complex health care landscape and empowers them to take charge of their health.

Thus, using modern communication media, as highlighted by Stokes et al. (2022), helps bridge the gap in health care for patients dealing with HIV and NCDs. It facilitates information dissemination and adherence counselling, ultimately enhancing the quality of care and health outcomes for individuals facing the dual challenge of these two conditions (Sheik et al. 2016; Stokes et al. 2022).

Opportunities for using innovative technologies in improving integrated management in low-resource settings

Opportunities for utilising innovative technologies to enhance the integrated management of HIV and NCDs are explored in this section. The explored opportunities are flexibility, cost-effectiveness, ease of use and privacy.

Flexibility

The flexibility offered by innovative technologies is pivotal in addressing the scarcity of expert clinicians, particularly in resource-limited settings. This flexibility means that clinicians' expertise can extend far beyond

geographical boundaries. Consequently, innovative technologies enable patients in low-resource areas to access clinical services previously available only in well-resourced regions (Jarva 2024). In the context of integrated management of HIV and NCDs, this flexibility is crucial. This is because comprehensive care for these conditions often requires periodic interventions by expert clinicians, typically in secondary or tertiary hospitals kilometres away from PHC facilities where patients initially seek care and treatment.

Innovative technologies bridge this geographical gap, allowing remote consultations and expertise to be readily available to patients in underserved areas (Eilu 2018). Furthermore, these technologies enable efficient communication with multiple patients concerning their clinical conditions, without requiring them to travel to health care facilities. This is particularly significant in managing chronic conditions like HIV and NCDs, where timely information and guidance can make a substantial difference in patient outcomes (Kiplagat et al. 2023). Thus, the flexibility afforded by innovative technologies is a game-changer in health care, especially for patients in low-resource settings. It extends the reach of expert clinical services, reduces the burden of travel for patients and enhances communication, all of which are vital components in the integrated management of complex health conditions like HIV and NCDs (Eilu 2018; Kiplagat et al. 2023).

Cost-effectiveness

Low-resourced settings are primarily inhabited by indigent households and, to some extent, lack expert clinical services because of the costs involved in outsourcing and retaining expert clinicians within their health care facilities. As a result, innovative technologies bridge the gap between cost-containment and providing expert clinical services to patients with a dual diagnosis of HIV and NCDs in low-resource settings. Innovative technologies are cost-effective and efficient in diagnosing and managing HIV and NCDs (Adeyemi et al. 2021). Cost-effectiveness mainly stems from the use of zero-rated mobile apps, short message services or pre-recorded voice calls. Furthermore, the cost-effectiveness of innovative technologies in managing HIV and NCDs is achieved by reducing travel costs to and from health institutions (Eilu 2018). This is particularly important because most people diagnosed with HIV and NCDs in low-resource settings are indigent. Therefore, innovative technologies enable patients to access the same quality of integrated care wherever they are, without being hindered by cost, distance or transport availability. The ability of innovative technologies to reduce costs and improve the management of HIV and NCDs is not only related to patient care. When using innovative technologies, the health care system saves on the inconvenience and compensation costs of expert clinicians who would have travelled to low-resource settings to render care to patients.

Ease of use and privacy

One of the greatest barriers to achieving buy-in from people in low-resource settings in terms of innovative technologies for improving the integrated management of HIV and NCDs could be the language used. While some patients may already perceive innovative technologies as unfamiliar or intimidating, language barriers can further hinder their effectiveness, particularly in low-resource settings where access to digital literacy support is often limited. Therefore, an opportunity for using innovative technologies in the integrated management of HIV and NCDs is to use the local language (Bhandari et al. 2021; Kiplagat et al. 2023). This can contribute to their acceptability and adoption by patients with HIV and NCDs in low-resource settings. Furthermore, customised messages ensure confidentiality and privacy, as they are personal to the patient (Laranjo et al. 2015). In addition, mobile phones, the main components of innovative technologies in managing HIV and NCDs, are widely available, popular and portable (Laranjo et al. 2015). They are often easy to use and offer privacy, as users can be authenticated by entering a password or PIN before gaining access.

Challenges of innovative technologies in improving integrated management of HIV and noncommunicable diseases in low-resource settings

While the benefits of using innovative technologies to improve the integrated management of HIV and NCDs in low-resource settings are acknowledged, this approach has its challenges. This section explores technical challenges, the potential for excluding some patients, and the quality of information in health care system records.

Technical challenges

Issues related to technical challenges remain a stumbling block in using innovative technologies to improve the integrated management of HIV and NCDs in low-resource settings. Such technical challenges include, among others, connectivity problems and technological illiteracy (Bhandari et al. 2021; Mishra et al. 2019). While some technological resources might be available, they are sometimes inappropriate or not fully functional. This negatively impacts the full adoption of innovative technologies in improving the integrated management of HIV and NCDs.

Potential for the exclusion of some patients

Although mobile phone access has increased substantially, high household ownership should not be equated with universal access to the devices, connectivity, digital literacy and financial resources required for digital health interventions. In South Africa, 96.1% of households owned at least one mobile phone in 2023, but significant differences remained in the availability of fixed and mobile internet services across geographic and socioeconomic settings (Statistics South Africa 2024). Consequently, some patients may remain excluded because of limited device ownership, unreliable connectivity, unaffordable data or insufficient digital skills (Chib et al. 2015; Oduor et al. 2019).

Quality of information in health care systems records

The quality of information in health care systems is critical in ensuring proper diagnosis and treatment of any patient, including patients diagnosed with HIV and NCD. However, one of the challenges of using innovative technologies to improve integrated management of HIV and NCDs is the poor credibility of recorded information in the health care system's records. These include illegible data, incomplete records and, at times, incorrect information, because, despite the system's reliability, data entry is still performed by a human being (Jacob et al. 2020). Therefore, human error can compromise data integrity and negatively influence the integrated management of HIV and NCDs.

Practical implications and gaps in technology-driven integrated HIV and noncommunicable disease care

This section examines the practical implications of the innovative technologies discussed in this chapter and highlights the identified gaps. These gaps challenge the already burdened health care system, particularly in low-resource settings. Understanding these implications and challenges is essential for developing strategies to improve the integrated management of HIV and NCDs.

Comprehensive exploration of innovative technologies and quality of care

The rapid advancement of digital health technologies presents promising opportunities to enhance the quality of care for PLHIV and NCDs. Key

innovations include telemedicine, mHealth and EHRs, each offering distinct benefits to improve access, adherence and continuity of care.

Telemedicine facilitates remote consultations, diagnosis and treatment through phones or computers, reducing geographic and logistical barriers for patients requiring regular follow-up or specialist input (WHO 2010). Mobile health tools, such as smartphones and wearable devices, support self-monitoring, medication adherence and access to educational content (WHO 2017). Electronic health records digitise patient histories and treatment data while improving coordination, safety and decision-making across providers (Blumenthal & Tavenner 2010).

Together, these technologies support patient-centred, data-driven care, particularly for chronic conditions. However, limitations remain. Laboratory-based diagnostics, such as blood pathologies, still require physical visits to local health care centres. Additionally, technical barriers (e.g. poor infrastructure and data security), organisational gaps (e.g. insufficient training), and sociocultural factors (e.g. digital illiteracy and trust issues) may hinder uptake (Altman, Huang & Breland 2018). Ethical concerns also persist, such as diminished patient–provider rapport in telehealth or potential breaches of confidentiality in EHR systems (Li et al. 2024).

While digital health tools offer transformative potential, their integration into HIV and NCD care requires thoughtful implementation strategies that consider equity, access and ethical safeguards.

Patient monitoring

Telemedicine has become a pivotal tool for patient monitoring, particularly in resource-constrained settings (Guinemer et al. 2021). It enables real-time remote consultations, allowing health care providers to track patients' clinical progress, monitor vital signs, and detect early deviations from treatment plans, all without the need for constant physical attendance (Zijlman 2020). In addition to reducing travel burdens, telemedicine empowers patients by offering access to their health data and personalised feedback (Kvedar, Coye & Everett 2019).

However, laboratory diagnostics remain an important limitation of fully remote care models. Blood chemistry, viral-load monitoring and NCD-related laboratory investigations, such as glycated haemoglobin (HbA1c) and lipid profiles, still require physical specimen collection. Point-of-care diagnostics, community-based specimen collection and mobile laboratory units can help decentralise selected diagnostic services. South African studies have demonstrated the feasibility of using mobile units equipped

with GeneXpert technology for community-based TB screening, although costs, diagnostic yield and the selection of appropriate high-burden settings require careful consideration (Bassett et al. 2019; Cassim et al. 2021).

In this hybrid model, telemedicine complements onsite sample collection by ensuring that laboratory results are digitally transmitted to clinicians, who then interpret findings and liaise with patients via mobile platforms, SMS or community health care worker (CHCW) follow-up. Integration with EHRs enables seamless information flow and supports timely, patient-centred interventions (Bashshur et al. 2016). Ultimately, bringing the laboratory to the patient, through mobile units or community-based phlebotomy, ensures the clinical integrity of remote monitoring while preserving the efficiencies of virtual care.

Personalised care

Mobile health apps, or mHealth, are an emerging and complementary approach for delivering personalised support and continuity of care to patients living with HIV and NCDs. Rather than replacing face-to-face interactions with health care professionals, mHealth technologies extend the reach of clinical care by providing timely, individualised assistance when patients are away from health facilities or between scheduled appointments. These tools empower patients to actively participate in managing their health while remaining connected to their care teams.

Mobile health platforms offer several key benefits:

- Tailored health education, lifestyle modification guidance and medication reminders that reinforce treatment adherence and promote ongoing patient engagement (Bhandari et al. 2021; Kiplagat et al. 2023)
- Bidirectional communication and feedback between patients and health care providers, enabling patients to clarify concerns and supporting timely responses within appropriately designed digital health interventions (Bhandari et al. 2021; Kiplagat et al. 2023; Li et al. 2024)
- Real-time data collection and analysis on patient outcomes, behaviours and preferences, which can inform the design of more adaptive, personalised and responsive care strategies (Wang et al. 2019).

By providing such support, mHealth apps supplement traditional care and improve patients' ability to manage their conditions in their own space and time, especially when direct interaction with a nurse or doctor is not possible. This hybrid model of human and digital care can enhance quality of life (QoL), strengthen continuity of care, and improve health outcomes for individuals living with HIV and NCDs.

Data analytics

Electronic health records are a crucial component of the integrated management of HIV and NCDs. Electronic health records enable the collection and processing of large volumes of patient data, providing valuable insights to improve the quality and efficiency of health care services (Jacob et al. 2020; WHO 2017). Electronic health records can support various functions, such as screening and diagnosis, risk stratification, treatment monitoring, adherence support, referral, follow-up and outcome evaluation (Chen et al. 2004; Kostkova et al. 2016). By using EHRs, health care providers can tailor interventions and treatment plans to the specific needs and preferences of patients or groups with similar characteristics (Porsdam Mann, Savulescu & Sahakian 2016). Electronic health records can also facilitate the generation and dissemination of evidence-based guidelines and policies for HIV and NCD care, as well as the assessment of their impact on health outcomes and costs (Gausi et al. 2021; Shayo et al. 2023). However, implementing and using EHRs also involve significant challenges, such as ensuring data security, privacy, interoperability and standardisation, as well as addressing ethical, legal and social issues (Kostkova et al. 2016; Porsdam Mann et al. 2016). Therefore, adopting a holistic and participatory approach to the development and deployment of EHRs, involving all relevant stakeholders, and considering local context and needs are essential (Kostkova et al. 2016).

Complexities of implementing advanced technologies in resource-constrained settings

Implementing advanced technologies in health care settings that face resource constraints presents several formidable challenges. One primary obstacle is insufficient infrastructure, including a reliable electricity supply, internet connectivity and data security. These issues can significantly impact the effectiveness, user-friendliness and viability of digital health care solutions. Additionally, they can impede the seamless integration of these technologies with existing health information systems (Chib et al. 2015; Mechael et al. 2010).

Another substantial challenge concerns the sociocultural context, which influences the acceptance and utilisation of digital health care solutions by health care providers and patients. Digital interventions may also create concerns about privacy, confidentiality, informed consent and the handling or ownership of health data, particularly where devices are shared or health information is transmitted electronically. These considerations highlight the importance of aligning technological innovation with local values, legal frameworks and ethical principles (Chib et al. 2015; Kostkova et al. 2016; RSA 2013; WHO 2021a).

Moreover, the successful implementation of advanced technologies requires a conducive policy environment and effective coordination and collaboration among various stakeholders. These stakeholders may include government agencies, donors, non-governmental organisations (NGOs) and private sector partners. Nevertheless, achieving alignment in policies and strategies can be obstructed by competing interests, power dynamics and institutional obstacles (Labrique et al. 2013; WHO 2017).

Hence, implementing advanced technologies in resource-constrained health care settings requires a comprehensive, participatory approach that considers the intervention's technical dimensions and social, cultural and political aspects. Furthermore, it is imperative to conduct thorough evaluations assessing the impact and cost-effectiveness of digital health care solutions on health outcomes and the performance of health care systems. This process should also identify best practices and draw valuable lessons from diverse contexts and settings (Braa, Monteiro & Sahay 2004; Qiang et al. 2011).

Infrastructure challenges

One of the primary impediments to digital health care initiatives in resource-limited environments is inadequate infrastructure, including limited internet connectivity and unreliable power supply. These challenges can significantly impact the quality and accessibility of digital health services, encompassing vital components such as telemedicine, EHRs and mobile health apps (Al-Shorbaji 2022).

To overcome these obstacles effectively, digital health initiatives must collaborate with relevant stakeholders, including prominent organisations such as the WHO. The WHO (2024) can play a pivotal role by providing technical support and essential equipment to address infrastructure deficiencies in low-resource settings. For instance, the WHO (2021b) initiated a global strategy for digital health spanning the years 2020–2025. This strategy was designed to assist nations in formulating and implementing digital health solutions that align closely with their unique health care priorities and requirements.

Through partnerships with the WHO, digital health projects can leverage the organisation's wealth of expertise, adherence to global standards and access to valuable resources. Moreover, these collaborations can make a meaningful contribution to the overarching global objectives of achieving universal health coverage (UHC) and fulfilling the United Nations' (UN) Sustainable Development Goals (SDGs), as outlined in the *2030 Agenda for Sustainable Development* (Mishra et al. 2019; UN 2015; WHO 2022).

Training and capacity-building

One notable hurdle encountered when implementing digital health care systems in resource-constrained settings is the shortage of adequate training and capacity-building opportunities for HCWs tasked with utilising these systems. In many instances, these health care professionals may lack the skills and knowledge required to operate these systems effectively and efficiently, thereby posing a potential risk to the quality and safety of patient care (Bhandari et al. 2021; Frontoni et al. 2019).

Hence, it becomes imperative to conceive and deliver training programmes that are thoughtfully tailored to cater to the specific needs and contextual nuances of these resource-limited settings. These programmes should aim to bolster HCWs' competence and confidence in navigating digital health care systems. Collaborative efforts with universities and health care institutions possessing expertise and experience in digital health care systems can facilitate such training initiatives. These partners can contribute by providing essential technical support, aiding in curriculum development, and evaluating the outcomes of the training programmes (Bhandari et al. 2021).

For instance, consider a training programme implemented for CHCWs in rural India. This programme leveraged a mobile application to deliver interactive modules focused on maternal and child health. The programme included assessments through quizzes and feedback mechanisms to gauge the effectiveness of the learning process (Bhandari et al. 2021). Similarly, a training programme for nurses in Nigeria harnessed a web-based platform to offer online courses focusing on digital health literacy, data management and telemedicine (Frontoni et al. 2019).

By investing in training and capacity-building initiatives, digital health care systems can enhance sustainability and maximise their impact within low-resource settings. However, it is essential to acknowledge the practical implications and challenges associated with these endeavours. Factors such as the availability and accessibility of Internet connectivity, electricity and requisite devices can significantly influence the delivery and uptake of training programmes. Considerations surrounding cultural and organisational influences that shape HCWs' attitudes and behaviours regarding digital health care systems must be duly addressed. Additionally, the ethical and legal complexities of data privacy, security and ownership necessitate careful resolution. Consequently, training and capacity-building programmes should extend beyond technical competencies and encompass the cultivation of soft skills such as effective communication, teamwork, problem-solving and critical thinking.

Community engagement

One of the complexities of implementing digital health care solutions is ensuring their acceptance and integration within the local community. A pivotal strategy to address this challenge involves community engagement. This process entails cultivating awareness and establishing trust among prospective users of these innovations, in line with the insights offered by Oduor et al. (2019). As emphasised by Oduor et al. (2019), outreach initiatives designed to educate patients and community members about the advantages of digital health care can effectively overcome barriers, such as a lack of knowledge, skills or confidence in using these technologies. Furthermore, local health care professionals and community leaders assume pivotal roles in these endeavours, serving as intermediaries, facilitators and advocates for the adoption of digital health care within their respective communities. Through robust community engagement, digital health care initiatives can ensure responsiveness to the distinct needs, preferences and values of the individuals they aspire to serve.

Beyond increasing acceptance, community engagement profoundly improves the quality and effectiveness of digital health care solutions. This enhancement is achieved through the active involvement of end-users in the design, planning, implementation and evaluation phases of these interventions, in line with the findings of De Weger et al. (2018). This collaborative approach helps tailor solutions to the local context, cultural dynamics and available resources, while also identifying and mitigating potential challenges and risks. Moreover, community engagement fosters a sense of ownership and empowerment among users, fostering greater satisfaction and adherence to digital health care solutions, as underscored by the White House Office of Science and Technology Policy (OSTP 2022).

However, it is essential to acknowledge that community engagement cannot employ a one-size-fits-all model. It necessitates a nuanced consideration of each intervention's goals, methods and outcomes. Distinct levels and forms of engagement may be suitable for varying scenarios and stakeholders. For instance, specific interventions may seek to inform or consult with the community. In contrast, others aim to collaborate or co-create with them, following the guidance provided by Aguilar-Gaxiola et al. (2022). Additionally, some interventions may employ digital technologies to facilitate or augment community engagement, while others utilise community engagement to promote or support digital technologies, in alignment with the Healthcare Information and Management Systems Society (HIMSS) (2021). Thus, an adaptable and flexible approach to community engagement is essential, tailored to each digital health care initiative's specific objectives and contextual nuances.

Cost-benefit analysis

One of the pivotal steps in the strategic planning and implementation of digital health care solutions involves conducting an appropriate economic evaluation. Such evaluation systematically compares the costs and consequences of alternative interventions and may include cost–benefit, cost-effectiveness or cost–utility analysis, depending on the decision being addressed. In cost–benefit analysis, both costs and benefits are expressed in monetary terms, whereas cost-effectiveness and cost–utility analyses compare costs with health outcomes measured in natural or preference-based units. Applying these methods can help decision-makers determine whether anticipated improvements in access, quality and operational efficiency justify the resources required to develop, implement and maintain a digital health intervention (De la Torre-Díez et al. 2015; Drummond et al. 2015).

Economic evaluations should consider both short- and long-term costs and consequences, including implementation, maintenance, training, infrastructure, hospital utilisation, patient outcomes and access to preventive services. Although some digital health interventions may generate favourable economic outcomes, conclusions regarding cost-effectiveness should be based on context-specific evidence and methodologically robust evaluations rather than an assumption that long-term benefits will necessarily outweigh initial costs (De la Torre-Díez et al. 2015; Mistry, Garnvwa & Oppong 2014).

Recommendations for innovative technologies and approaches for integrated management

It is apparent that the health care system, like many other spheres of life, is gradually migrating to technology-based systems. While this is true, we cannot ignore that readiness to adopt these innovative technologies remains a significant challenge in low-resource areas. To support the feasibility of adopting innovative technologies in low-resource areas, three recommendations are made hereunder.

Firstly, the district, provincial and national levels of the South African National Department of Health (NDoH) should jointly establish a directive for the implementation and governance of innovative technologies within the health care system. This directive should oversee the development of policies that govern innovative technologies within the health care system. Some policies may include ethics related to innovative technologies and policies on data use, with greater emphasis on zero-rated or subsidised innovative technologies. This is paramount, given technological

advancements and the increased risk of information leaks from Internet fraud. In addition, the directive should be responsible for managing a database that stores all patient information in case of localised system crashes or data loss and to ensure continuity of care. Furthermore, decision-makers at the district, provincial and national levels of the health care system should consider conducting innovative technology workshops, which should be reinforced by allocating continuous professional development (CPD) points. These workshops will go a long way in ensuring that health care providers are capacitated.

Secondly, higher education institutions should incorporate innovative technologies in the curriculum for their undergraduate health care sciences programmes. This can be achieved by incorporating innovative technologies into health information system modules and making them mandatory across health sciences education. This will help ensure that the new generation of qualified health care professionals is conversant with innovative technologies for managing NCDs and HIV.

Thirdly, it is recommended that clients with dual diagnoses of NCDs and HIV should be consulted when moving towards the use of innovative technologies for integrated management. This will be achieved through continuous education on the need to introduce innovative technologies for integrated management. Such benefits are discussed in earlier sections of this chapter. Furthermore, since these innovative technologies are discussed in the context of low-resource areas, the affordability and accessibility of such services should be taken into consideration. To address these issues, innovative technology services for integrated management can be subsidised, zero-rated or delivered via asynchronous platforms.

Conclusion

This chapter explored innovative technologies in low-resource settings to improve the integrated management of HIV and NCDs. Integrated support for HIV and NCD dual diagnoses, the opportunities and challenges for using innovative technologies and other approaches, and the practical implications have been investigated. Gaps in health care were identified related to innovative technologies and other approaches to improve the integrated management of HIV and NCDs. Using innovative technologies and other innovative approaches greatly influences the health care system. This includes the management of HIV and NCDs.

Although innovative technologies and approaches offer significant potential to enhance the integrated management of HIV and NCDs, their widespread implementation remains challenging, particularly in low-resource settings where infrastructure, training and accessibility gaps persist. These challenges include, but are not limited to, connectivity

problems, technology illiteracy and sometimes poor-quality information entered into a system. These can negatively impact the quality of the intended services. Nevertheless, this chapter suggests that these innovative technologies and other approaches to improve integrated management of HIV and NCDs are effective and may be the future of integrated management in low-resource settings.

Declarations

Ethical considerations

The chapter is based on literature and policy analysis. No human or animal participants were involved; therefore, it did not require ethical approval.

Consent

Not applicable.

Authors' contributions

Conceptualisation, G Gause, LA Sehularo and TG Makhado; *data curation*, G Gause, LA Sehularo and TG Makhado; *formal analysis*, G Gause, LA Sehularo and TG Makhado; *funding acquisition*, N/A; *investigation*, G Gause, LA Sehularo and TG Makhado; *methodology*, G Gause, Leepile A. Sehularo and TG Makhado; *project administration*, TG Makhado; *resources*, G Gause, LA Sehularo and TG Makhado; *software*, G Gause, LASehularo and TG Makhado; *supervision*, N/A; *validation*, G Gause, LA Sehularo and TG Makhado; *visualisation*, N/A; *writing – original draft*, G Gause, LA Sehularo and TG Makhado; *writing – review and editing*, G Gause, LA Sehularo and TG Makhado.

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Disclaimer

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Chapter 10

Integrating HIV and noncommunicable disease services for vulnerable populations: Case studies and best practices

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Abstract

This chapter provides case studies of successful integrated management programmes for human immunodeficiency virus (HIV) and noncommunicable diseases (NCDs). Related best practices, lessons learnt and opportunities for future research and collaboration are also covered. The chapter explains the legal and ethical aspects that health care providers must consider when providing integrated management to vulnerable populations affected by HIV and NCDs. The chapter explains the challenges experienced by vulnerable populations and reviews research and the South African *Bill of Rights* in relation to these populations. Finally, comprehensive recommendations are detailed for health care providers working in the integrated management of HIV and NCDs among vulnerable populations.

Introduction

In Africa, nearly 15 million people on antiretroviral therapy (ART) are at an elevated risk of developing noncommunicable diseases (NCDs). These NCDs are related to ageing and the effects of human immunodeficiency virus (HIV) infection over time, possibly compounded by exposure to antiretroviral (ARV) medications (Adeyemi et al. 2021). In Malawi, the dual burden of NCDs and HIV poses a significant public health challenge (Nyangulu et al. 2019). Uganda is witnessing a growing burden of NCDs among people living with HIV (PLHIV) in both urban and rural areas (Twinomugisha 2020). In South Africa, large numbers of people are affected by multiple health issues, including NCDs such as diabetes, obesity and hypertension. As of 2020, an estimated 2.5 million individuals were living with tuberculosis (TB), a condition associated with HIV infection, and 7.7 million people were living with HIV (Castelyn et al. 2020). Many live with both HIV and various NCDs, including cancer, liver and kidney diseases, and cardiovascular conditions. Additionally, there is a notable prevalence of multimorbidity, defined as the coexistence of two or more NCDs within these populations (Okonji et al. 2021).

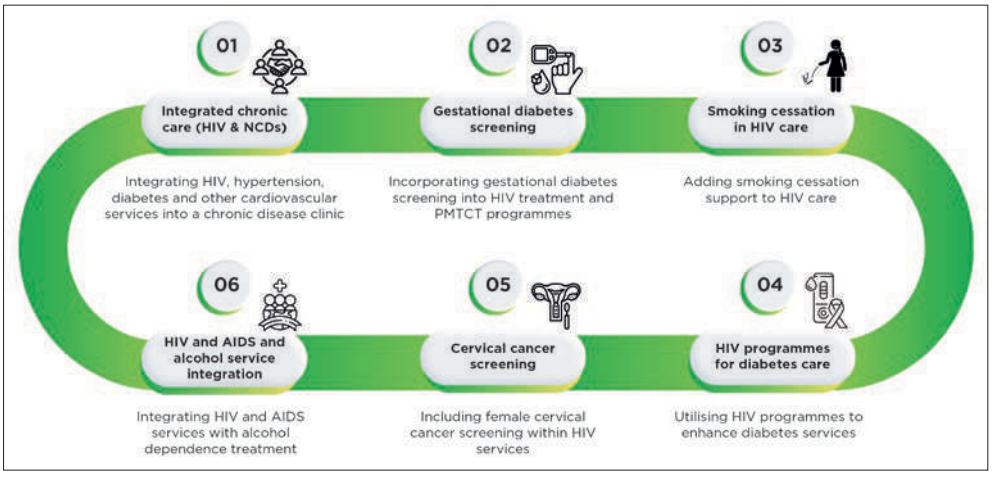
Numerous global, regional and local strategies addressing the management of HIV and NCDs advocate for the integration of services for these health issues (Haregu et al. 2014; Schwartz et al. 2015). The concept of 'integration' can differ among individuals and stakeholders (Haregu et al. 2014). Nevertheless, integrated service delivery involves coordinating the organisation and delivery of services so that patients receive continuous, accessible and person-centred care that responds to their multiple health needs. In relation to HIV and NCDs, this includes linking prevention, diagnosis, treatment and follow-up across programmes and levels of care (Adeyemi et al. 2021; World Health Organization [WHO] 2023). This strategy seeks to improve health outcomes and enhance

cost-effectiveness. The integration of HIV and NCD services can boost patient retention in care and reduce the likelihood of missed opportunities to provide comprehensive treatment to patients managing multiple health conditions (Adeyemi et al. 2021).

This chapter addresses integrated health services in accordance with the directives of the WHO (n.d.). The primary objective is to assist countries in ensuring equitable access to a range of integrated health services, including health promotion, disease prevention, curative interventions, rehabilitation and palliative care. The chapter underscores the importance of delivering health care services that are not only effective and safe but also focused on individuals' needs and that follow a primary health care (PHC) model. Furthermore, it emphasises the need to enhance national capacity to evaluate and oversee the performance of their health services, as recommended by WHO (n.d.) guidelines.

Within this framework, the chapter draws particular attention to the growing imperative of integrating services for PLHIV who also experience NCDs. As HIV has transitioned into a chronic, manageable condition, the burden of NCDs – such as cardiovascular disease, diabetes, various cancers and chronic viral hepatitis, such as hepatitis B virus (HBV) and hepatitis C virus (HCV) – has become increasingly evident in this population. This dual burden places significant demands on already fragile health care systems, particularly in low-resource settings.

Figure 10.1 presents selected opportunities for integrating HIV and NCD-related services, including unified chronic disease clinics, diabetes



Source: Created by Nthuseni Sharon Murudi-Manganye, Leepile Alfred Sehularo and Lufuno Makhado, based on Haregu et al. (2014), Adeyemi et al. (2021) and WHO (2023).
Key: HIV, human immunodeficiency virus; PMTCT, prevention of mother-to-child transmission; AIDS, acquired immunodeficiency syndrome; NCDs, noncommunicable diseases.

FIGURE 10.1: Key points on the co-management of human immunodeficiency virus and major noncommunicable diseases, including cardiovascular disease, diabetes and cancer.

screening, smoking-cessation support, cervical cancer screening and interventions addressing harmful alcohol use. These examples demonstrate how established HIV-service platforms can be used to expand access to screening, prevention, treatment and referral for other chronic conditions (Adeyemi et al. 2021; Haregu et al. 2014; WHO 2023).

Benefits of the integration of HIV and noncommunicable disease health care services

Human immunodeficiency virus and NCDs share several characteristics, such as chronicity, a need for sustained adherence to treatment, and long-term follow-up. Integrated health care models can offer a more efficient and patient-centred way to address both burdens simultaneously (Haregu et al. 2014). Integration is not only a conceptual alignment but increasingly a pragmatic response to dual epidemics within under-resourced health care systems.

Key factors supporting integration include:

- Increased susceptibility to NCDs among PLHIV as a result of factors like immune suppression, ART effects and ageing
- Heavy clinical and economic burden of coexisting conditions, especially in low- and middle-income countries (LMICs)
- Shared delivery infrastructure and care pathways, such as counselling, follow-ups and medication management.

These factors reflect disease overlaps and health care system opportunities instead of mere superficial similarities. However, integration must be weighed against concerns about resource diversion. The argument that focusing on HIV and NCDs might draw resources from other urgent priorities is legitimate. Integration should not imply exclusivity but rather a strategic entry point for broader system strengthening. For integration to be ethically sound, it must lay the groundwork for expanding chronic care platforms to include mental health, maternal care and neglected conditions over time, contributing to universal health coverage (UHC).

To strengthen the argument beyond theoretical grounds, this chapter includes case study evidence. While data from settings such as Haiti have been questioned because of the fragility of the health care system, the Partners In Health (PIH) model remains a compelling example. In a widely cited analysis, Vasan et al. (2014) reported that integrating HIV and NCD services at PIH-supported facilities led to:

- Improved access to HIV testing and treatment
- Higher enrolment in ART

- Better control of hypertension and diabetes
- Ancillary benefits like improved vaccination coverage.

Similarly, a systematic review by Badacho et al. (2024) evaluated integrated HIV–NCD services in sub-Saharan Africa (SSA), including South Africa's Integrated Chronic Disease Management (ICDM) approach. The review found that integrated service delivery improved diagnostic efficiency, reduced patient loss to follow-up, and optimised provider workflow in settings where task shifting and decentralisation were already underway (Badacho et al. 2024).

These cases illustrate that when well-planned and contextually adapted, integration enhances rather than detracts from broader health care system performance. They also provide practical insight into how integration can be sequenced and scaled without undermining parallel health priorities.

Challenges experienced by vulnerable populations affected by HIV and noncommunicable diseases

Vulnerable populations in South Africa encounter a variety of health-related challenges, notably remaining undiagnosed and untreated, which increases their risk of preventable complications (Okonji et al. 2021). Many individuals in these groups lack private health insurance and therefore depend heavily on public health facilities. This reliance creates several obstacles, including shortages of emergency transport, extended waiting times, drug shortages, limited infection control measures, understaffed health care facilities and discriminatory behaviours by health care staff towards these populations.

These challenges are further intensified by the unequal distribution of health care resources, characterised by a deficit of health care professionals, especially in rural and underserved areas. This shortage is compounded by systemic inefficiencies in recruitment and budget allocations. For example, although South Africa produces an increasing number of medical graduates, intern numbers rose from 1,472 in 2018 to 2,210 in 2024, but not all have been absorbed into the public-sector workforce. Many qualified junior physicians, despite applying, remain unemployed as a result of frozen funded posts and budget constraints (Government of South Africa 2024; Sobuwa 2025).

This paradoxical situation, in which skilled professionals cannot find work whereas health facilities remain understaffed, contributes to service delivery gaps and demoralisation among early-career professionals. It undermines efforts to expand integrated care platforms for HIV–NCD comorbidity management and weakens PHC coverage overall.

Moreover, evidence indicates this is not just a local issue but part of a broader regional trend. Sub-Saharan Africa reportedly faces a severe health workforce paradox: approximately one in three trained health care workers (HCWs) remain unemployed despite ongoing shortages of skilled staff (Holt et al. 2024).

Additionally, the public health care system suffers from issues like underfunding, rampant corruption, mismanagement of financial resources, misconduct, and insufficient accountability (Okonji et al. 2021). This situation violates Section 27, Subsection 1 of the *Constitution of the Republic of South Africa Act 108 of 1996* (Republic of South Africa [RSA] 1996b), which affirms that all individuals, including those vulnerable to HIV and NCDs, have the right to access health care services. The Constitution also stipulates that the state must undertake reasonable legislative and other measures within its available resources to facilitate the progressive realisation of this right. Despite these constitutional assurances, access to health care remains inadequate for vulnerable populations (Okonji et al. 2021).

In comparison, the United States of America (USA) exemplifies the disparities that can arise in nations without a UHC system (Sam 2020). During the coronavirus disease 2019 (COVID-19) pandemic, projections indicated a potential shortage of 20,000–35,000 intensive care unit (ICU) beds and 75,000–90,000 general hospital beds between June and November 2020. There are growing concerns about the lack of a national directive governing resource allocation, prioritisation of care and triage protocols in both public and private health care settings. This absence of clear guidance from the government could adversely impact the most vulnerable segments of the population (Castelyn et al. 2020).

Vulnerable populations in research

The level of vulnerability among research participants can differ significantly based on factors such as legal status, socioeconomic position and health condition (Pelek, Bortun & Østergaard-Nielsen 2023). In South Africa, a considerable proportion of research participants are considered vulnerable because of legal insecurity, such as being undocumented migrants or asylum seekers, as well as health-related vulnerabilities, particularly for those living with HIV or chronic NCDs (National Department of Health [NDoH] 2015).

It is important to clarify that rejection from research participation is often rooted in assumptions about legal vulnerability (e.g. undocumented status), rather than the person's HIV or NCD status alone. However, both dimensions may intersect to heighten marginalisation and ethical exclusion. Ethically, vulnerable populations affected by HIV and NCDs should not be excluded from scientific research solely on the basis of their status. On the

contrary, such individuals deserve equitable inclusion, as they often bear a disproportionate share of the disease burden and can offer critical insights to guide public health responses. Their involvement must be facilitated through additional safeguards, not exclusion, to ensure ethical integrity, social value and justice in research practices.

Vulnerability can vary among individuals, with certain groups facing a greater risk of harm or exploitation. In research contexts, vulnerability is characterised by a participant's reduced ability to safeguard their own interests, increasing the likelihood of intentional or unintentional harm. This may stem from difficulties in understanding informed consent processes or from structural power imbalances that compromise autonomy and human rights (González-Duarte et al. 2019).

While the recruitment and enrolment processes must be designed to avoid unethical or unintentional selection bias, it is important to distinguish this from intentional, scientifically justified selection criteria that form part of clinical trial design. Inclusion and exclusion criteria are established to ensure participant safety and the validity of results and are subject to thorough review by research ethics and scientific committees. These committees also assess whether such criteria unfairly exclude vulnerable groups or unintentionally perpetuate inequity. Therefore, selection criteria are not inherently unethical, provided they are transparent, justified and ethically reviewed. Informed consent documents should clearly explain why certain populations are included or excluded, reinforcing participant autonomy and promoting trust in the research process.

To mitigate some of the difficulties faced by vulnerable groups, informed consent procedures should be employed. Participants must be adequately informed about the research objectives, potential risks and safeguards in place to protect their personal data through written or oral consent documentation. Vulnerable populations must be able to provide voluntary consent before participating in the research project (Pelek et al. 2023). Additionally, when disseminating research findings, it is vital to protect the identities of vulnerable participants. Researchers must ensure that their reporting does not disclose any information that could identify individual participants or the vulnerable groups involved. In qualitative research, names should not be included in any publications; instead, pseudonyms or initials should be utilised to maintain participant anonymity.

Bill of Rights and vulnerable populations affected by HIV and noncommunicable diseases

The *Bill of Rights* in South Africa, enacted as Chapter 2 in the *Constitution of the Republic of South Africa Act 108 of 1996* (RSA 1996b), represents a fundamental aspect of the nation's democratic framework. It guarantees

the rights of all individuals, including those belonging to vulnerable populations affected by HIV and NCDs, and emphasises key democratic principles such as equality, human dignity and freedom. The state is responsible for upholding, protecting, promoting and fulfilling these rights. The specific rights of vulnerable populations affected by HIV and NCDs include the following from the *Bill of Rights* (RSA 1996b):

- *Section 9: Equality* – all individuals, including those affected by HIV and NCDs, are guaranteed equality before the law, along with the right to equal protection and benefits under the law. This provision ensures that all individuals enjoy the full spectrum of rights and freedoms. The state and private actors are prohibited from engaging in any form of unfair discrimination based on various factors, including gender, sex, race, health status, colour, sexual orientation, age, belief systems, culture, language and birthplace.
- *Section 10*: *Human Dignity* – individuals in vulnerable populations affected by HIV and NCDs possess inherent dignity, and their dignity must be respected and protected.
- *Section 11*: *Life* – vulnerable populations affected by HIV and NCDs have a recognised right to life, placing an obligation on health care providers to safeguard the lives of those they serve.
- *Section 12: Freedom and Security of the Person* – this section guarantees vulnerable populations the right to personal freedom and security, which entails freedom from violence, irrespective of its source, and protection from treatment that is cruel, inhumane or degrading. Additionally, individuals have the right not to be subjected to medical or scientific experimentation without their informed consent, necessitating the involvement of ethics and scientific review committees to ensure protection.
- *Section 13: Prohibition of Slavery, Servitude, and Forced Labour* – all individuals, including those affected by HIV and NCDs, must not be subjected to any form of slavery, servitude or forced labour. Health care providers also have a duty to protect these rights.
- *Section 14*: *Privacy* – vulnerable populations affected by HIV and NCDs have the right to privacy, which includes protection against unwarranted searches of their person, home or property, as well as the safeguarding of their communications from interference.
- *Section 15: Freedom of Religion, Relief, and Opinion* – this right allows individuals within vulnerable populations to exercise freedom of conscience, religion, thought, belief and opinion, including perspectives regarding their health conditions.
- *Section 16: Freedom of Expression* – vulnerable populations possess the right to freedom of expression, which includes the ability to obtain and share information and ideas, including those related to their health conditions.

- *Section 24*: *Environment* – vulnerable populations affected by HIV and NCDs are entitled to an environment that does not pose a threat to their health or overall wellbeing.
- *Section 27: Rights to Health Care, Food, Water, and Social Security* – these individuals are entitled to sufficient nourishment, clean water and access to comprehensive health care services, which encompass reproductive and mental health services.
- *Section 32: Right to Access Information* – individuals affected by HIV and NCDs are granted the right to access information held by others or by the state that is necessary for the exercise or protection of their rights. This right includes the opportunity to seek, receive and disseminate information regarding their health conditions.

This legislation establishes a solid foundation for protecting the rights of vulnerable populations in South Africa, ensuring that their needs and dignity are recognised and upheld.

Case studies of successful integrated management programmes

The integrated management of HIV and NCDs has gained significant attention in South Africa as an effective strategy for enhancing the continuity of care, minimising service duplication and improving overall health outcomes for the population. By combining resources and efforts, health care providers can deliver more comprehensive care to patients dealing with multiple health challenges. The following case studies illustrate various practical, scalable models that have effectively linked chronic disease care under unified service delivery platforms, resulting in measurable improvements in health care management and patient outcomes.

Case study 1: Adherence clubs in Cape Town – a community-driven integration model

Cape Town's health care system has ingeniously pioneered and expanded the adherence club model to support PLHIV who have achieved viral suppression (Grimsrud et al. 2016; Wilkinson et al. 2016). This innovative approach recognises the importance of community involvement in health care and has proven to be transformative for both patients and the health care system. Initially focused solely on HIV management, the adherence clubs have evolved into a multi-condition health platform for those also managing comorbid conditions such as hypertension and diabetes. This integrated approach addresses the complexities of chronic disease management by enabling patients to receive comprehensive care in a single setting, thereby significantly improving their health outcomes.

Each adherence club is managed by trained lay HCWs, community members with a deep understanding of the challenges faced by their peers. These HCWs facilitate a range of services, including monthly medication refills, group counselling sessions and basic clinical monitoring. One of the key advantages of conducting these activities in non-facility community spaces is reduced congestion in traditional health care facilities. Patients can engage in their health management in a more relaxed, accessible environment, fostering open communication and peer support (Grimsrud et al. 2016).

The adherence club model has shown remarkable effectiveness, as highlighted by Grimsrud et al. (2016) and Wilkinson et al. (2016). The outcomes are impressive, with a reported patient retention rate of 93.1% and an extraordinary 99% viral suppression rate over a 12-month period. These statistics underscore the model's effectiveness in maintaining patients' health and supporting their adherence to treatment. Moreover, the clubs have had a notable impact on participants with hypertension. Among these individuals, 69% achieved blood pressure (BP) control, demonstrating the model's potential to address multiple chronic diseases concurrently (Grimsrud et al. 2016). This dual management improves individual patient health and contributes to the broader public health goal of reducing the incidence of complications associated with untreated chronic conditions.

Patients involved in the adherence clubs have expressed higher levels of satisfaction with their care. They appreciate shorter wait times compared to traditional health care settings and often report feeling more connected to their health care providers and peers. The strong social support networks that develop within these clubs empower individuals, fostering a sense of shared purpose and community resilience (Grimsrud et al. 2016).

The adherence clubs in Cape Town exemplify how community-driven care models can effectively integrate multiple health services. They empower patients, enhance health outcomes and significantly reduce the burden on the health care system (Grimsrud et al. 2016). By recognising the importance of community engagement and addressing patients' needs holistically, this innovative model offers valuable insights for health care systems worldwide seeking to improve chronic disease management.

Case study 2: Mobile health units – integrated screening for reach and early detection

In recent years, addressing health disparities in peri-urban and rural communities has become a critical focus for health care initiatives. One innovative approach is the deployment of mobile health units, which provide integrated screening services for multiple health conditions,

including HIV, hypertension, diabetes and obesity (Smith et al. 2021). This initiative aims to eliminate barriers to access and promote early detection of chronic diseases in underserved populations.

The mobile health units operate within the framework of community wellness campaigns aimed at destigmatising HIV testing. By offering HIV screening alongside general health checks, these campaigns create a supportive environment where individuals feel more comfortable seeking necessary medical evaluations (Smith et al. 2021). This strategy underscores the importance of normalising HIV testing as part of routine health care, rather than as a separate or stigmatised service.

Between 2008 and 2016, the mobile clinic provided HIV testing to 43,938 individuals. Across the overall study population, approximately 26% screened positive for elevated blood pressure, while 6% reported symptoms associated with diabetes. 60% of those screening positive for hypertension and 16.6% of those screening positive for diabetes had not previously been diagnosed (Smith et al. 2021). These findings highlight the vital role that early detection plays in managing chronic health conditions and preventing the progression of diseases that can severely impact quality of life (QoL).

The success of the mobile health units can be attributed to several key factors. Firstly, their flexibility allows them to reach hard-to-access areas where traditional health care services may be limited. By bringing health care directly to communities, these units can engage populations that might otherwise avoid clinics because of logistical challenges or stigma. Secondly, the comprehensive nature of the screenings helps address multiple health concerns in a single visit, which is particularly beneficial for individuals with limited time or resources.

Moreover, integrating various health services into a single mobile unit fosters a holistic approach to patient care. This means that individuals who may be hesitant to seek care for specific conditions can receive necessary screenings for a broader range of health issues, thus improving overall health outcomes. The mobile health model not only advances preventive care but also strengthens links to the broader health care system, ensuring that individuals can access further treatment and support if needed (Smith et al. 2021).

Thus, the mobile health units represent an effective strategy for integrated screening and early detection. Through overcoming geographical and social barriers, these units play a crucial role in advancing public health, improving health equity and ultimately enhancing the wellbeing of communities that are often left behind in the health care system. The lessons learnt from this initiative can inform similar interventions in other regions, demonstrating the potential of mobile health solutions in addressing complex health challenges.

Case study 3: Integrated chronic disease management model in primary health care

The ICDM model, developed by the South African NDoH (2020a), represents a significant advancement in the delivery of PHC. It specifically targets the complex challenges faced by patients with chronic diseases, including HIV, TB and NCDs, by utilising a unified chronic care framework. This innovative model addresses the critical need for improved health outcomes in populations affected by these conditions, particularly in resource-constrained settings.

At the core of the ICDM model are several key components designed to enhance the efficiency and effectiveness of primary care services. Facility reorganisation enables health care providers to create dedicated spaces for chronic disease management, ensuring patients receive focused, comprehensive care. Streamlined appointment systems help reduce wait times and improve patient flow through clinics, making it easier for individuals to access the services they need (NDoH 2020a).

In addition, the ICDM model incorporates clinical support tools that empower health care providers to deliver evidence-based care. These tools facilitate better decision-making and promote adherence to clinical guidelines, which is particularly crucial for managing chronic diseases that require long-term treatment and monitoring. Task shifting, a critical element of the model, enables trained community health care workers (CHCWs) to take on specific clinical tasks traditionally performed by doctors and nurses (NDoH 2020a). This approach not only alleviates the burden on overworked health care professionals but also enhances access to care in underserved communities.

Community outreach is another vital aspect of the ICDM model, realised through the establishment of ward-based outreach teams (WBOTs) (NDoH 2020a). These teams consist of multidisciplinary health professionals who engage with the community to provide health education, screening and support for individuals with chronic diseases. This proactive approach to health care encourages patients to take charge of their health, promotes early detection of complications and fosters a culture of prevention.

The implementation of the ICDM model has demonstrated several positive outcomes. As highlighted in the research by Mahomed and Asmall (2015), the model has significantly improved continuity of care for patients, ensuring they receive consistent and coordinated treatment across various health care settings. This is essential for managing chronic diseases effectively, as it helps prevent treatment gaps that could lead to adverse health outcomes.

The ICDM model was designed to improve continuity and coordination of care by reorganising service delivery, strengthening clinical support and

aligning facility- and community-based chronic care processes (Mahomed & Asmall 2015; NDoH 2020a). Its implementation has demonstrated the feasibility of providing care for multiple chronic conditions through a common primary care platform. However, evaluations have also identified uneven implementation fidelity, staff shortages, infrastructure limitations, medication supply challenges and gaps in clinical record management (Lebina et al. 2019; NDoH 2020a).

The ICDM framework therefore provides an important national platform for integrated service delivery, but its effectiveness depends on adequate staffing, reliable supplies, functional referral systems, appropriate clinical training and continuous monitoring. Rather than being regarded as a uniformly successful model, it should be understood as a scalable framework whose outcomes depend on the quality and consistency of local implementation (Lebina et al. 2019; Mahomed & Asmall 2015).

Case study 4: Central Chronic Medicines Dispensing and Distribution programme

The Central Chronic Medicines Dispensing and Distribution (CCMDD) programme, initiated by the South African NDoH (2024a), is a groundbreaking initiative designed to decentralise the delivery of medication for stable patients living with chronic conditions. These conditions include chronic illnesses such as HIV, hypertension and diabetes, which require ongoing management and regular access to medication. The programme allows patients to conveniently collect their prescriptions at alternative pickup points, such as community pharmacies, retail outlets and workplace clinics, rather than visiting traditional health care facilities (NDoH 2024a). This flexibility is crucial because it meets patients' needs, leading to improved adherence and better health outcomes.

As a public–private partnership, the CCMDD programme has emerged as a cornerstone of differentiated service delivery in South Africa's health care landscape. This innovative approach not only enhances accessibility but also aims to streamline services, thereby reducing the burden on health care facilities and providers.

Research conducted by Wang et al. (2023) highlights the significant positive impact of the CCMDD programme on patient health outcomes. The findings reveal that participants have maintained exceptionally high adherence to ART, with an impressive 92% of individuals achieving viral suppression. This outcome is particularly noteworthy, as sustained viral suppression is essential for the health of individuals living with HIV and is critical for public health efforts to reduce transmission rates.

The expansion of the CCMDD programme demonstrates its capacity to operate at national scale. By May 2022, the NDoH reported that more than five million patients had been registered on the programme since its inception in 2014/15 (NDoH 2022a). Earlier programme data showed that by October 2019, approximately 2.07 million patients were actively receiving services through CCMDD across 46 health districts, including patients receiving ART, NCD medication or treatment for both HIV and NCDs (Liu et al. 2021). These figures demonstrate substantial programme reach, although cumulative registration should not be interpreted as evidence that all registered patients remained active or achieved favourable clinical outcomes. This considerable expansion reflects the programme's effectiveness and vital role in transforming the way chronic medication is managed and delivered. Through ongoing support and collaboration between public and private sectors, the CCMDD continues to demonstrate how innovative solutions can enhance health care delivery, ultimately leading to improved health outcomes for millions of patients.

Case study 5: Limpopo's conceptual model for integrated HIV and noncommunicable disease care

In Limpopo province, Murudi-Manganye, Makhado and Sehularo (2023) developed a conceptual model to strengthen integrated HIV and NCD management among nurse-initiated management of antiretroviral therapy (NIMART)-trained nurses in PHC facilities. The model was informed by an explanatory sequential mixed-methods study involving patient records, skills audits across 25 PHC facilities and data from 28 NIMART-trained nurses.

A key aspect of this conceptual model is its focus on building the capacity of nurses and other HCWs. In resource-limited settings like the Limpopo province, where health personnel may face overwhelming patient loads, empowering nurses with enhanced skills and knowledge is vital. This capacity-building not only improves the quality of care but also fosters greater confidence among staff in managing complex cases, such as patients with both HIV and NCDs (WHO 2023). Moreover, the model advocates for the integration of electronic health records (EHRs), which can streamline patient information management and enhance communication among health care providers (Murudi-Manganye, Makhado & Sehularo 2022; Zharima, Griffiths & Goudge 2023). By having comprehensive and easily accessible patient data, health care teams can coordinate care more effectively, ultimately leading to better health outcomes. This technological integration is especially critical in rural areas where health care services may be fragmented.

Another essential component of the model is the emphasis on multisectoral collaboration. The health of individuals is often influenced by

a range of factors, including social, economic and environmental conditions. By working together across sectors such as education, housing and community services, the model aims to create a holistic approach to care that addresses the broader determinants of health (WHO 2023).

The engagement of facility leadership and community involvement stands out as a critical enabler of successful integration. Leaders in health care facilities play a pivotal role in fostering an organisational culture that supports collaborative practices, while community involvement ensures that the services provided are responsive to the actual needs and preferences of the population. This participatory approach helps ensure that interventions are culturally appropriate and relevant, increasing the likelihood that patients will engage with the health care system (Moloko-Phiri, Sepeng & Sebaeng 2022).

The conceptual model has not yet been evaluated through a formal implementation trial. Consequently, conclusions cannot presently be drawn about its effect on staff confidence, appointment scheduling or patient outcomes. The next stage should involve feasibility testing and implementation evaluation to assess its acceptability, fidelity, effectiveness and sustainability in rural PHC facilities (Murudi-Manganye et al. 2023).

Overall, this initiative in Limpopo underscores the importance of context-sensitive, evidence-informed models grounded in the realities of local health care challenges. It highlights the urgent need for innovative solutions that cater specifically to the needs of resource-constrained rural settings, particularly in managing the intertwined issues of HIV and NCDs. Through such comprehensive and collaborative efforts, there is hope for improving health outcomes and enhancing the quality of care for vulnerable populations in the region.

The five case studies illustrate different stages and forms of HIV–NCD integration. The Cape Town adherence-club model demonstrates community-based differentiated HIV service delivery, while the mobile health-unit case illustrates integrated community screening and early detection. The ICDM model represents a national PHC service-reorganisation framework, and the CCMDD programme demonstrates differentiated medicine distribution through public–private delivery arrangements. In contrast, the Limpopo initiative is a conceptual model developed to strengthen nurses' capacity to provide integrated HIV and NCD care and still requires formal implementation evaluation. Collectively, these examples demonstrate that integration can occur through community-based care, mobile outreach, facility reorganisation, decentralised medicine distribution and workforce-development frameworks. However, the strength and type of evidence differ across the cases, and claims regarding effectiveness, scalability and sustainability should be made only where supported

by empirical evaluation (Grimsrud et al. 2016; Liu et al. 2021; Mahomed & Asmall 2015; Murudi-Manganye et al. 2023; Wilkinson et al. 2016).

National trajectory of integrated HIV and noncommunicable disease management in South Africa

Since 2002, South Africa has made significant strides in adopting a unified approach to chronic disease management, beginning with the rollout of the ART programme between 2004 and 2005. This initiative employed a framework developed for the expanded Practical Approach to Lung Health and HIV/AIDS in South Africa (PALSA PLUS), which played a crucial role in training professional nurses within PHC settings (Stein et al. 2008). By empowering these health care providers, the framework enabled them to manage not only HIV but also TB and critical NCDs such as hypertension, diabetes and asthma (Stein et al. 2008).

South Africa's integrated clinical-management approach developed through successive generations of primary care tools. The Practical Approach to Lung Health in South Africa was initially evaluated during 2002–2003 and was expanded as PALSA PLUS during 2004–2006 to incorporate HIV and ART care alongside TB and respiratory disease management (Stein et al. 2008; Zwarenstein et al. 2011). This approach was subsequently broadened into Primary Care 101, which was evaluated during 2011–2013 and extended clinical decision support to common symptoms and chronic conditions encountered in adult PHC (Fairall et al. 2016). Primary Care 101 was later adopted nationally and renamed Adult Primary Care (APC), which now provides comprehensive clinical decision support for adult patients at the primary care level (NDoH 2023b).

Moreover, the National Strategic Plan for HIV, sexually transmitted infections (STIs) and TB, along with subsequent frameworks for managing NCDs, continues to stress the importance of quality care, task-shifting among health care providers, and integrated management systems to improve patient outcomes (NDoH 2023c). These frameworks are underpinned by detailed clinical guidelines and policy tools that collectively offer a national roadmap for the sustainable and equitable implementation of integrated service delivery (Murudi-Manganye, Makhado & Sehularo 2020).

The significance of these policy developments cannot be overstated. They not only provide context for the previously mentioned case studies but also reinforce the notion that integrating HIV and NCD services is not merely a collection of isolated pilot projects. Instead, it represents a strategic, well-planned and evolving commitment embedded in South Africa's health care system reform agenda (Cashin, Sparkes & Bloom 2017).

The feasibility of HIV–NCD integration is supported by evidence from several health care systems that have implemented co-located, coordinated or fully integrated approaches. These models may improve access, continuity, screening and selected clinical outcomes by enabling patients to receive services for multiple chronic conditions through coordinated care pathways. However, outcomes vary according to programme design, workforce capacity, medicine availability, information systems and the quality of implementation. Integrated care should therefore be adapted to local health care system conditions and evaluated using clearly defined implementation and clinical outcomes (Adeyemi et al. 2021; Haregu et al. 2014; Schwartz et al. 2015; WHO 2023).

The journey towards effective HIV and NCD service integration in South Africa is an ongoing and dynamic process. The established frameworks, supportive policies and continual training of health care professionals create a conducive environment for the successful implementation of integrated care. This holistic approach not only enhances individual patient care but also strengthens public health care systems, leading to a healthier population equipped to face the challenges posed by chronic diseases.

List of available policies and clinical guidelines in South Africa

Health policies play a crucial role in guiding the management of various diseases within populations. Periodic reviews of these policies ensure their relevance and effectiveness in light of evolving scientific evidence. The following summary outlines key health policies, many of which are reviewed every five years, along with specific guidelines that are adapted as necessary.

- *National Consolidated Guidelines for the Management of HIV in Adults, Adolescents, Children and Infants and Prevention of Mother-to-Child Transmission (2020)*: These provide standardised recommendations for the use of ARV medications in treating HIV (NDoH 2020b).
- *Adherence Guidelines for HIV and TB (2020)*: Recommendations that emphasise the importance of adherence to treatment regimens for improving health outcomes in patients with HIV and TB (NDoH 2020c).
- *National Strategic Plan for NCDs 2022–2027*: This strategic framework focuses on combatting diseases such as diabetes and cardiovascular conditions that are not primarily caused by infectious agents (NDoH 2022b).
- *ART Clinical Guidelines (2023)*: These guidelines are updated as needed or when new scientific evidence regarding clinical treatments becomes available (NDoH 2023a).
- *Adult Primary Care Clinical Tool (2023)*: Protocols designed to ensure effective PHC for adults (NDoH 2023b).

- *National Strategic Plan for HIV, TB, and STIs 2023–2028*: This plan addresses the prevention, treatment and management of these communicable diseases on a national scale (NDoH 2023c).
- *Primary Healthcare Standard Treatment Guidelines and Essential Medicines List 8th Edition (2024)*: A comprehensive list that outlines the PHC standard treatment and medications considered essential for addressing the most important PHC needs (NDoH 2024b).

As indicated in Table 10.1, South Africa's NDoH provides public access to its key policy frameworks and clinical guidelines via the NDoH Knowledge Hub and South African National AIDS Council (SANAC) websites.

This structured approach to policy assessment and development is crucial for enhancing public health and ensuring that health care practices align with the latest medical knowledge and the population's needs.

The skills associated with NIMART and advocacy, prevention and care are not being utilised optimally by professional nurses and other clinicians trained in the integrated management of HIV and NCDs. However, there are notable strengths in South Africa's integrated management strategies (Murudi-Manganye, Makhado & Sehularo 2021).

TABLE 10.1: Accessible national resources on human immunodeficiency virus–noncommunicable disease integration in South Africa.

Document type	Access path and relevance
National Strategic Plan for HIV, TB and STIs (2023–2028)	Available on the SANAC[4] and NDoH[5] websites. Guides integrated services, including hepatitis and cervical cancer screening goals.
Strategic Plan for NCDs (2022–2027)	While not hosted on the same portal, it is linked in NDoH[6] and SANAC policy references. Formerly published as part of the national policy suite.
APC Clinical Tool	Accessible on the NDoH Knowledge Hub.[7] Consolidates clinical guidance across HIV, NCDs, chronic care and more.
ART and adherence guidelines, essential medicines list, and primary care guidelines	Regularly updated and published online via the Knowledge Hub (Knowledge Translation Unit)[8] and the government e-library. The APC guide integrates all these elements into one streamlined tool.

Source: Tabulation by Nthuseni Sharon Murudi-Manganye, Leepile Alfred Sehularo and Lufuno Makhado. Adapted from NDoH (2020b, 2022ab, 2023a, 2023b, 2023c, 2024b).
Key: HIV, human immunodeficiency virus; TB, tuberculosis; STIs, sexually transmitted infections; SANAC, South African National AIDS Council; NDoH, National Department of Health (South Africa); APC, adult primary care; ART, antiretroviral therapy.

4. Refer to https://sanac.org.za/wp-content/uploads/2023/05/SANAC-NSP-2023-2028-Web-Version.pdf

5. Refer to https://knowledgehub.health.gov.za/elibrary/national-strategic-plan-hiv-tb-and-stis-2023-2028

6. Refer to https://www.health.gov.za/wp-content/uploads/2025/05/NCD-NSP-FINAL-VERSION-20-SEPT-22-1.pdf

7. Refer to https://knowledgehub.health.gov.za/elibrary/adult-primary-care-apc-clinical-tool-2023?utm_source and https://knowledgehub.health.gov.za/elibrary/adult-primary-care-apc-guide-20192020-updated?utm_source

8. Refer to https://knowledgehub.health.gov.za/e-library

Demographic factors

A significant number of public health care facilities in South Africa adopt adaptable operating hours. Most NIMART nurses are of African descent, and many have completed comprehensive training, typically a four-year diploma or degree. Many of these nurses have experience in PHC and community health care (CHC) settings and possess essential skills for the integrated management of both HIV and NCDs, including training in NIMART and advanced practice clinician methodologies (Murudi-Manganye et al. 2023).

Availability of required clinical stationery

One major challenge in integrated care is the fragmentation of clinical records for adults living with both HIV and NCDs. Currently, referral forms used for patient transitions to higher levels of care, such as specialist clinics or hospitals, include medical details that cover both the patient's current condition and any relevant past conditions. However, within PHC settings, the lack of integrated record systems often impedes continuity of care and coordinated disease management.

To address this, the *Protection of Personal Information Act 4 of 2013* (PoPIA) (RSA 2013) compliant documentation tools, such as anonymised clinical registers, laboratory logs and condition-specific patient files, are maintained to support monitoring and evaluation (M&E) efforts. This does not imply the creation of a centralised national database of personally identifiable data for people with HIV or NCDs, which would contravene both ethical standards and PoPIA (RSA 2013). Instead, data are aggregated, de-identified and handled in accordance with legal and ethical guidelines, ensuring patient confidentiality and enabling service improvement and population-level health planning.

A core ethical principle guiding data use in South Africa is that health information should be used only for health care provision, reporting and system management, when adequately safeguarded, with individual consent where applicable. The emphasis remains on strengthening local record-keeping systems to support integrated care, without compromising patient rights or privacy.

Medication and equipment

The integration of ART within PHC facilities has facilitated access to essential medications, including ART, antihypertensives and antidiabetic treatments for individuals in need. Furthermore, necessary equipment is used to enhance comprehensive service management that addresses both HIV and NCDs, such as BP monitoring devices, glucometers, laboratory specimen containers, needles and personal protective equipment (PPE).

Implementation of integrated management of HIV and noncommunicable disease screening

Screening for HIV and NCDs, along with general clinical assessments, is routinely conducted for all patients accessing PHC facilities. This screening is the responsibility of professional nurses and occurs irrespective of the patient's current health status regarding HIV or NCDs. Records of NCD screenings include documentation of HIV clinical staging and TB evaluations for each patient.

The Ideal Clinic's services management facilitates an integrated approach to managing both HIV and NCDs by establishing chronic care streams for patients categorised as stable or unstable (NDoH 2018). This model is designed for individuals requiring ongoing consultations for communicable diseases, such as HIV (pre-ART and ART) and TB, as well as NCDs, including hypertension, diabetes, chronic obstructive pulmonary disease, epilepsy, mental health disorders, cancer, liver or kidney disease, and cardiovascular diseases. Patients with HIV and NCDs are incorporated into these chronic care streams as specified in the Ideal Clinic Service Manual (NDoH 2018).

The CCMDD programme, now referred to as 'dablapmeds', offers an alternative method for stable patients to access their medications (NDoH 2024a).[9] Patients can collect their prescriptions either within the health care facility or externally, depending on their preference. Those classified as stable have successfully managed their chronic conditions. The Patient Adherence Guidelines for chronic diseases delineate specific targets for patients suffering from various conditions:

- *HIV*: Achieving viral load [VL] suppression of less than 50 copies per mL
- *TB*: Completing a full six-month treatment regimen and being declared cured
- *Hypertension*: Maintaining BP readings below 140/90 mmHg
- *Diabetes*: Having fasting blood glucose levels between 4 mmol/L and 7 mmol/L (NDoH 2020c).

While the Kenyan HIV Treatment Guidelines do not directly address the integrated management of HIV and NCDs, they provide guidance on lifestyle modifications and pharmacological therapy for HIV patients who also present with hypertension or diabetes. These guidelines outline a segregated service-delivery model that enables patients to receive care across various tiers of the health care system (Adeyemi et al. 2021).

9. Refer to the guidelines at https://www.health.gov.za/ccmdd

In Tanzania, the HIV treatment guidelines reference supplementary resources for the holistic management of NCDs, including diabetes and hypertension. They advocate for an integrated strategy for community testing initiatives that should encompass screenings for STIs, HIV, TB, BP, blood glucose levels and nutritional assessments. It is highly recommended that screenings for diabetes, hypertension and dyslipidaemia be conducted during the initial enrolment into HIV care, supplemented by continuous monitoring and management of these conditions within the HIV clinic (Adeyemi et al. 2021).

The Ugandan National Health Policy recognises the rising prevalence of both NCDs and HIV. One of its foundational principles is the integration of curative, preventive and promotional health services. Moreover, the 2020 Uganda Consolidated Guidelines for the Prevention and Treatment of HIV and AIDS advocate for the integrated management of HIV and NCDs (Uganda Ministry of Health 2020). They recommend that stable HIV patients with NCDs and no complicating conditions should have their consultations consolidated into a single appointment with the same health care provider, particularly when patient records are accessible at the same site. Additionally, comprehensive health education regarding both HIV and NCDs should be available within the clinic environment (Adeyemi et al. 2021).

Recommendations for integrated care for vulnerable populations affected by HIV and noncommunicable diseases

Health care providers are advised to adopt an integrated management approach when addressing the needs of vulnerable populations impacted by HIV and NCDs. Key elements of this approach include the involvement of governmental agencies, enhanced collaboration among stakeholders, provision of social support, equitable resource allocation, and the application of triage procedures. A detailed exploration of these recommendations is provided in this section.

The role of government

The government has a critical role in ensuring that there is an adequate number of functional PHC facilities to address the needs of vulnerable populations affected by HIV and NCDs. These facilities must be staffed with well-trained health care professionals and equipped with necessary medications for the management of HIV and NCDs (Okonji et al. 2021). Furthermore, all HCWs should receive comprehensive and ongoing training and empowerment to effectively provide health education and basic health care guidance (Castelyn et al. 2020).

Health care services should be affordable for all individuals, with a payment structure grounded in equity principles. This structure must ensure that both public and private health care services remain accessible to vulnerable populations, thereby preventing those affected by HIV and NCDs from incurring higher health care costs compared to wealthier households (Okonji et al. 2021). The government is obligated to proactively address these vulnerabilities by ensuring equitable access to resources distributed through societal institutions. Additionally, the health care system must take deliberate steps to reduce these vulnerabilities, lessen their impact, and provide appropriate support to those affected so they are not further disadvantaged during service delivery or research participation (Mohapanele & Makwara 2023). It is imperative that national health strategies, policies and plans are guided by robust evidence to foster the development of efficient and effective health care services (Adeyemi et al. 2021).

Task shifting

Numerous insights drawn from experiences with HIV care are highly relevant to the management of NCDs, particularly concerning approaches to health service delivery. One of the most important lessons is the need to redistribute tasks among health care professionals, establish robust M&E systems, and maintain continuous, patient-centred care with strong support for treatment adherence (Kuntz et al. 2014).

Task shifting refers to the strategic delegation of selected clinical and administrative tasks from highly specialised professionals (such as physicians) to less specialised but appropriately trained HCWs (such as nurses, clinical associates and CHCWs). This approach enhances efficiency, expands access and ensures continuity of care in settings where specialist capacity is limited (Nyangulu et al. 2019).

In the context of NCD management, task shifting does not imply transferring full responsibility for the management of complex diseases to nurses or mid-level providers. Instead, it involves assigning defined clinical actions that can be performed safely with adequate training, supervision and clear protocols. For example:

- *In diabetes care*, nurses and clinical associates can conduct routine blood glucose monitoring, provide dietary counselling, manage medication refills, screen for complications (such as foot ulcers), and refer patients to physicians when control targets are not met.
- *For hypertension and cardiovascular disease*, BP can be measured, cardiovascular risk factors assessed, medications titrated according to standing orders, and adherence and lifestyle modification counselling can be provided.

- *In pulmonary and renal care*, nurses can perform symptom assessments, support medication adherence, monitor renal function and fluid balance (where point-of-care [PoC] tests are available), and identify red-flag symptoms requiring escalation.
- *In cancer care*, their role can include patient education on treatment side effects, psychosocial support, symptom tracking, and ensuring referral adherence.

What distinguishes task shifting from standard nursing practice is the targeted upskilling and scope expansion required to manage specific chronic conditions safely. Nurses must acquire competencies in NCD pharmacotherapy, complication screening and the interpretation of basic diagnostic tests, in addition to the foundational nursing skills of patient assessment and education. This specialised training enables them to act as first-line providers under structured supervision and clinical governance frameworks. To ensure quality and patient safety, effective task shifting must include the following:

- *Comprehensive training and certification* covering disease-specific management algorithms, medication protocols and patient communication skills
- *Ongoing mentorship and supervision* by physicians or senior clinicians to review cases, support clinical decision-making and reinforce accountability
- *Clear referral pathways* for patients presenting with complications or requiring specialist input
- *Routine M&E*, with data collected on outcomes, patient satisfaction and provider performance (Fairall et al. 2012; WHO 2008, 2023).

These measures help ensure that task shifting complements rather than replaces the contributions of physicians and specialists. When implemented effectively, task shifting supports team-based care in which appropriately trained health workers contribute within regulated scopes of practice. Its success in integrated HIV and NCD programmes depends on competency-based training, supportive supervision, functional referral systems, appropriate regulation and continuous monitoring (Fairall et al. 2012; WHO 2008).

Broad-based stakeholder engagement

In line with the insights of Visagie and Pillay (2017) and Kuntz et al. (2014), a comprehensive array of stakeholders should be engaged in collaborative efforts to deliver essential support and care to vulnerable populations affected by both HIV and NCDs. This collaboration is critical, as the interconnected nature of HIV and NCDs necessitates a holistic approach to health care that addresses the complexities of these conditions simultaneously.

To achieve successful HIV and NCD integrated services, broad-based stakeholder engagement is essential. This means involving diverse parties who bring unique perspectives, resources and expertise to the table. Key stakeholders should include government agencies, which play a vital role in policy formulation, programme funding and the coordination of health services. Their participation can ensure that integrated approaches receive appropriate political and financial backing, making sustainable initiatives a reality.

Non-profit organisations (NPOs) and non-governmental organisations (NGOs) often operate at the grassroots level and possess invaluable insights into the needs and challenges faced by vulnerable communities. Their deep-rooted connections within these populations allow them to provide tailored care and support. By collaborating with these organisations, health care providers can ensure that integrated services are culturally competent and effectively address the specific needs of those affected by both HIV and NCDs.

Community organisations also play a crucial role in outreach and education. They serve as vital links between health care providers and the communities they serve, helping raise awareness of the importance of integrated care and ensuring individuals have access to the services they require. Engaging community members in this dialogue not only fosters trust but also encourages community ownership of health initiatives, which is essential for long-term success. In addition, academic institutions and research organisations can make significant contributions by conducting studies that inform our understanding of the intersection between HIV and NCDs. Their research can shed light on best practices, innovative treatment modalities and effective prevention strategies. Furthermore, they can assist in training health care professionals, ensuring that they are well-equipped to provide integrated services.

Civil society groups are equally important in advocating for policies that promote health equity and access to integrated care. They can help amplify the voices of marginalised populations, ensuring that their needs and perspectives are included in the development of health services. Moreover, engaging bilateral and unilateral entities is crucial for securing necessary funding and support. These organisations can assist in initiating programmes that target HIV and NCDs simultaneously, providing resources and expertise that enhance the implementation of integrated services.

Health informatics specialists play a pivotal role in this collaborative framework by utilising technology and data analytics to improve health care delivery. Their efforts can facilitate better communication among stakeholders, provide real-time data on health outcomes, and enhance evidence-based decision-making. By integrating technology into services,

health care providers can track progress, identify gaps and adapt their approaches to meet the evolving needs of the populations they serve.

The successful integration of HIV and NCD services depends on broad-based stakeholder engagement. By fostering a collaborative environment that includes government agencies, NPOs, NGOs, community organisations, academic institutions, civil society groups, bilateral and unilateral entities and health informatics specialists, a comprehensive support system can be created. This united approach will enable the health care sector to tackle the multifaceted challenges faced by vulnerable populations more effectively, ultimately leading to improved health outcomes and a healthier future for all. Together, health care providers can ensure that the voices of those affected are heard and that the necessary services are accessible, equitable and impactful.

☐ Use of triage

In health care settings, such as clinics and hospitals, triage criteria must prioritise reducing discrimination based on socioeconomic factors. This means that individuals should receive equitable care regardless of their economic background, ensuring that everyone has access to necessary medical services. To achieve this, triage criteria must be informed by pre-established clinical standards that uphold fairness and objectivity in the evaluation process.

Throughout the COVID-19 pandemic, the challenges faced by health care systems highlighted the crucial role of community health workers. Unfortunately, inadequate training and a severe shortage of PPE have significantly hindered these workers' ability to perform their vital roles effectively (Castelyn et al. 2020). Community health workers are instrumental in bridging the gap between underserved populations and health care professionals, including nurses and physicians. Their work involves educating the community about health resources, guiding individuals through the health care system and ensuring that patients receive timely and appropriate care.

The pandemic underscored the importance of empowering CHCWs and equipping them with the resources and training they need. By enhancing their capacity to serve the community, health care systems can improve health outcomes and foster a more inclusive approach to care. Ensuring that these CHCWs have the tools needed to protect themselves and effectively support their communities is crucial for achieving health equity, especially in times of crisis (Castelyn et al. 2020).

☐ Monitoring and evaluation

The continuous assessment and thorough evaluation of integrated programmes that address both HIV and NCDs are not only essential but

also crucial in today's multifaceted public health landscape. As the global health community grapples with the dual burden of infectious diseases and chronic conditions, the need for integrated approaches becomes increasingly evident. These programmes must be systematically evaluated to gain a nuanced understanding of the potential benefits and risks associated with such integrated strategies.

By employing rigorous methodologies to analyse both outcomes and challenges, stakeholders, including health care providers, policymakers and community organisations, can pinpoint specific areas for improvement. This analytical process empowers them to enhance the overall effectiveness of health initiatives, ensuring that they are not only comprehensive but also responsive to the diverse needs of the populations they serve. Moreover, the insights garnered from these assessments are invaluable for shaping future service developments. They allow for the incorporation of real-world evidence, which is vital for designing programmes that truly resonate with the communities affected by these health issues. This evidence-based approach ensures that interventions are tailored to meet the unique challenges faced by different demographics, ultimately leading to better health outcomes.

Ongoing evaluation of integrated HIV and NCD programmes fosters a deeper understanding of how to optimise PHC strategies effectively. By prioritising these assessments, health care providers can create a more informed and responsive health care system that addresses the complexities of both infectious and chronic diseases, thereby improving the overall wellbeing of the populations they aim to serve (Adeyemi et al. 2021).

Improving access and rights protection for people living with HIV and noncommunicable diseases: Provider recommendations

Individuals living with HIV and those suffering from NCDs frequently encounter significant obstacles to obtaining high-quality health care services, particularly in PHC settings. These obstacles encompass stigma and discrimination, a lack of awareness and education, financial constraints, geographical limitations, and inadequate capacity and resources within the health care system. Such challenges can violate the human rights of these groups and adversely affect their health outcomes. Therefore, it is essential to understand the relevant rights and legislative measures that safeguard these populations, and to propose strategic interventions for health care providers to mitigate barriers to care.

The *Universal Declaration of Human Rights* asserts that every individual has the right to life, liberty, security and adequate health and medical care (United Nations [UN] 1948). Additionally, the *International Covenant on*

Economic, Social and Cultural Rights entitles every person to the highest attainable standard of physical and mental health (UN 1966). The *African Charter on Human and Peoples' Rights* similarly emphasises these rights, declaring that every person shall have the right to the best possible state of physical and mental health and that states are obligated to take necessary actions to protect the health of their populations (African Union [AU] 1981).

Moreover, various specific rights and legislative frameworks exist to protect the rights of PLHIV and individuals with NCDs. For instance, the Office of the United Nations High Commissioner for Human Rights (OHCHR) and the Joint United Nations Programme on HIV/AIDS (UNAIDS) provide international guidelines on HIV and AIDS and human rights as a framework for countries to uphold human rights in the realms of HIV prevention, treatment, care and support (OHCHR & UNAIDS 2006). In a similar vein, the WHO Global action plan for the prevention and control of NCDs outlines a strategy for nations to address the risk factors and determinants of NCDs, while strengthening health care systems to deliver integrated, person-centred and equitable care for affected individuals (WHO 2013). These rights and frameworks are founded on the principles of non-discrimination, participation, accountability and empowerment (OHCHR & UNAIDS 2006; WHO & United Nations Development Plan [UNDP] 2019).

Despite these established rights and frameworks, many individuals living with HIV and those with NCDs continue to experience difficulties in accessing health care services within PHC settings. Hence, health care providers must implement strategies to overcome these barriers and ensure that quality care is accessible to these populations. Some of these strategies include the following.

Enhancing awareness and education

Enhancing awareness and education is a pivotal strategy in strengthening the integrated management of HIV and NCDs. A limited understanding among health care providers and communities often leads to missed opportunities for early detection, prevention and treatment adherence, while also perpetuating stigma and misconceptions. A well-informed public and a knowledgeable health care workforce are better equipped to make timely decisions, access appropriate care and support long-term disease management. Therefore, integrating targeted educational initiatives into health programmes is essential not only for improving clinical outcomes but also for fostering community ownership and trust (Adeyemi et al. 2021; WHO 2013). To achieve this, several practical strategies can be employed:

- Increasing awareness and education among health care providers and communities regarding HIV and NCDs

- Educating on risk factors, prevention methods, treatment options, complications and human rights and legal protections
- Utilising training workshops, campaigns, media platforms, peer education and counselling to disseminate information (Adeyemi et al. 2021; OHCHR & UNAIDS 2006; WHO 2013).

☐ Reducing stigma and discrimination

Stigma and discrimination remain significant barriers to the successful integration and delivery of HIV and NCD care. Individuals affected by these conditions often experience social exclusion, reduced access to services and psychological distress, all of which can undermine their willingness or ability to seek and adhere to treatment. Within health care settings, negative attitudes and discriminatory practices can further erode trust, compromise the quality of care and deter patient engagement (OHCHR & UNAIDS 2006; Okonji et al. 2021). To dismantle these structural and social barriers, health care systems must adopt intentional and multifaceted approaches that promote dignity, equity and justice for all.

Reducing stigma and discrimination requires more than policy; it demands cultural transformation across all levels of society and service delivery. The following strategies are critical to advancing this goal:

- Promote positive attitudes, behaviours and practices among health care providers and communities
- Enforce anti-discrimination laws and policies
- Combat stigma and discrimination through awareness campaigns, advocacy, legal support, social assistance and empowerment initiatives (OHCHR & UNAIDS 2006; Okonji et al. 2021; RSA 1996b).

☐ Improving access and affordability

Access to affordable and equitable health care remains a cornerstone of effective HIV and NCD management. Yet, many individuals, especially those in low-resource or rural settings, continue to face significant financial, structural and systemic barriers. Out-of-pocket expenses, inadequate transport, limited service availability and fragmented referral systems often restrict timely diagnosis and continuity of care. For PLHIV and those managing chronic NCDs, these challenges are compounded by socioeconomic vulnerabilities, resulting in preventable morbidity and mortality (NDoH 2022b; Okonji et al. 2021; WHO 2023). To bridge these gaps, comprehensive strategies are needed to ensure that cost and accessibility do not hinder the right to health.

A multipronged approach that includes financial protection, infrastructure development, and inclusive policy frameworks can

meaningfully expand access to essential services and treatment. The following strategies are key to realising this vision:

- Enhance access to health care services for PLHIV and those with NCDs
- Reduce health care costs and eliminate fees
- Offer subsidies, vouchers or insurance scheme cover
- Improve transportation, infrastructure and referral systems
- Implement policy reforms
- Mobilise resources and foster public–private partnerships
- Involve communities in health care access initiatives (NDoH 2022b; Okonji et al. 2021; RSA 1996b).

☐ Strengthening health care system capacity

The successful integration and long-term sustainability of HIV and NCD services hinge on the strength and resilience of the health care system delivering them. In many LMICs, health care systems are strained by workforce shortages, inconsistent supply chains, fragmented services and inadequate infrastructure, challenges that undermine the delivery of person-centred, continuous care (Adeyemi et al. 2021; Haregu et al. 2014; WHO 2023). To meet the growing demands of comorbid HIV and NCD burdens, it is essential to build responsive and adaptable systems that can coordinate prevention, treatment and long-term management effectively.

Strengthening health care system capacity requires investment in physical and human resources, as well as the development of cohesive clinical protocols, robust information systems and a culture of continuous quality improvement. The following strategies outline key interventions necessary to support integrated service delivery and improve health outcomes:

- Building the capacity and resources of health care systems to provide integrated, comprehensive care for PLHIV and NCD patients
- Increasing human resources and providing training, supervision, equipment, supplies, medicines, diagnostics and information systems
- Developing and implementing integrated HIV and NCD guidelines and protocols
- Focusing on capacity-building, quality improvement, monitoring, evaluation, innovation and research (Adeyemi et al. 2021; NDoH 2022b; WHO 2023).

☐ Engaging people living with human immunodeficiency virus and those with noncommunicable diseases

Sustainable, person-centred care requires more than top-down policy implementation; it demands meaningful involvement of the very individuals affected by HIV and NCDs. Engaging PLHIV and those managing chronic

conditions empowers them to shape the services they use, fostering dignity, ownership and accountability. Too often, health interventions are designed without adequate input from the communities they intend to serve, resulting in care models that fail to reflect the realities, preferences and daily-life challenges of those communities. Incorporating the voices of PLHIV and NCD patients into programme design, service delivery and evaluation ensures that health care systems become more responsive, inclusive and equitable (Kuntz et al. 2014; OHCHR & UNAIDS 2006).

Furthermore, active engagement builds trust, promotes transparency and strengthens health literacy. The following strategies promote patient engagement and community empowerment in integrated health care programmes:

- Involving PLHIV and NCD patients in designing, implementing, monitoring and evaluating health care services
- Ensuring their active participation, representation, empowerment, feedback and accountability
- Fostering community mobilisation, consultation, partnerships, empowerment and advocacy efforts (Kuntz et al. 2014; OHCHR & UNAIDS 2006; WHO 2023).

These strategies aim to comprehensively address the challenges posed by HIV and NCDs by focusing on awareness, reducing discrimination, improving access, strengthening health care systems and actively involving affected communities. Furthermore, these strategies allow health care providers to overcome barriers to care for PLHIV and patients with NCDs in PHC settings. This can improve their access to quality health care services, enhance their health outcomes, protect their human rights and reduce health inequalities (OHCHR & UNAIDS 2006; RSA 1996b; WHO 2023).

Conclusion

This chapter makes a significant contribution to the growing literature on the legal and ethical considerations for health care providers when delivering integrated care to vulnerable populations affected by HIV and NCDs. The authors outlined the multifaceted challenges experienced by vulnerable groups, including women, children, adolescents, people living with multimorbidity and other populations facing socioeconomic, legal or health-related vulnerability. Additionally, the chapter critically engaged with the structural and systemic barriers that exacerbate disparities in access to care and health outcomes. The intersection between the South African Constitution's *Bill of Rights* and the lived realities of these populations highlights the ethical necessity of upholding equity, non-discrimination and the right to health in both clinical and public health care practices.

Practical and legally sound guidance was provided on how HCWs can align their services with constitutional and human rights frameworks. This includes fostering community participation, reducing stigma and discrimination, and improving access and affordability through targeted interventions such as subsidies, integrated service delivery and health care system strengthening. Furthermore, robust M&E mechanisms were advocated for to track programme performance and ensure that care delivery remains responsive, accountable and evidence-based. Comprehensive provider training and stakeholder engagement were identified as essential strategies for building system-wide capacity to implement ethically grounded and legally compliant integrated care.

The chapter presented a compelling case for a rights-based, people-centred approach to health care system reform. Legal mandates, ethical obligations and practical strategies, such as enhancing health literacy, enforcing anti-discrimination laws and ensuring the active involvement of PLHIV and those with NCDs, were described. Thus, it serves as a resource for health care professionals, policymakers, legal scholars and programme managers aiming to promote social justice and public health equity in South Africa and similar contexts.

Declarations

Ethical considerations

This chapter is based on secondary sources and policy documents. No human or animal participants were involved; therefore, it did not require ethical approval.

Consent

Not applicable.

Authors' contributions

Conceptualisation, NS Murudi-Manganye and L Makhado; *data curation*, NS Murudi-Manganye, L Makhado and LA Sehularo; *formal analysis*, NS Murudi-Manganye, L Makhado and LA Sehularo; *funding acquisition*, N/A; *investigation*, NS Murudi-Manganye, LA Sehularo and L Makhado; *methodology*, NS Murudi-Manganye, L Makhado and LA Sehularo; *project administration*, L Makhado; *resources*, NS Murudi-Manganye, L Makhado and LA Sehularo; *software*, NS Murudi-Manganye, L Makhado and LA Sehularo; *supervision*, L Makhado; *validation*, L Makhado; *visualisation*, NS Murudi-Manganye, L Makhado and LA Sehularo; *writing – original draft*,

NS Murudi-Manganye, L Makhado and LA Sehularo; *writing – review and editing*, NS Murudi-Manganye, L Makhado and LA Sehularo.

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Data availability

No new data were generated.

Disclaimer

The views expressed in this chapter are those of the authors and do not necessarily represent the official views of their affiliated institutions or those of the publisher.

Chapter 11

Towards integrated and holistic health: Strategies for addressing HIV and noncommunicable diseases

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Abstract

The global health landscape is currently undergoing a significant transformation, characterised by the concurrent and overlapping epidemics of human immunodeficiency virus (HIV) and noncommunicable diseases (NCDs). As the burden of NCDs continues to rise, particularly in low- and

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middle-income countries, the need for integrated and holistic approaches to health care delivery has become increasingly evident. This chapter explores key insights and practical strategies for policy and practice that can guide the effective integration of HIV and NCD services. It places particular focus on leveraging primary health care as a cornerstone of this integrated approach and also addresses the critical role of social determinants of health in shaping health outcomes, as well as the importance of addressing these broader factors to achieve more comprehensive and equitable improvements in population health.

Introduction

The convergence of the human immunodeficiency virus (HIV) and noncommunicable disease (NCD) epidemics poses profound challenges for health care systems, particularly in low- and middle-income countries (LMICs). As the global burden of NCDs continues to escalate, integrated and holistic approaches to health care delivery are imperative.

This chapter delves into integrated service delivery, addressing the critical intersection of HIV and NCDs. By leveraging the lessons learnt and infrastructure created through successful HIV programmes, health care systems can adapt and apply proven chronic care models to more effectively manage the growing burden of NCDs. Integrating the management of HIV and comorbid conditions, such as cardiovascular disease, diabetes and mental health issues, can yield significant benefits for individuals and health care systems alike.

Moreover, this chapter underscores the pivotal role of social determinants of health (SDoH) in the prevention and management of infectious and chronic illnesses. Addressing the social, economic and environmental factors that influence health outcomes is essential for achieving more holistic and equitable care, ultimately improving the wellbeing and long-term prognosis of people living with HIV (PLHIV) and NCDs.

Key insights

The human immunodeficiency virus (HIV) and NCDs pose significant public health challenges, particularly in resource-limited settings. The integration of HIV and NCD services presents an opportunity to leverage the lessons and infrastructure from HIV programmes to address the growing burden of chronic conditions (Joska & Sorsdahl 2012). Primary health care (PHC) has been identified as a cornerstone of this integrated approach, enabling comprehensive and person-centred care (Duffy et al. 2017).

A critical consideration in this integrated model is the recognition of SDoH and their impact on the prevention and management of both infectious diseases and NCDs. Addressing the social, economic and environmental factors that influence health outcomes is essential for holistic and equitable care.

Integration of HIV and noncommunicable disease services

Significant benefits for individuals and health care systems can be achieved by integrating HIV and NCD management (Duffy et al. 2017; Haregu et al. 2015). By leveraging well-established chronic-care models and person-centred approaches developed through HIV programmes, health care systems can strengthen the prevention, detection and management of NCDs (Kintu et al. 2020; Njuguna et al. 2018; Rabkin & Nishtar 2011). Such integration can improve the coordination and efficiency of service delivery, although its outcomes depend on the model adopted, the availability of resources and the local implementation context (Dowdy, Powers & Hallett 2020; Murudi-Manganye, Makhado & Sehularo 2020).

Through this integrated approach, patients can receive comprehensive, personalised care that addresses their HIV status and comorbid NCDs (Duffy et al. 2017; Njuguna et al. 2018). This allows for more holistic management of their health care needs and may support improved disease managsement and quality of life (QoL). Combining established components of HIV care, including strong patient–provider relationships, treatment-adherence support, and community-based care, with NCD management may improve continuity and coordination across the care pathway (Kintu et al. 2020; Rabkin & Nishtar 2011). This model has the potential to improve health outcomes and contribute to more equitable and sustainable health care delivery, although further implementation evidence is required (Dowdy et al. 2020).

Primary health care as a cornerstone

Primary health care has been identified as a cornerstone in the integrated management of HIV and NCDs (Duffy et al. 2017; Varghese et al. 2019). A comprehensive and accessible PHC approach that allows for early detection and prevention of communicable diseases and NCDs on a single, person-centred platform (Kane et al. 2017). By strengthening and integrating PHC services with specialised services, health care systems can provide a more integrated, coordinated and holistic model that addresses the diverse and complex needs of individuals and communities affected by HIV and NCDs (Godongwana, De Wet & Milovanovic 2021).

An integrated primary health care (IPHC) model enables a more comprehensive and coordinated approach to tackling the dual burden of infectious and chronic conditions (Harrison & Jordan 2022). It builds on chronic-care systems established through HIV programmes and adapts these systems to support NCD prevention and management (Moyo et al. 2023; Rabkin & Nishtar 2011). Integration at PHC level may improve continuity of care, facilitate earlier intervention and strengthen the quality of services available to individuals with HIV–NCD multimorbidity (Kintu et al. 2020).

Furthermore, an integrated PHC approach promotes person-centred care that addresses patients' physical, mental and social needs. Providing prevention, detection, treatment and follow-up through a coordinated platform may reduce fragmentation and enhance continuity of care (Duffy et al. 2017; Harrison & Jordan 2022). This integration of services and adoption of a more comprehensive, person-centred approach is crucial for effectively addressing the intersection of HIV and NCDs and achieving equitable, high-quality health care for all.

Social determinants of health

Recognising the pivotal role of SDoH is crucial in addressing HIV and NCDs. Poverty, education, housing and access to social services can influence disease exposure, access to care, treatment outcomes and the capacity to manage chronic conditions (Dean & Fenton 2010; Marmot & Allen 2014; Menza et al. 2021). Integrating interventions that address these determinants into health and social systems is important for achieving more equitable and sustainable outcomes (Artiga & Hinton 2018; Hacker et al. 2022).

Addressing SDoH requires a multisectoral response extending beyond the health care system (Gómez et al. 2021; Magnan 2017). It involves collaboration among government agencies, community organisations and other stakeholders to address the underlying causes of health inequity. Relevant interventions include policies and programmes addressing education, housing, income security and access to social support (Taylor et al. 2016; Thornton et al. 2016).

Challenges and opportunities in integrated management

The integration of HIV and NCD services presents implementation challenges, including shortages of appropriately trained staff, fragmented disease-specific programmes, weak information systems and constrained resources (Duffy et al. 2017; Haregu et al. 2015). Coordinated multidisciplinary

care is particularly important for managing multimorbidity and the diverse needs of patients living with HIV and NCDs (Kintu et al. 2020; Mwagomba et al. 2018).

Vulnerable populations, including rural-to-urban migrants, may experience delayed diagnosis and fragmented access to services as a result of social and economic marginalisation (Peer 2015). Integrated models should therefore be adapted to the characteristics and access barriers of the communities in which they are implemented.

Established HIV infrastructure offers opportunities to strengthen NCD services through existing supply chains, trained workforces, adherence systems and community-based platforms (Njuguna et al. 2018; Rabkin & Nishtar 2011). However, effective adaptation requires attention to staffing, financing, governance and the capacity of existing services to accommodate additional responsibilities (Mwagomba et al. 2018; Nugent et al. 2018).

This transformation also requires multisectoral collaboration among government departments, non-governmental organisations (NGOs) and community organisations. Such collaboration can help address the social and structural determinants affecting access to integrated services (Rasesemola 2023).

Practical strategies for policy and practice

Tackling HIV and NCDs together demands more than clinical interventions alone; it requires deliberate, system-wide strategies that bridge health policy and service delivery to local realities and global commitments (Mwagomba et al. 2018; WHO 2023). As the burden of these epidemics continues to rise, integrated, person-centred approaches are increasingly recognised as the cornerstone of effective health care system responses (Harrison & Jordan 2022; Lazarus et al. 2021). Practical strategies must not only prioritise clinical integration but also address the socio-structural and operational determinants that affect access to health care, equity and outcomes.

Achieving this requires a coordinated effort in policymaking, health care system strengthening, community engagement, workforce capacity-building, and continuous monitoring and evaluation (M&E) (Reynolds & Sutherland 2013; WHO 2023). Moreover, adaptive, context-driven research and innovation must underpin implementation to ensure that interventions remain responsive to the evolving needs of individuals and communities. This section discusses components that offer a structured roadmap for policymakers, practitioners and community stakeholders to operationalise integration and enhance the effectiveness, sustainability and equity of services for PLHIV and NCDs.

Policy development and implementation

Effective policy frameworks are essential for integrating HIV and NCD services (Haregu et al. 2015; Kintu et al. 2020). Successful integration requires strong coordination and collaboration among various government sectors, including health, social services and finance (Rasesemola 2023). This approach is crucial because the challenges posed by HIV and NCDs often intersect, impacting individuals' health and wellbeing in multifaceted ways.

Policymakers must develop comprehensive guidelines and standards that facilitate the implementation of integrated service delivery models. These models should be designed to meet the complex needs of individuals affected by both infectious diseases, like HIV, and chronic conditions, such as diabetes and cardiovascular disease (Duffy et al. 2017). Addressing the diverse factors influencing health outcomes, including socioeconomic status, access to care and SDoH, is essential to ensuring effective integration.

Establishing sustainable financing mechanisms, such as universal health coverage (UHC) and appropriate health-financing arrangements, is a priority for policymakers (Nugent et al. 2018; WHO 2023). These mechanisms are vital for ensuring equitable access to a broad spectrum of preventive, diagnostic and treatment services needed for the effective management of both HIV and NCDs. Sustainable financing not only facilitates access to services but also promotes greater resilience in the health care system, enabling the continued provision of care during crises or periods of increased demand.

Creating enabling policy environments that foster coordinated, person-centred and financially accessible care will enhance health care systems' ability to address the dual burden of these overlapping health challenges effectively (Kintu et al. 2020; Lazarus et al. 2021). A focus on individual patient needs and holistic care can address current health issues and implement preventive measures to reduce future risks. Ultimately, integrating HIV and NCD services improves health outcomes and QoL for individuals while alleviating pressure on health care systems by reducing the fragmented care often encountered in traditional service delivery models. A well-structured policy framework benefits those affected by these diseases and enhances the overall efficiency and effectiveness of public health care initiatives.

Health care system strengthening

Strengthening health care systems is essential for delivering integrated care for HIV and NCDs (Duffy et al. 2017). A multifaceted approach is required, involving significant investments in health care infrastructure and resources to address these interrelated health challenges.

Well-equipped PHC facilities form the backbone of an effective health care system (Harrison & Jordan 2022; Varghese et al. 2019). These facilities should be designed to provide integrated, comprehensive services that address both communicable diseases like HIV and NCDs, such as diabetes and cardiovascular conditions. Effective supply chain management systems are needed to ensure the availability of essential medicines, diagnostic tools and treatment options (Murudi-Manganye et al. 2020; WHO 2023). Robust supply chains enable timely access to care and prevent stockouts, which can significantly hinder patient treatment and management (WHO 2023).

Moreover, the recruitment, training and retention of a skilled, multidisciplinary health care workforce are vital (Mwagomba et al. 2018; Njuguna et al. 2018). Health care professionals must be well-versed in HIV and NCD management. Ongoing education is essential to keep them updated on best practices and emerging treatment modalities. Holistic, patient-centred care should be emphasised to address the full spectrum of an individual's health needs rather than treating isolated conditions.

Building the capacity of PHC facilities involves more than just physical resources; it also includes fostering an environment that encourages interdisciplinary teamwork among health care providers (Duffy et al. 2017; Harrison & Jordan 2022). Collaborative approaches ensure that specialists, such as doctors, nurses and social workers, can work together seamlessly to care for patients with multiple health conditions. Training programmes focused on integrated care practices can enhance providers' skills, enabling them to manage chronic diseases more effectively.

Promoting a culture of continuous improvement and learning within health care teams is essential. Regular training workshops, peer review and feedback mechanisms can help identify areas for improvement and reinforce best practices. By investing in these areas, health care systems can improve the quality of care, enhance patient experiences and ensure continuity of services.

Ultimately, by strengthening health care systems in these comprehensive ways, health care providers can establish a more robust foundation for effectively delivering integrated HIV and NCD care. This integrated approach not only addresses individuals' immediate health care needs but also contributes to improved health outcomes for the populations they serve. Communities supported by stronger health care systems may be better positioned to manage the combined burden of HIV and NCDs and to use available resources more efficiently (Nugent et al. 2018). In summary, investing in health care infrastructure, skilled personnel and cohesive practices is essential for achieving lasting health improvements for those affected by HIV and NCDs (Duffy et al. 2017).

Community engagement and empowerment

Engaging and empowering communities is crucial for the success of integrated health programmes (Sacks et al. 2019; WHO 2023). This approach requires active collaboration with diverse community-based organisations (CBOs), faith-based groups and grassroots leaders to gain a comprehensive understanding of the local population's unique needs and perspectives. By fostering genuine partnerships among patients, health care providers and community stakeholders, the design, implementation and monitoring of integrated services can be customised to address the social, cultural and economic factors that influence health outcomes.

One key aspect of this collaborative process is the prioritisation of building health literacy and self-management capabilities within individuals and communities. Health literacy encompasses the knowledge and competencies that enable people to access, understand, appraise and use health information and services in ways that promote and maintain their health and wellbeing (WHO 2021). By empowering community members to take an active role in their care, they can advocate for the resources and support necessary to manage and overcome challenges, particularly those related to the intersection of HIV and NCDs. For instance, individuals equipped with better health literacy are more likely to engage in preventive health behaviours, adhere to treatment regimens, and manage their health conditions effectively.

Through this comprehensive, community-centred approach, integrated health care programmes can leverage local knowledge, assets and community agency to enhance the sustainability and relevance of their efforts to improve population health (Sacks et al. 2019; WHO 2023). Engaging community health care workers (CHCWs) is pivotal to this strategy. These individuals have a profound understanding of local contexts, which can significantly enhance the reach and effectiveness of integrated HIV and NCD services (Sacks et al. 2019; Sinha & Pati 2017; WHO 2023). Their insights can inform service delivery, ensuring that interventions are culturally relevant and more readily accepted by the community.

Empowering patients and caregivers to participate in their own care actively through self-management support programmes can lead to markedly better health outcomes and improved treatment adherence (Harrison & Jordan 2022; Lazarus et al. 2021). Such programmes can include training sessions, access to resources and support networks that help individuals navigate their health issues effectively. This empowerment also strengthens the overall health care system, as patients become more informed and engaged, reducing the burden on health care providers.

Furthermore, by building robust partnerships with CBOs, integrated health care programmes can develop tailored solutions that meet the

unique needs and preferences of the populations they serve. These partnerships can facilitate outreach efforts, enhance resource sharing and promote a shared understanding of health challenges within the community. For example, collaborative initiatives could address specific barriers to health care access, such as transportation issues or cultural stigmas associated with certain health conditions.

The success of integrated health programmes hinges on a thorough understanding of community dynamics and the establishment of collaborative partnerships. By empowering communities to take an active role in their health care, building health literacy and leveraging local resources, these programmes can create sustainable and effective health solutions that truly serve the needs of the population. The evidence presented shows the importance of this community-centred approach in addressing the complex health care challenges posed by HIV and NCDs, ultimately leading to improved health outcomes and QoL for individuals and communities alike.

Capacity-building and training

Strengthening the capacity of the health care workforce is crucial for the effective delivery of integrated services that address both HIV and NCDs (Mwagomba et al. 2018; Njuguna et al. 2018). This process involves basic training as well as more comprehensive education that equips health care providers with the knowledge and skills to manage communicable diseases and NCDs concurrently (Murudi-Manganye et al. 2020; WHO 2023).

To meet the complex needs of patients facing the dual challenges of HIV and chronic conditions, it is essential to foster an interdisciplinary approach within health care teams (Duffy et al. 2017; Harrison & Jordan 2022). This means bringing together diverse professionals – including physicians, nurses, social workers and CHCWs – to collaborate effectively. Each discipline and role contributes unique insights and skills that enhance overall patient care. For instance, social workers can address mental health and SDoH, while CHCWs can offer valuable support in navigating health care systems and community resources.

Furthermore, such interdisciplinary collaboration enables a more holistic, coordinated response to patients' biopsychosocial needs. It allows health care teams to develop comprehensive treatment plans that address not only the medical aspects of care but also the emotional and social challenges patients may face. This team-based care approach is particularly important, given the complex relationship between HIV and chronic conditions, where both physical and mental health considerations are critical to achieving positive health outcomes.

Through targeted capacity-building initiatives that enhance individual professionals' competencies and team collaboration, health care systems can significantly improve the quality of care they deliver. By investing in workforce development, health care organisations can foster an environment that prioritises continuous learning and adaptation to evolving health challenges (WHO 2023). This ultimately leads to improved health outcomes for individuals and communities affected by HIV and chronic conditions (Sinha & Pati 2017). By ensuring health care providers are well-equipped to deliver integrated services, urgent health care needs are addressed, and long-term wellness and resilience are promoted among vulnerable populations.

Monitoring and evaluation

Evaluation systems play a crucial role in measuring the impact and effectiveness of integrated programmes that address both HIV and NCDs (Reynolds & Sutherland 2013). These systems rely on a range of standardised indicators, including clinical outcomes and patient-reported and community-level experience metrics, all of which provide a comprehensive understanding of programme performance (Lazarus et al. 2021; Patel, Sabin & Godfrey-Faussett 2018).

High-quality, disaggregated data allows health care systems to identify existing gaps, disparities and areas requiring improvement in the delivery of integrated services (Patel et al. 2018). By leveraging this information, health care systems can gain insights into the specific needs of diverse populations and communities, facilitating more targeted and effective interventions.

The use of this data should not be confined to mere performance reporting. Instead, it should actively inform processes aimed at continuous quality improvement (Reynolds & Sutherland 2013; WHO 2023). Health care systems should utilise insights from this data to guide policy development and programmatic decisions at every level. Establishing robust M&E frameworks that remain responsive to evolving community needs enables integrated HIV and NCD programmes to adapt and refine their approaches (Reynolds & Sutherland 2013). This adaptability ensures resources are allocated efficiently and health care is person-centred, equitable and effective (Estacio 2019; Hannah et al. 2023; Hogg 2018; Lazarus et al. 2021; Nigatu 2012; Patel et al. 2018).

Moreover, effective M&E can significantly inform policy development and implementation by generating data-driven insights into the impact and effectiveness of integrated programmes (Guenther et al. 2014; Maratt et al. 2019; Mbachu et al. 2013; Reynolds & Sutherland 2013). These insights are invaluable for directing decisions on resource allocation, optimising

service delivery models, and crafting policies that foster the integrated management of HIV and NCDs. By identifying specific gaps and disparities, M&E efforts empower policymakers and practitioners to allocate resources and implement practical solutions strategically to enhance integrated service delivery. Ultimately, this targeted approach contributes to improved health outcomes for the populations served, ensuring that both immediate and long-term health care needs are met effectively and equitably.

Research and innovation for integrated HIV and noncommunicable disease interventions

Ongoing research and innovation are crucial for developing and implementing integrated interventions for HIV and NCDs (Dowdy et al. 2020; Njuguna et al. 2018). This field of study requires a thorough exploration of innovative service delivery models that effectively address the unique needs and challenges arising from these two health care issues (Duffy et al. 2017; Harrison & Jordan 2022). Addressing these challenges involves investigating comprehensive care approaches tailored to individuals who are affected by both HIV and NCDs.

Additionally, developing cost-effective, accessible diagnostic and treatment technologies is essential (Nugent et al. 2018; WHO 2023). These technologies must be designed for seamless integration into PHC settings, ensuring they are readily available to those who need them most (Varghese et al. 2019). The ability to access both HIV and NCD care through a single health care provider can significantly improve health outcomes and streamline the treatment process for patients facing the dual burden of these conditions.

Rigorous research is necessary to identify effective, evidence-based strategies that confront the complex social, economic and environmental factors influencing HIV and NCD health outcomes (Dean & Fenton 2010; Menza et al. 2021). Understanding these intersecting determinants of health is vital for creating targeted interventions that truly reflect the realities of affected communities. For instance, socioeconomic status, access to health care resources and community support systems all play significant roles in shaping health outcomes.

Collaboration among researchers, policymakers and community stakeholders is indispensable (Rasesemola 2023; Sacks et al. 2019). Engaging diverse perspectives ensures that the research agenda aligns closely with the lived experiences and pressing needs of individuals impacted by HIV and NCDs. This collaborative approach not only enhances the relevance of research efforts but also fosters a sense of ownership and involvement among affected communities.

Establishing meaningful partnerships and amplifying the voices of those directly affected can bring invaluable insights to the research process (Sacks et al. 2019; WHO 2023). These insights contribute to the development of innovations and strategies that address real-world challenges. Tailoring interventions to meet the specific contexts of the populations they aim to serve will ultimately enhance the efficacy of HIV and NCD health initiatives. By prioritising collaboration and community engagement, the field can advance towards more effective solutions that address the dual burden of these health conditions.

Conclusion

The integration of HIV and NCD services presents a significant opportunity to address the increasing burden of chronic conditions, particularly in resource-limited settings. Successful HIV programmes have established valuable lessons and infrastructure that can be leveraged to enhance service delivery for both HIV and NCDs. Strengthening PHC as a foundational element is essential, as it can improve access to integrated services and ensure that individuals receive comprehensive care tailored to their specific needs.

Providing integrated HIV and NCD services enables a holistic approach to health care, where both communicable diseases and NCDs are addressed simultaneously. This person-centred care model recognises that many individuals are affected by multiple health issues, and treating them in isolation often neglects broader health implications. Therefore, offering coordinated services ensures more efficient resource use and a better patient experience.

Another critical factor in improving health outcomes discussed in this chapter is addressing the SDoH. Socioeconomic status, education level and access to essential resources, including nutritious food and clean water, play a significant role in shaping health outcomes. Understanding and tackling these determinants is vital for creating equitable health solutions that reach the most vulnerable populations.

Challenges in integrating the management of HIV and NCDs must be identified and addressed proactively. Barriers may include resource allocation, workforce training and the lack of awareness or stigma surrounding certain conditions. However, opportunities also exist to enhance service delivery through innovative practices and the sharing of best practices among health care providers. Continuous assessment and adaptation of integration strategies can lead to improved health care systems that effectively meet the needs of diverse populations.

To drive sustainable improvements in population health, a multifaceted approach is essential. This includes developing and implementing sound

policies, strengthening health care systems, engaging and empowering communities, and investing in capacity-building and training for health care workers. Robust M&E frameworks are necessary to assess the effectiveness of integrated services and support ongoing research and innovation.

Fostering multisectoral collaboration is also crucial. Engaging diverse stakeholders, including government agencies, NGOs and the communities served, enhances the development of tailored solutions that resonate with local needs and preferences. Amplifying the voices of affected communities ensures that health initiatives are relevant and responsive, facilitating a collaborative environment that ultimately leads to healthier populations and improved health outcomes for all.

Declarations

Ethical considerations

This chapter is based on a literature review and policy analysis and did not involve human participants.

Consent

Not applicable.

Authors' contributions

Conceptualisation, L Makhado and TG Makhado; *data curation*, L Makhado; *formal analysis*, L Makhado; *funding acquisition*, N/A; *investigation*, L Makhado; *methodology*, L Makhado and TG Makhado; *project administration*, L Makhado; *resources*, L Makhado; *software*, L Makhado and TG Makhado; *supervision*, L Makhado; *validation*, TG Makhado; *visualisation*, N/A; *writing – original draft*, L Makhado and TG Makhado; *writing – review and editing*, L Makhado and TG Makhado.

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No new data were generated.

Disclaimer

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Chapter 1

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Chapter 5

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Chapter 6

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Chapter 9

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Chapter 10

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Chapter 11

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Integrated care for human immunodeficiency virus and chronic diseases in South Africa is the inaugural volume in the Advances and Innovations in African Rural Health Care Book Series. Addressing one of the most pressing challenges facing health care systems today, this scholarly book explores how primary health care can serve as a foundation for the integrated management of human immunodeficiency virus (HIV) and noncommunicable diseases.

As people living with HIV experience longer life expectancy, the burden of chronic conditions such as hypertension, diabetes and cardiovascular disease continues to grow. Yet, health care services often remain fragmented. This volume presents an evidence-based framework for integrating HIV and noncommunicable disease care within primary health care settings, with particular relevance for rural African and low-resource contexts.

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