EXPLORING DETERMINANTS TO HIV VIRAL LOAD MONITORING IN NIGERIA.

A LITERATURE REVIEW ON PROMISING PRACTICES FOR IMPROVEMENT

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Nigeria

56th Master of Public Health/International Course in Health Development 16th September 2019 – 04th September 2020

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Exploring Determinants to HIV Viral Load Monitoring in Nigeria.
A Literature Review on Promising Practices for Improvement.

A thesis submitted in partial fulfilment of the requirement for the degree of Master of Public Health By

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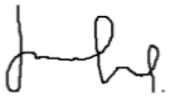

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Abbreviations

ART	: Antiretroviral Therapy
ARV	: Antiretroviral
CHW	: Community Health Workers
EMR	: Electronic Medical Record
ESA	: East and Southern Africa
FSWs	: Female Sex Workers
GDP	: Gross Domestic Product
GNI	: Gross National Income
HCW	: Health Care Worker
HDI	: Human Development Index
HIT	: Health Information and Technology
HSB	: Health-Seeking Behaviour
HIV	: Human Immunodeficiency Virus
KP	: Key Population
LMIC	: Low-Middle-Income Countries
M&E	: Monitoring and Evaluation
MSM	: Men Who Have Sex with Men
PLHIV	: People Living with HIV
PWID	: People Who Inject Drugs
RCT	: Randomized Control Trial
SAD	: Stigma and Discrimination
SES	: Socio-Economic Status
SSA	: Sub-Saharan Africa
TAT	: Turn Around Time
UNAIDS	: The Joint United Nations Programme on HIV/AIDS
VL	: Viral Load
VLM	: Viral Load Monitoring
VLS	: Viral Load Suppression
VLT	: Viral Load Testing
WCA	: West and Central Africa
WHO	: World Health Organization

Abstract

Background

The HIV treatment cascade in Nigeria for 2019 revealed a viral load suppression rate of 42%; this is significantly below the UNAIDS 90% target for 2020 and way off the new 95% mark for 2030. This poor performance indicates important gaps in viral load monitoring (VLM) services in the country. This study aimed to explore the factors influencing VLM and identify promising practices for improvement to provide recommendations for adoption.

Method

I conducted a comprehensive literature and desk review of studies on viral load monitoring conducted in Nigeria from 2005 to 2019 from VU Library, PubMed and Google scholar. I also utilized the socio-ecological model as a framework for the study.

Result

I found that limited knowledge and negative attitude to HIV services were a huge hindrance to the uptake of VLM by people living with HIV. Also, lack of disclosure of HIV status and poor social support were barriers to receiving adherence support and subsequent viral load testing. In addition, factors such as stigma and discrimination from health workers further discouraged access to HIV treatment services and VLM. Lastly, structural factors such as indirect costs, poor health services and long waiting times for results further mitigated efficient viral load service provision.

Conclusion and Recommendation

The barriers to VLM in Nigeria are multifactorial and require a multi-dimensional approach to be addressed. Low-cost interventions such as peer support mentoring that enables safe status disclosure and improve adherence to antiretroviral therapy, use of Point-of-care viral load testing to address the logistics barriers of VLM have been shown to be beneficial and should be explored.

Keywords: PLHIV, Viral Load Suppression, Viral Load Monitoring, Antiretrovirals Adherence and Nigeria.

Word Count: 12997

Introduction

My name is Adejo Solomon Utenwojo, I am a medical doctor with 7 years of experience practising in Nigeria. I spent five (5) years as a clinician providing health services in the public health sector at the tertiary, secondary and primary level of care and had my core public health experience with a non-governmental organization (NGO) for two (2) years.

My experience in providing HIV services as a clinician was in the care and management of people living with HIV (PLHIV) in the facility with support from an NGO that was implementing HIV program. I was responsible as the HIV focal person responsible for initiating and monitoring PLHIV in care. The recognition that I could offer more than providing services in the facility motivated me to consider field implementation of program at community level.

Engaging with an NGO availed me with the opportunity to identify the systemic gap in HIV services. I was responsible for HIV service delivery in a district with one of the highest HIV burdens in Nigeria. There were challenges to the services, which resulted in a quality improvement initiative that I coordinated as a quality improvement specialist. I championed several QI initiatives, including improving viral load monitoring and early infant diagnosis of HIV. The position allowed me to establish a relationship with PLHIV, including Key population community where I served. It enabled me to asked questions on the barriers they face utilizing the available HIV services as it was obvious that viral load suppression was poor. The responses instigated my interest to conduct research prior to my commencement of postgraduate studies. As the opportunity availed, I decided to focus my research on exploring factors to VLM in Nigeria as the country is faced with a triple threat of a high HIV burden, low ART coverage, and unsatisfactory decline in new HIV infections and poor viral suppression.

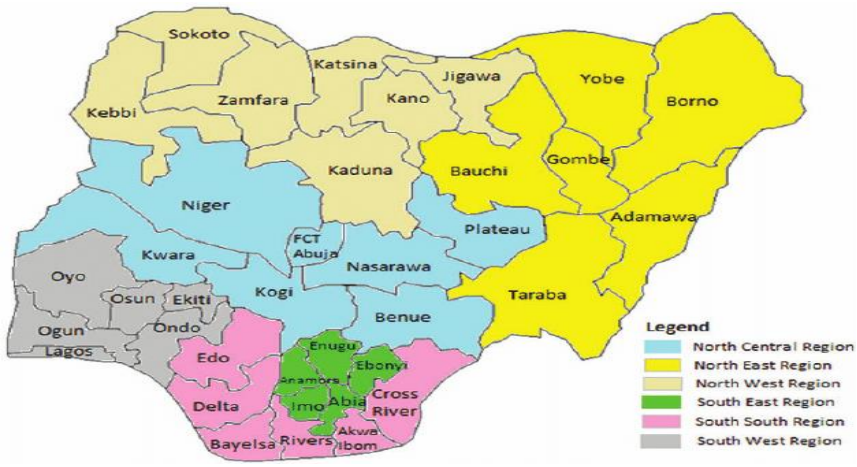
I am optimistic that the findings from the research and the recommendation made will be considered to improve VLM and to enable Nigeria progress towards the control of the HIV epidemic.

Chapter 1: Country profile

1.1 Nigeria

Nigeria is a sub-Saharan African country located on the west coast and shares boundaries with Benin, Niger, Cameroon, and Chad. It has an estimated population of 198 million in 2018, making it the most populated country in Africa and ranked the seventh most populous country in the world. With the population projected to grow to 210 million by 2022 and 396 million by 2050, it will be the world's third-largest population behind India and China (1). The country has a young population structure in which children below 15 years make up 45% and young people (10-24 years) constitute 33% of the population. Within the population, women of reproductive age group, under-five children and the elderly (65 years above) make up 22%, 20% and less than 5% respectively (2)(1)

Figure 1: Map of Nigeria, showing the states and administrative regions



Source: National Primary Healthcare Board Development Agency 2018 (3)

1.2 Economy

Nigeria is a low-middle-income country (LMIC) with a GDP per capita of 2028.18 USD and GDP growth of 2.1%, which remains below the country's population growth (4). The economy is driven majorly by revenue generated from crude-oil exploration and export accounting for 75% of its GDP estimated at 397,270 billion USD in 2018. However, subsistence agricultural practices are the predominant occupation in the country (1). Despite the enormous resources, the per capita income remains low with significant poverty in which poor people constitute 40.1% (82.9 million) of the population (1,5).

1.3 Human Development Index (HDI) and Gender Equity

Nigeria is categorized to have low human development index (HDI of 0.534) that reflects a poor socio-economic development (6). On the gender-related development index, the country is ranked 152 out of 188 countries. Women are disproportionately disadvantaged generally than men due to the gender disparities that exist. They are less educated and employed in the formal sector and financially dependent on their spouse (1). Women are not able to seek health care independently as consent is required from men who are the decision-makers (7), and this puts them at more risk of health challenges.

1.4 Sociocultural context

A number of cultural and norms and practices in Nigeria have positive values and implications for HIV prevention, treatment and care, which include strong family and community relationship and network (8). Furthermore, religion plays a significant role in health service utilization in Nigeria.

1.5 Health system and status

Health services provision is organized according to the three levels of government. The federal government controls tertiary care, state government manages the secondary care, and the local government supervises the primary care level. Over 10, 000 health facilities publicly and privately owned are spread across all the 774 Local Government Areas (LGA) in the 36 states and Federal Capital Territory (FCT). Public health services provision is faced with the challenge in poor funding of the health sector, inadequate and inequitable distribution of qualified, skilled health workforce, an inadequate number of functional primary healthcare facilities, poor level of literacy and insecurity (3). There are also gaps in the national health information system which include non-adherence to reporting guidelines, poor availability and utilization of standardized tools, the dearth of skills for interrogation of data, and non-involvement of private providers. This affects the use of evidence in policy, planning and implementation of programs (9).

Nigeria's key health indicators are among the worst in the globe. The country is among the LMICs suffering from a continual high prevalence of communicable disease and rising non-communicable disease (9). Vaccine-preventable disease (measles, pneumonia, and diarrhoea) infectious (HIV, TB) and parasitic disease (malaria) are the leading causes of morbidity and mortality. Nigeria has the highest number of HIV-infected persons in the African component and the fourth-highest TB burden in the world (9). The progress towards health-related sustainable development goals is slow and unlikely to be achieved by 2030.

1.6 Overview of HIV

HIV has infected 75 million people, with an estimated 32 million deaths globally since its onset (10). The burden of HIV is disproportionately distributed globally and significantly concentrated within the sub-Saharan Africa (SSA) region, which is made up of forty-six (46) countries, including Nigeria and together constitutes about 12% of the world population. SSA account for 71% of the global HIV disease burden, 65% of a new infection, and about 75% of the global HIV-related deaths in 2018 (11). HIV burden and new infection are more in the Eastern and Southern African region than the West and Central Africa region (table 1) (12).

HIV epidemic impacts the socio-economic development of countries with devastating consequences on the health and wellbeing of people living with HIV (PLHIV). The effect cuts-across all sectors of the economy with the LMIC in sub-Saharan African suffering the worse hit (13).

Table 1: Summary of global HIV prevalence, incidence and mortality for 2018

Region	People Living with HIV (PLHIV)	People newly Infected with HIV	HIV-Related Deaths
Global	37.9 million	1.7 million	770 000
East and South Africa	20.6 million	800 000	310 000
West and Central Africa	5 million	280 000	160 000

Source: UNAID 2019 (12)

1.7 HIV and Nigeria

Nigeria, has the second-largest HIV epidemic globally, contributing an estimated 9% of PLHIV, 10% of new HIV infections, and 14% of HIV-related deaths in 2013 (8). As a country with the largest population in Africa, it accounts for 13% of the HIV burden and has one of the highest rates of new infection in SSA. It also contributes an estimated 60% of new infection and 54% of all the AIDS-related death in West-Africa region (8,12). The country has a mixed HIV epidemic, where the general population has a high HIV-burden, but a high-risk key population (KP), have a far greater burden when compared to the rest of the population (14). In 2017, children accounted for 36,000 of the 210,000 new infections. The KP, who constitute approximately 1% of the adult population, contributes to 25% of a new infection. These KP with their partners together make up 3.4% of the adult population and together contribute 40% of new infections in Nigeria (15). The KP which includes female sex workers (FSW), men who have sex with men (MSM) and people who inject drugs (PWID) are together significant drivers of the HIV epidemic in Nigeria (16).

The impact of HIV in Nigeria is enormous, and its consequences have resulted in overburdening the health sector with increased cost for health personnel training, recruitment, and workload. It has increased the burden of responsibilities on families and homes caring for children who are orphaned and decreased school enrollment. There is also, a decrease in the skilled workforce which has resulted in the decline in socioeconomic productivity, stagnancy in economic growth, and increased poverty level (17).

In reducing the HIV epidemic, various strategies and management guidelines had been instituted across the HIV care continuum (treatment cascade) with varying degrees of success. The HIV care continuum is a public health model showing the various steps people living with HIV (PLHIV) undergo from diagnosis through to commencement of treatment to achieve and maintain viral load suppression (VLS) (18). In 2013, in a bid to mount an effective response in ending the epidemic by the year 2020, the Joint-United Nation Program on HIV/AIDS (UNAIDS) set an ambitious target of 90-90-90 for diagnosis, treatment and monitoring. It was expected that by 2020, 90% of all PLHIV would know their status; 90% of all diagnosed PLHIV infection will receive sustained antiretroviral therapy; 90% of all PLHIV on therapy will have viral suppression. These targets have been reviewed to become UNAIDS 95-95-95 for 2030(19). To this end, improvement of diagnostic capacity, the commencement of early treatment, scale-up of effective treatment and monitoring was recommended in the revised World Health Organization (WHO) treatment guideline (20). These strategies have recorded immense success, as there is a decline in the epidemic within the past decade in the global context and in Nigeria. However, a recent report in 2018 showed a rise in the epidemic in Nigeria (Table 2) (8,12). With the current rise in the HIV epidemic in the country, shows that there is an increasing gap in achieving the UNAIDs HIV control targets (8,12).

Table 2: Estimates of HIV prevalence, incidence and mortality for Nigeria in 2015 and 2018

Region	**People Living with HIV (PLHIV)**	**People newly Infected with HIV**	**HIV-Related Deaths**
Global	37.9 million	1.7 million	770 000
East and South Africa	20.6 million	800 000	310 000
West and Central Africa	5 million	280 000	160 000

Source: UNAIDS 2019 (12)

Chapter 2: Problem Statement, Justification, Objective, and Methodology

2.1 Problem Statement

The ultimate goal of antiretroviral therapy (ART) is to achieve viral load suppression (VLS) (21). The achievement of VLS prevents HIV transmission in sexual partners (22) and amongst the key population (23). Viral load monitoring (VLM) enables clinicians to assess people living with HIV (PLHIV) response to treatment, including adherence, drug resistance and treatment failure (24)(25). Viral suppression encourages higher level of treatment adherence (26). Furthermore, it can be used as a proxy measure for transmission risk, the effectiveness of prevention programs, quality, coverage and inequalities in the utilization of HIV services at both the individual and population levels (27).

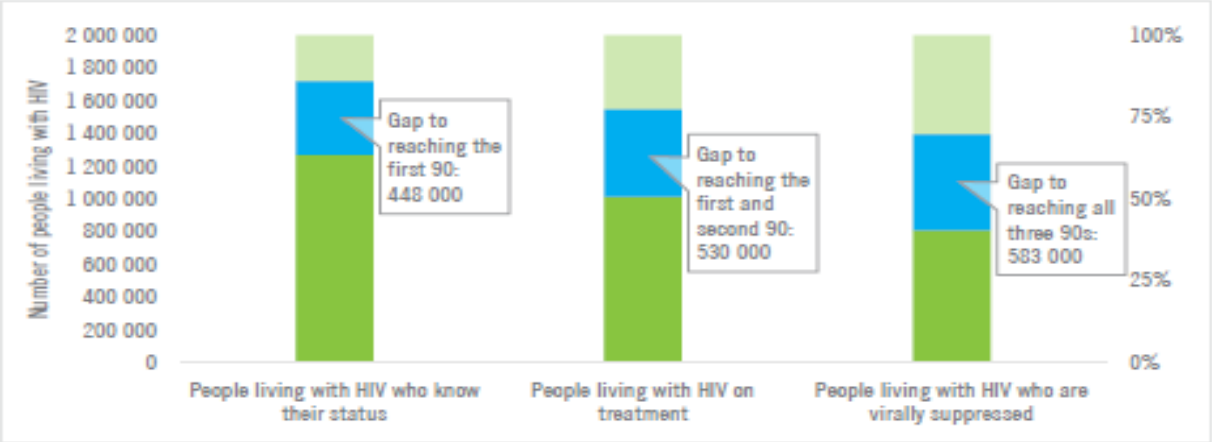
Scaling-up VLM globally became a necessity due to the increased risk of drug resistance and treatment failure from the "treat all policy" recommendation (28)(29). It was adopted in Nigeria in 2015, and the progress towards achieving the 90-90-90 target now UNAIDS 95-95-95 for the year 2030 is slow. The country remains among the six nations with a triple threat of a high HIV burden, low ART coverage, and unsatisfactory decline in new HIV infections and poor viral suppression (30). In 2018, the overall VLS rate was 45%, which reflects the gap in achieving HIV epidemic control (15)(12) (figure 2). The rate varies across the regions of the country and among the age groups, and between males and females (see figures in appendices) (31). KP, especially MSM, have poor viral load (VL) outcomes due to the impact of stigma and discrimination (SAD) influencing their adherence to HIV treatment continuum (32)(33)(31). Furthermore, access to viral load testing (VLT) is higher in central and urban areas compared with more remote areas (34)(35).

VLM is done in Nigeria at six months after initiation on ART, then at twelve months and then yearly for a stable PLHIV on treatment following the WHO guideline. It follows a logical flow of activities from blood sample collection from eligible PLHIV to achieving viral suppression (stable patient). A stable PLHIV has VL < 1000 copies/ml while an unstable patient has a VL > 1000 copies/ml indicating treatment failure (20,36). In achieving viral suppression, at least 95% adherence is recommended by WHO. Studies have shown that adherence to ART strongly correlates with viral suppression (37)(38). However, VLS can be achieved with an adherence level of less than 95% (39). The importance of adherence to ART is to attain the overall goal of undetectable viral load, which equals to untransmittable HIV infection (U=U) (40). For unstable PLHIV, enhanced adherence counselling (EAC) is recommended (41)(42). EAC involves intensive counselling session carried out monthly for three months, followed by a second or repeat VLT. If the VL remains high (> 1000 copies/ml), virological failure is diagnosed, and the patient is switched to another ART regimen (43). WHO defines virological failure as "plasma viral load above 1000 copies/ml based on two consecutive viral load measurements after three months, with adherence support" (44). From studies, EAC results in VLS in over 70% of PLHIV with initial unsuppressed VL (45).

Just like other LMICs, Nigeria's VLM encounters bottle-necks at every step (figure 3) which include, complexities with operational cost, shortage and overburdened health care workers, inadequate training and lack of knowledge, weak infrastructure and logistic system (24,46). Specifically, issues with the inability for demand creation, operational inefficiencies, downtime

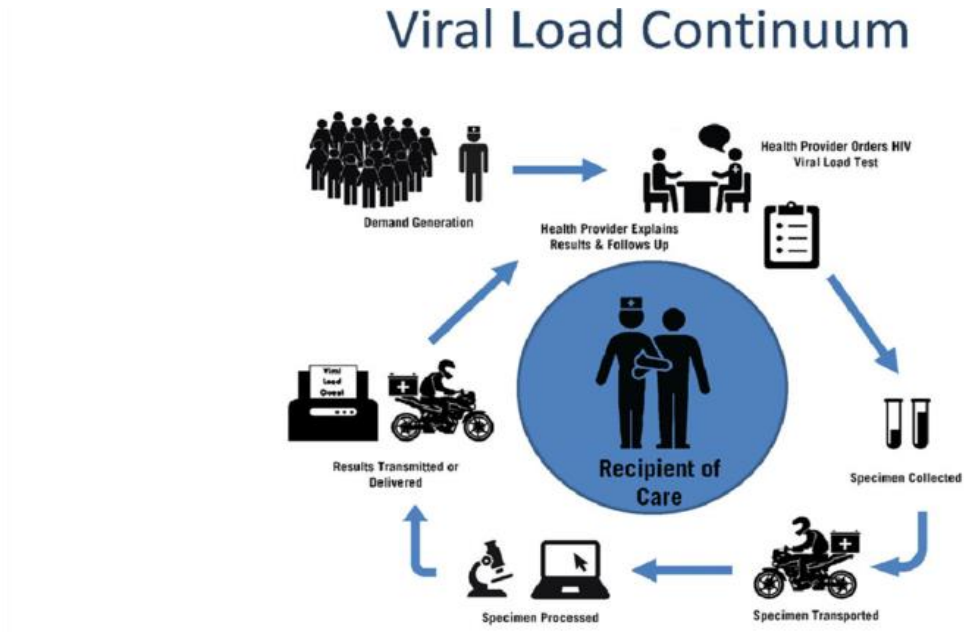
of PCR laboratories equipment and poor turnaround time for VLM were stated to impedes its improvement in Nigeria (15). Furthermore, security threat from insurgencies and communal clashes which hinder immunization services (47), also constitutes a challenge to PLHIV access to VLM services. With the gaps in performance achievement and ongoing challenges with VLM, if evidenced-informed interventions are not undertaken, the goal to control HIV epidemics and its associated morbidity and mortality will remain an ambition rather than a reality.

Figure 2: The 2018 UNAIDS HIV care cascade for Nigeria, showing progress toward the 90-90-90 target.



Source: UNAIDS 2019 (12)

Figure 3: Steps to receiving viral load monitoring



Source Arpadi et al., 2017 (48)

2.2 Justification

Viral load monitoring (VLM) provides data that can be used to show and explain the effect of policies made on HIV and also to advocate for interventions (32). Currently, there is a dearth of literatures on VLM and also on the scorecard of Nigeria 3rd 90 in the UNAIDS target, and this is a pointer to lack of research in VLM. Studies done in the field of HIV management focuses on the factors and gaps in the diagnosis and treatment, especially treatment adherence, and significant progress have been achieved on them (15). Adherence to treatment correlates with VLM outcome (37), and they are both dependent on each other in ART. From the several studies done on adherence aspect of the HIV management spectrum, the attention to VLM is minimal, and they did not seek to explore the factors and gaps related to VLM improvement in Nigeria.

To this end, this research aims to explore factors that influence demand creation and health system-related services for VLM in people living with HIV (PLHIV). The analysis will provide insight into evidenced-informed practices from other settings that can be recommended for adoption to improve VLM and achieve the UNAIDS targets in Nigeria.

2.3 General Objective

To explore factors influencing VLM in PLHIV and recommend interventions for its improvement in Nigeria.

2.4 Specific Objectives

1. To explore demand-side factors influence on PLHIV VLM in Nigeria.
2. To explore supply-side factors, influence on PLHIV VLM in Nigeria.
3. To identify and analyze promising practices that will improve VLM as tried in other settings for possible adoption in Nigeria.
4. To make recommendations on improving VLM to stakeholders working in the HIV sector in Nigeria.

2.5 Methods

The study was conducted by doing a literature and desk (document) review of relevant studies. Articles and books were searched, and retrieved from VU library database, PubMed, Google Scholar and Google. Information was obtained from grey documents published by international organizations such as UNAIDS, WHO and AVERT. Policy documents from ministries and agencies of the Federal Republic of Nigeria and research institutions were also used.

Table 3: Description of study methodology showing inclusion and exclusion criteria of articles.

	Explanation of Methods	**Inclusion Criteria**	**Exclusion Criteria**
Objective 1 and 2	• Exploration of demand and supply-side factors influence on VLM in Nigeria. • Adherence was used as a proxy to VLM due to dearth of articles on VLM in Nigeria	• Peer-reviewed articles published in English between 2000-2020. • Studies conducted on adherence or viral load in sub-Saharan Africa	• Studies on adherence and viral load not related to HIV (e.g Hepatitis B and C)
Objective 3	• Identify and analyze promising interventions that improved VLM in other settings.	• Peer-reviewed articles on VLM improvement in other settings published in English between 2010-2020	• Unpublished interventions from NGOs, not peer-reviewed

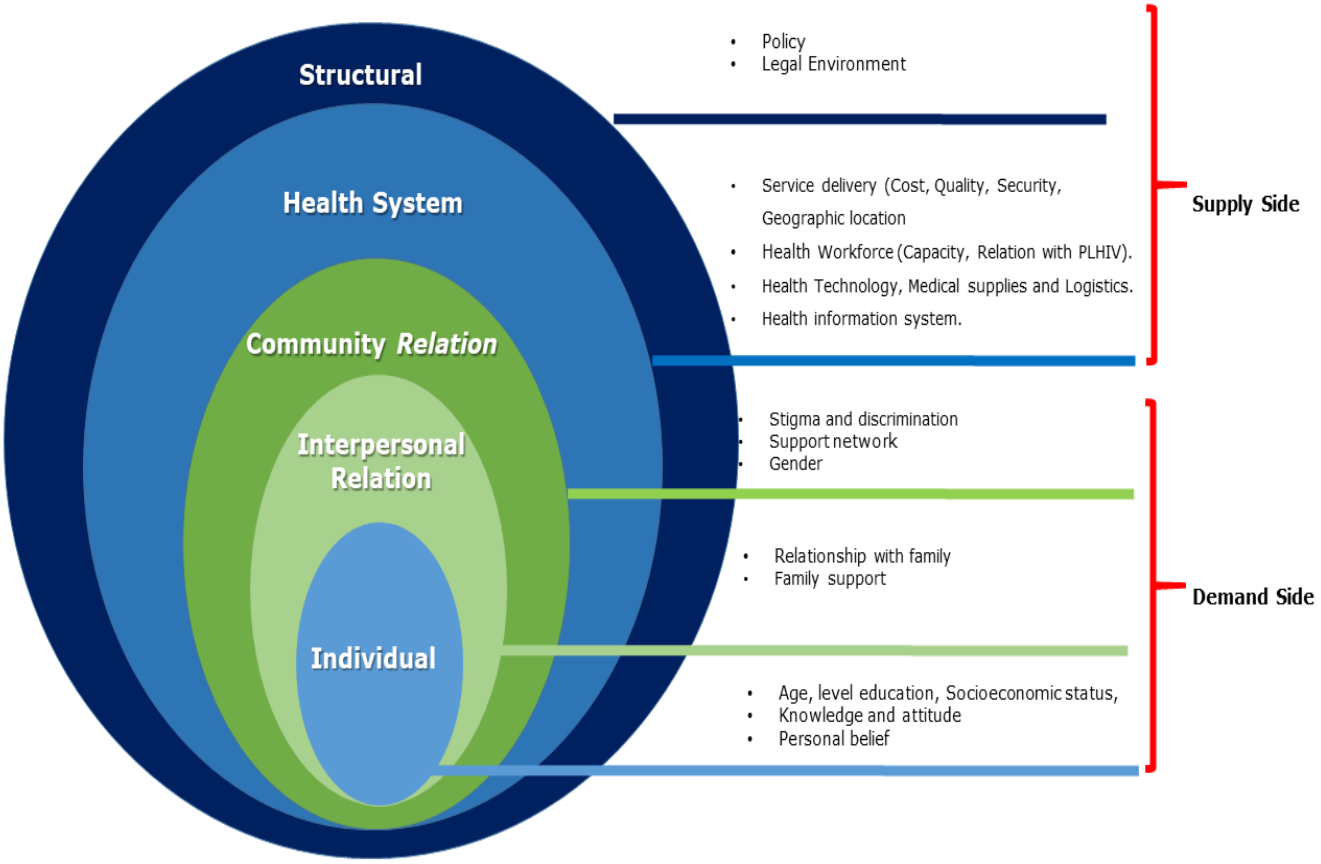
Source: Author's

Keywords: The main words that provided relevant articles using Boolean operators include, PLHIV, HIV, Viral Load Suppression, Viral Load Testing, Viral Load Monitoring, Antiretrovirals Adherence and Nigeria. Other keywords used were categorized in relation to the framework and study objective shown in the appendices section (table 3).

2.6 Conceptual Framework

The study is based on the socio-ecological model (SEM) by Kaufman et al. (49) (figure 9) which was adapted with the WHO building block of the health system (figure 5). The SEM was chosen because it recognizes the interlinked relationship between an individual and their environment. It addresses the complexities and interdependence between factors responsible for behaviours in seeking health care and the environment for service provision (49,50), in this case, VLM. The domains for the study were categorized into demand-side and supply-side (see table). The strength of the SEM lies in its use in multilevel analysis for factors influencing VLM, which enables the identification of gaps as well as strategies. However, it does not directly provide an approach for the intervention aspect of the study, and the multilevel analysis is complex and cumbersome.

Figure 4: Conceptual Framework-Adapted Socioecology model with the WHO Health System Building Block



Source: Kaufman et al, and WHO 2010 (49,50)

Table 1: Description of the adapted socio-ecological model for the study.

Category	SEM Layer	Explanation	Domain
Demand-side	Individual	The influence of the individual's characteristics on VLM	Age, educational level, SES, Gender knowledge and attitude, personal belief
	Interpersonal Relationship	How interactions with family and friends influence VLM	Family relationship and social network support
	Community Relationship	How the perception of people about PLHIV affects VLM	Stigma and discrimination and Community network, Gender.
Supply-side	Health System	What and how the influence of the service provision influences VLM	Access to service delivery (cost, quality, insecurity, and geographical condition). Health workforce (capacity, relationship with PLHIV) Health technology, medical supplies, and logistics Health Information System
	Structural	How governance enables the interaction between individual and environment (supply-side) for VLM	Policy, legislation

Source: Authors'

Chapter 3: Demand-side findings

The findings on the demand-side factors influencing VLM in Nigeria are described using the adapted SEM in categories as, individual, interpersonal relation, and community factors.

3.1. Individual Factors

3.1.1. Age, level of education, socioeconomic status (SES)

Age is reported to influence VLM in Nigeria. From a case study conducted in Northern Nigeria on the associated factors for viral non-suppression, Sunkanmi et al., reported a lower chance of virological failure with increasing age. From 402 PLHIV (all age group) in the study, they found that the odds of virological failure is increased with increasing age groups (5-9 years [OR=1.97, 95%CI = 0.02-169.913], 15-19 years [OR=2.22, 95%CI=0.14-3.54], and ages 35+ [OR= 3.33, 95%CI = 0.064-171.66]) (51). The results indicate that younger age groups are more likely to have non-suppressed VL. The reason for this may likely be due to the intricacy in medication adjustment, especially in children as they grow, and the fear of SAD affecting younger people than adults. Ekong et al., (2020) contradicts these finding in a case-control study on the epidemiologic and viral predictors of antiretroviral drug resistance among 458 PLHIV in a large treatment program in Nigeria. They found older age group (ages 31–40 [OR = 2.35 [95% CI 1.29, 4.27], and 41 + [OR = 2.31 [95% CI 1.11, 4.84]) to be significantly associated with antiretroviral drug resistance (52). The findings may not be comparable to the earlier the finding (51) as it did not consider the lower age group.

In the context of the level of education and socio-economic status (SES) with VLM in Nigeria, no studies were found. However, their relationship with adherence was explored. Oku et al., conducted a cross-sectional study in a rural setting in Nigeria on the factors that influence PLHIV adherence to ART with a finding that poor adherence rate was attributable to low SES and low literacy level among 393 PLHIV on ART. They reported that a higher proportion of PLHIV (72.4%) who earned a monthly income greater than $118.75 (N19,000) were significantly more likely to adhere to ART in comparison to 57.8% of those earning less than $118.75 (N19,000) ($p<0.05$) (53). Usman et.al (2019) also corroborated this finding stating that earning income above minimum wage, (Adjusted Odds Ratio [aOR] = 2.38, 95% CI = 1.06-4.76) and acquiring formal education (aOR=3.03, 95% CI = 1.5-6.0) were independently associated with adherence (54).

3.1.2 Knowledge and attitude

Olowookere, Fatiregun and Adewole (2012) conducted a qualitative study in Nigeria to assess 318 PLHIV knowledge and attitudes towards ART. They reported that 75.2% (239/318) understood the importance of ART (good knowledge). Of those with the knowledge, 77.8% (186/239) had good adherence (>95% adherence) compared to 17.7% (14/79) of those with poor knowledge (24.8% [74/318]) ($p<0.01$). They also found that a significant proportion (44.3% [141/318]) of the respondents did not understand the technical term ("viral load is the number of HIV viruses in the blood") related to viral load. Regarding attitude, they found that 78.9% (251/318) of the respondent had a positive attitude towards ART ("there is hope for a better future living with the disease"). Among those with a positive attitude, 76.9% (193/251) had good adherence level compared to 10.4% (7/67) of those with a negative attitude (21.1% [67/318]) ($p<0.01$) (55).

Kasamu, Kasamu and Balogun (2014) agreed that PLHIV with improved awareness about VLT after adherence counselling developed a positive attitude. Most of the participants (64%) had less than tertiary level of education; 78.9% of the respondents became aware of VLT, and 98.1% had a positive attitude towards ART (56). By implication, PLHIV who were adequately informed about HIV, developed a positive attitude towards treatment adherence and most likely have VLM.

3.1.3 Personal belief

Personal belief on the use of medication in treating a disease could be positive or negative, which can influence medication use (57). Adeyinka et al., conducted a study on medication belief, locus of control and adherence among PLHIV on ART in Lagos Nigeria. Among 308 PLHIV in the study, 85.8% (n=259) felt that they would remain sick even if they take the HIV medications while 76.5% (n=231) believe that the HIV medication will only work when they are feeling sick (58). Interestingly, in northern Nigeria with the predominant Islamic religion, PLHIV put their hope on Islamic prophets and healers for a cure, and also due to seasonal fasting obligation they do not follow prescription and providers have to adjust the prescription (59). Similarly, the use of complementary herbal medicine amongst PLHIV who believes it boosts their immunity affects their level of adherence to ART (60). Adefolalu et al. in a study found that PLHIV with > 95% adherence level had a strong positive belief and concerns about the importance of ART in HIV management. These show that personal belief care along the HIV continuum and likely VLM.

3.2 Interpersonal Factors

3.2.1 Relationship with partners and family

The perception around HIV infection by Individuals and groups leading to SAD discourages PLHIV from disclosing their status. Disclosure of HIV is an independent determinant against virological failure (61), and it has the advantage of helping in reducing stress and isolation which leads to an increase in social support and adherence (62). In HIV status disclosure, PLHIV can select a treatment partner. Studies have shown that patient-selected treatment partners were associated with improved adherence and viral suppression (63). However, non-disclosure of HIV status was found to be a predictor of poor adherence (64) (65).

Ekama et al., in a study conducted in Nigeria on pattern and determinants of Antiretroviral Drug Adherence among Nigerian Pregnant Women, found that good adherence is association with disclosure of HIV status and treatment support. From 170 pregnant PLHIV, 80.6% (137) report to adhere to treatment. 95.6% (131) who were adherent had their status disclosed to their partner compared to 4.4% (6) who did not disclose. They also found that among those who adhered, 55.9% had a treatment supporter who is their spouse in 89.5% of cases (66). In another study, It was also reported that HIV status disclosure to family members while living with them was a positive predictor for adherence ($p \leq 0.05$). Amongst the 250 participants (adult) They found that adherence was highest (77.6%) among those who disclosed their status to family members compared to 3.2% for those who did not disclose their status ($p > 0.05$) (67). Although these studies (66) (67) found disclosure beneficial, the small sample size limits the generality of the findings to VLM.

3.2.2 Social network support

Social support from family and network is very crucial for PLHIV (68) treatment adherence through the HIV continuum as it is apparent that adherence relates to (38).

Afolabi et, al studied the roles of family dynamics on adherence to ART using a family APGAR score to measure family functioning in relation to support for PLHIV. Family APGAR is an acronym for adaptability, partnership, growth, affection, and resolve, which are 5 items used to measure and validate family functioning. The subject answers "hardly ever", "sometimes" or "almost always" based on their frequency of feeling of satisfaction with a score of 0 to 20 (no satisfaction=0; high satisfaction=20). They reported that 99% of PLHIV in the studied population who were adherent to treatment had normal family APGAR score when compared to 1% of the non-adherent PLHIV ($p=0.023$). They also found that 97% of PLHIV who are treatment adherent reported to strongly believe they had social support in comparison with 3% non-adherent PLHIV ($p=0.001$) (69). A recent study in Nigeria also found a significant association between friends and family support and PLHIV adherence to ART (70). This point to the fact that when PLHIV are accepted and cared for by family and friends, they are adherent to treatment and may likely to undergo VLM.

3.3 Community Relations

3.3.1 Community Stigma and discrimination

Stigma and discrimination (SAD) have been implicated the access to HIV services, especially in relation to HIV status disclosure which hinders adherence through HIV treatment continuum (71)(66).

Study by Omosanya et al., found a strong association (P ¼ .001) between stigma and discrimination and PLHIV ART adherence in a study in a tertiary health facility in Nigeria. They found that 92.4% of respondents with low level of enacted SAD had good adherence to ART in comparison with 37.5% of those with high SAD (w2 ¼ 21.00, degrees of freedom ¼ 1, P ¼ .001) (72).

Aransiola et al., (2014), in a similar study, observed that PLHIV hesitates to attend clinics for fear of been seen by people they know. From the study, a participant responded:

> *When they come for the refill of their drugs, most of them are filled with the fear of meeting people they know and are always in a hurry to leave* (Non-clinical officer).

The broad influence of stigma adversely impacts HIV program interventions and optimal service utilization (73). Inarguably, this shows the influence of SAD, reducing the chances for VLM.

3.3.2 Community Network Support

Ramadhani et al., (2018) in a study observed an increased odds of achieving viral suppression among the study participants that had larger network size and stronger social support in comparison to those with smaller size density and weaker social support (aOR = 3.0; 95% CI, 1.1 – 8.2) (74).

3.3.3 Gender

Gender is reported to influence VLM in a retrospective cohort study conducted on the pattern of attrition from ART program in Nigeria. The risk of attrition was found to be higher in males compared with females [HR 1.18, 95% CI: 1.01 to 1.37, p = 0.038]. Attrition, as defined in the study, refers to "the patients who stopped treatment or were confirmed dead or lost to follow-up (LTFU)" (75). Usman et al., in a case-control study on the predictors of non-adherence to ART among PLHIV in Northern Nigeria found that being male is a risk factor for non-adherence (OR=1.5, 95%CI=0.34-1.19, p-value- 0.16). They observed that 70% of the study participant are women which shows that women are more adherent to clinic than men. Furthermore, they mentioned that men get proxy drug pick up by their wives, and by paying healthcare workers (54). However, Uzochukwu et al. contradicts the finding that being female is significantly associated with non-adherence as males were positively and statistically significantly associated with adherence to ART (p-value=0.001) (76).

Chapter 4: Health Supply-related side findings

The supply-side factors findings are grouped according to the adapted SEM as, institutional-health system, and structural factors.

4.1 Access to Service delivery

In Nigeria, PLHIV VLM (Adults, pregnant women, paediatrics, and KP) follow the same process and guidelines according to the WHO. In this study, VLM is discussed in terms of cost, quality of services and referral, security, and geographical condition to accessing services.

4.1.1 Cost

HIV services, including VLM, are offered free in Nigeria, but user fees are charged to enable health facilities provide other services not funded in the HIV program (77). For PLHIV, user fee and other costs from transportation, consumables and other treatment such as hospitalization act as barriers to accessing services (78). In a focus group discussion (FGD) of a study conducted on the influence of cost in the access to HIV services in Nigeria, PLHIV lamented on the charges for investigations required to commence ART and transport cost to the facility. A participant said,

> *'The major problem I have with ARV is the cost. Although government has made it free, we still need to obtain the drug from Lagos. The transport money then becomes a burden.'* (79).

Likewise, Banigbe et al., reported the response by a healthcare worker in a clinic that introduced user fee due to cut in HIV funding support:

> *"The patient pays out of pocket, and many complain about cost; the lack of money cause[d] some [patients] to skip the tests."* (*Public, secondary hospital)* (77)**.**

4.1.2 Quality of care

Okonkwo et al., provided insight on quality of HIV service delivery on treatment outcome in a study comparing two levels of care in North Central Nigeria. They measured the quality of care using, time to initiation, and found that the satellites sites had a significantly longer time to initiation (84 days) compared with the prime sites (32 days) ($p<0.001$). They also reported that the number of patients in the prime site with undetectable VL was higher at week 12 and 48 [(43.1% and 53.3%) $p=0.03$], compared to those at the satellite sites [(36%) and (48.8%) $p < 0.001$] (80). The contrast in quality was due to the availability of better resources to decide and commence early HIV treatment and therefore offer quality services at the prime site than in the satellite sites (81–84). Ojikutu et al., (2014), explored the association between quality of HIV care and treatment, loss-to-follow-up and mortality in PLHIV on ART. They found that adolescents with high-quality score were less likely to be lost to follow-up (AOR: 0.42; 95% CI: 0.32, 0.56) when compared to those with a low score. Quality of care was scored using tuberculosis screening at point of entry, last level of adherence measured, last visit counselling, co-trimaxole prescription since enrollment, weight measurement and last CD4 count in last (85).

4.1.3 Insecurity

Insecurity hinders access to HIV services as found in studies by Kolawole et al. (Nigeria) and Olupot-Olupot et al., (Uganda). Both studies at different scenarios observed study participant saying,

> *"All the fighting and running all over,' explained one participant, 'sometimes, there is a crisis, and there will be roadblocks mounted". (Patient Participant, Individual Interview, Female)* (86).

> *"Insecurity results in loss of drugs or forgetting to pick them in time from your house. If you hear the alarm, you just take off". (Patient Participant)* (87).

Similarly, in a study in Kenya, it was observed that the number of missed appointments increased during a post-election violence. They observed that 42% of 447 scheduled appointments were missed during the conflicts compared to 14% in the pre-conflict period Both PLHIV and staffs exempt from the clinic for fear of attacks. (88). The fear of being attack during crisis discourages use of HIV services and VLM.

4.1.4 Geographical condition

Distance to health facilities is a barrier associated with poor adherence to ART (89). Olaleye, Ogwumike and Olaniyan (2013) studied the inequalities in access to ART among PLHIV and reported that those living in rural areas and of low SES travel longer distance to health facilities to access care. From, 1056 completed and analyzed questionnaire, 33.1 lived in rural area and 66.9% in urban areas. More than 50% of the rural dwellers travelled over 10km to the nearest ART sites compared to 29.7% of urban dwellers (p=0.000). Other studies found more access to VLT in central and urban areas compared with more remote areas (34) (35). As earlier mentioned, due to distance to health facility transportation cost impedes ART access and compromised treatment adherence

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4.2 Health workforce

4.2.1 Health care workers capacity

Health care workers jointly provide HIV services, although their specific roles are not described in studies in Nigeria, their scope of practice is related to the WHO HIV clinical task recommendations and guidelines (90). In a typical HIV clinic in Nigeria, Doctors initiate PLHIV on ART, treat severe opportunistic infections, manage side effects of medication, including several conditions. Nurses play a supportive role to doctors, coordinate PMTCT and perform adherence counselling on ART. Pharmacists counsel on side effects of medication and ensure appropriate dosing, and laboratory scientists take blood samples for VLT. Community Health Workers (CHW) disseminate HIV-related information, work as treatment supporters and assist in clinics (91). This joint approach for HIV service delivery is perceived to be good by PLHIV in a study (92) conducted on the perception of end-users on the quality of ART in public health facilities in Nigeria. In one of the FGD, a participant said,

> *'…I enjoy the treatment of doctors. The doctors, they are too good, and the nurses, the people they are working. They are too good. I enjoy the hospital because they take care of me. When I came here, I was very lean; I didn't know I'll be like this now. So, I enjoy their treatment and the drugs given to us, I enjoyed it'* (92).

Also, PLHIV perception about HCW in a clinic influences adherence and retention to care and the use of the clinic (93). Adherence is poor if there is stigma and inadequate care from HCW poorly trained on HIV care (94). A study in Kenya investigated clinician's perspective on optimizing ART adherence in MSM. A clinician responded,

> *"I suggest that we train more health workers …because not all of them have been sensitized. Because the buck stops with the health care worker: If they [MSM] think that you are approachable and that the clinic is friendly, then they will be back…" (Male clinician, age 28 years)* (95).

Experience in HIV care enables the delivery of compassionate and quality ART services (96), including VLM. For instance, an experienced CHW can provide client-centred care that improves satisfaction and enables adherence (97). Ibitoye et al reported that PLHIV were more adherent to ART clinic attendance for drug refill in a study on community health workers led-ART delivery model (CLAD) for KP in Lagos, Nigeria. They reported that PLHIV adherence for scheduled drug pick visit was 22.4% (100/446) for general clinic and 60% (108/180) for CLAD. 75% of patients in CLAD (27/36) had VLT, and 74.1% (20/27) achieved VLS (98). A similar study, observed an excellent drug refill and high retention to care with very minimal LTFU associated with the use of CHW (pharmacist) (99). Other studies reported improved VLS with CHWs service provision(100). However, in a cohort study and two RCTs, there was no difference in viral load outcome between and intervention and control groups (101), (102), (103).

4.2.2 Health workers availability

Health care workers availability to deliver services is reported in two separate studies (Odafe et al., 2019 and Abugu et al., 2020) in Nigeria to influence on the HIV services. Both studies explored the perspectives of HCW (doctors, nurses, adherence counsellors, laboratory scientists, and monitoring and evaluation officers) on factors influencing HIV service implementation. From one of the studies (104) participants were asked on the perceived key barrier to implementation. A clinician responded,

> *"Then another barrier is manpower. Because the test and treat ["Test and Treat "guidelines] has increased the workload. So, making the clinic a busy one for the clinicians."*

From the other study (105) participant were asked about the availability and adequacy of staffs, they responded as below,

> *"not adequate at all"* (Participant 10).
>
> "*we are not adequate; we don't have enough hands in the facility"* (Participant 4).

Based on these findings, the strength of health workers in ART clinics influences service delivery along the continuum.

4.2.3 Health workers relationship with PLHIV

Healthcare workers display of good attitude strengthens client-provider relation, which is crucial for treatment adherence (106)(107). When clients have a poor perception of health workers in a clinic, it affects their need to use and retain the service of the clinic (93). Patients prefer using a clinic with more supportive and friendlier staff that provide quality counselling and physical examination (108)(109).

In Nigeria, this relationship is hindered by the display of stigma and discrimination by HCWs towards PLHIV seeking care (110). Letamo et al., in a study involving 1021 HCW (doctors, nurses, and midwives) providing HIV services across four states in Nigeria. They found that 9% of HCW reported that they had denied PLHIV of treatment services, and 66% have observed their colleagues denying PLHIV of care. This study was corroborated by Sekoni and Owoaje (2013), who reported S&D of PLHIV among HCW (111).

However, Ehiri et al. in a recent study conducted in a similar setting in Lagos reported that generally low levels of stigmatization ($r=0.21$, $p<0.01$) towards HIV-infected pregnant women receiving the prevention-of-mother-to-child transmission of HIV services by health providers. They observed that very few workers reported discriminatory attitudes and behaviours correlating with negative perceptions about PLHIV. And also, 15% of respondents reported to have noticed the provision of poor quality care by colleagues, and 4% have heard colleagues talk badly about PLHIV (112). These findings suggest that S&D against PLHIV exists among HCW, however, it is on the decline due to desensitization intervention.

4.3. Technology and Medical supplies

4.3.1 Health Technology

Currently, there is no data showing the influence of health technology on viral load monitoring in Nigeria. However, in Zimbabwe, Ndlovu et al., conducted a clinical trial to evaluate the feasibility of HIV VL, early infant diagnosis (EID) and multidrug and rifampicin-resistant tuberculosis (MTB/RIF) testing integration using GeneXpert platform technology. They found that GeneXpert polyvalent testing for VL testing and EID had shorter overall median turnaround time (TAT) (1 day [IQR: 0–1] and one day [IQR: 0–4] respectively) in comparison with centralized testing (26 days [IQR: 23–32] and 17 days [IQR: 13–21] respectively). It was also reported that median time to EAC was eight days for PLHIV with VL > 1000 copies/ml, and most of them had documented re-suppressed viral load outcome (20/32; 62.5%) at a study facility (113). In a corroborating finding by Ndlovu et al., preliminary data from a trial conducted in South-Africa reported that the use of Xpert device for VLT is likely to improve viral suppression and promote higher retention in care compared to standard laboratory testing methods (114).

Other aspects of health technology involve the use of mobile phones (mHealth) in HIV services. Although no studies in Nigeria on the influence of mHealth on VLM studies done in Uganda, Kenya, Mozambique, and South-Africa report it is in use to track and follow-up defaulters (24,115,116). In Uganda and Mozambique, It was shown to reduce results TAT by almost 50% (24,115).

4.3.2 Medical supplies and logistics

Medical facilities and supplies such as laboratory consumables and equipment are essential for diagnosis and treatment of patients (117). A study in Nigeria on building laboratory capacity to support HIV care reported an increase in VLT from 12007 in 2009 to 29868 in 2011. (117). Also, non-availability of test-kits for VLM activities in a South-Africa study hindered testing and prolong results TAT. From the studies, out of 614 PLHIV who had VLT, more than 300 did not receive their results at the scheduled follow-up appointment, and clinicians were not able to provide appropriate care (118).

In VLM, sample packaging, storage and transport logistics and return of results are important elements in the VLM cascade (119). The influence of logistics for VLM was reported in a study by Faruna, Akintunde and Odetola (2019) which assessed the impact of private sector (3PL) engagement in HIV sample transportation. They compared the quantities of specimen transported over three months by 3PL to quantities transported before the engagement. They reported that 277.356 viral load specimen were tested compared to 116,046 initially. The number of facilities covered was 3114 compared to the initial 1700 facilities. Overall, the use of 3PL resulted in a significant increase of 38% samples tested and over 83% increase in facilities receiving testing services (120). A similar study found that the use of 3PL circumvented the barriers for late sample delivery, reduced sample rejection reduced TAT and addressed complex VLT (121)

4.4. Health Information System

Health information system (HIS) is an important building block of health systems that comprise of HIS resources, health indicators, management of data, information products and use (122). Nigeria introduced National Response Information Management System (NNRIMS), and its operational plan has improved the functionality of the national HIV monitoring and evaluation (M&E) system (15). The M&E indicators used are according to the WHO list of indicators for HIV program along the HIV treatment cascade from testing, through linkage and VLS (123).

In the domain of HIV and specifically VLM, very limited studies have been done on HMIS influence on HIV treatment. Kingston Omo-Emmanuel et al., (2017) in a study, evaluated the laboratory logistics management information system for HIV treatment in South-south, Nigeria. They reported that the use of HMIS enabled the identification of poor documentation, stock-outs and the expiration of lab commodities required for HIV services (124).

The electronic medical record (EMR), which is a web-based tool of DHIS 2.0 allows for efficient monitoring of health activities, quality control audit and subsequent reporting to stakeholders (125,126). It is currently in use across the country, with about 67% of over 34000 health centres reporting HIV and non-HIV services monthly (127). In a study conducted in Nigeria describing the setting-up of EMR for HIV treatment program implementation, the use of EMR was reported to enable storage of large volumes of laboratory test results. The results were easily accessible to service providers for treatment monitoring (126).

Studies in Uganda by Alamo et., on EMR and adherence in a community-based HIV care program, reported that an improved PLHIV adherence to clinic appointment using EMR for prompt identification and tracking of defaulters. They found that average daily missed appointment reduced significantly from 21 pre-EMR to 8 post-EMR (t_{601} = 15.31, P < 0.001); LTFU significantly decreased from 10.9 to 4.8% (P = 0.001) and total median waiting time decreased significantly from 291 to 94 min (Z = −9.55, P < 0.001) (128). Defaulting of appointment means a missed opportunity to carry out VLM; however, the use of a system that keeps and tracks patients' clinic appointments and attendance helps to check adherence and opportunity for VL uptake.

4.5 Structural Factors

This section identifies and explores the most significant HIV related policies and legislation and their influence on HIV treatment services and outcomes.

4.5.1 Policy

Policies related to HIV funding has been reported to affect HIV service utilization and delivery in Nigeria. A study described the impact of a reduction in funding policy by PEPFAR (major donor agency) on large clusters of clinics in Nigeria. They observed a statistically significant reduction in HIV services demand creation activities (84% vs 16%, $p<0.001$). They also reported a decrease in VLT, defaulter tracking, prevention services and staff employment support (92% vs 64%, $p = 0.02$; 100% vs 44%, 84% vs 16%, 80% vs 20%, before and after respectively, $p<0.01$ for all) (77). They observed compromised quality of service delivery, disruption of laboratory services, introduction of user fee for previously free services, and a reduced willingness for service provision by health workers.

HIV services decentralization policy introduced by WHO in 2002 and implemented in Nigeria in 2007 was reported to influence HIV services. The purpose is to improve access to care and retention (129) by relocating HIV services from a central site (hub) to a peripheral centre (spokes) for geographical closeness to patients (130).

A retrospective study was conducted on the effect of ART service decentralization on costs and service utilization using two states (Cross River and Kaduna states) as a case study. Each state had two cohorts that received services at the decentralized facility (spoke) and another to remain at the main facility (hub) for service. They found that in Cross Rivers patient at the decentralized site had ~0.35 visits and slightly fewer missed appointments per year compared with patients that choose to remain at the hub site, but also had 0.2 less CD4 counts and one less laboratory test in a year ($P < 0.10$). The patients in Kaduna that decentralized had 3.7 more visits in a year than the patient that did not decentralize ($P < 0.01$) (131). A meta-analysis comparing community versus health facility-based intervention reported that participant receiving community-based services had statistically significant higher rates of treatment visits. The pooled analysis of results from cohort studies showed that the treatment engagement (linkage and retention) was 89.4% (1074 of 1203) for community-based services and facility-based ART was 84.9% (2578 of 3038) at the end of the follow-up period (RR = 1.09, 95 % CI 1.03 to 1.15, I2 =69 %). On the viral suppression rates, there was no statistically significant difference between both groups (pooled RR = 1.06, 95 % CI 0.77 to 1.46). However, in three cohort studies, adherence was reported to be statistically significantly higher in community-based ART (RR =1.80, 95 % CI 1.04 to 3.13), of which 92.9% (274/295) of the participant had optimal adherence level compared to 68.1% (196/288) of those in the facility-based ART (132). Although an earlier study in Nigeria (80), found lower levels of VL in community-based care, both studies were carried out on where services were decentralized. But the possible contradiction could result from the extent of the decentralization where task-shifting could have been applicable to the studies by Nachega et al (132). From these findings, it is apparent that policies HIV-related policies affect services along the treatment continuum.

4.5.2 Legislation

Nigeria has existing legislation against stigma and discrimination (SAD) of PLHIV (133) but, currently, no literature is available on its influence on VLM. A study by Schwartz and colleagues (2015) shows how legislation indirectly influences HIV services. They conducted a prospective cohort study to assess the immediate effect of a Prohibition Act (same-sex marriage) on stigma, discrimination, and HIV prevention and treatment service engagement among MSM in Nigeria. They observed that the history of fear of seeking healthcare and avoidance of health care was significantly higher ($p<0{\cdot}0001$) in the post-law visit (n=161 [38%]) than prelaw visit (n=187 [25%]); the avoidance of healthcare was also significantly higher post-law (n=118 [28%]) compared to prelaw (n=151 [20%]; $p=0{\cdot}001$). They also reported that those who discussed their sexual behaviour with a health provider were often virally suppressed compared to those without previous disclosure (18 [29%] of 62 *vs* 13 [13%] of 99 men; $p=0{\cdot}013$) (134).

Chapter 5: Promising practices

Based on the study findings on factors influencing VLM in Nigeria, four interventions with promising evidence that have been applicable in the HIV program of other settings are identified. These interventions have the potentials to be successful in improving VLM on the assumption of their feasibility in Nigeria. The analysis of these interventions provides evidence to enable informed decision-making in consideration for adoption.

5.1. Encouraging HIV Status Disclosure

A randomized controlled trial was conducted in Tanzania to evaluate the effect of interactive group counselling intervention on status disclosure and prenatal depression. The intervention involves a support group providing a 6-weekly focus-group counselling session on status disclosure with the aim of improving participant abilities to status disclosure in a safe manner (absence of negative reaction). A total of 331 HIV positive pregnant women attending antenatal care across five clinics were randomly assigned to either intervention or control group. They reported that 56% of the intervention group participant disclosed their status compared to 46% in the control group (RR=1.2, 95% CI: 0.91-1.6, p=0.19) (135). Although the finding was not significant, it was observed to be along the hypothesized direction of safe status disclosure of which 60% disclosed to their partners and some to their friends and relatives without a negative response (anger, blame). 88% of the participant who disclosed in the intervention group were satisfied compared to 62% in the control group (RR=1.4, 95% CI: 1.1-1.8, p=0.004) (135). Similar a nurse-facilitated status disclosure intervention in Tanzania improved status disclosure among 95% (379/399) of the study participant (136).

In Ghana, a RCT was conducted on a clinic-based pediatric (7-18 years) HIV status disclosure intervention in which 466 caregivers were randomly assigned to intervention (n=240) and control group (n=206). The intervention group were trained on the stepwise disclosure over time to children. 51.4% of children in the intervention group had status disclosed to them compared to 16.2% in the control group by one year (P, 0.001; un-adjusted hazard ratio = 3.98: 95% confidence interval: 2.63 to 6.03). By the 3rd year, 71.3% of intervention group had disclosure compared to 34.0% of control group (unadjusted hazard ratio = 4.21: 95% confidence interval: 3.09 to 5.72) (137). Overall, the intervention improved pediatric status disclosure.

Status disclosure is found to be associated with reduced chances for virological failure (61). By implication, interventions on status disclosure may likely improve VLS.

5.2 Task shifting in HIV service delivery

Task shifting is delegating clinical roles by shifting tasks to different cadres of HCW which has been applicable in maternal and child health and malaria programs in Nigeria but yet to be adopted in the HIV program despite the service decentralization (138). It is cost-effective, feasible and improves access to care (139) (140).

In South Africa, a RCT was conducted to measure the effects of a program called STRETCH (Streamlining Tasks and Roles to Expand Treatment and Care for HIV program) on mortality, VLS, quality indicators and other health outcomes. The STRETCH program was initiated to use outreach activities to provide educational training on nurses to initiate and re-prescribe ART and devolve care. They reported that VLS after 12 months on ART in the intervention group was 71% (2156/3029) and 70% (2230/3202) with a risk difference of 1.1% (95% CI-2.4 to 4.6)(141). The study findings relate to that in Nigeria (131) in that both studies involve interventions with HIV service decentralization aimed at improving access to services. However, the difference as seen from both studies is that nurses are enabled to perform the duty of doctors (task-shifting) in Tanzania (141), unlike in Nigeria (131) where nurses roles are restricted to adherence counselling and testing under the supervision of clinicians.

Several studies conducted in SSA reported task-shifting as a cost reduction or saving approach in healthcare delivery (142)(143)(144). Jaffer et al., provided evidence on the cost and effectiveness of task-shifting in an RCT conducted in Uganda on virological failure rates in home-based versus facility-based HIV care model for treating PLHIV. In the model, home-based care was initiated to provide services to PLHIV who could not afford to visit the clinic. CHW (field officers) who after undergoing 4-weeks of intensive training on ART are responsible for visiting patients at home to offer services and refer complicated patients to the facility. They reported that 66% (566/859) of the home-based participant and 63% (377/594) of the facility-based group were alive, receiving care and had undetectable VL. 24% (184) of home-based and 27% (145) of facility-based participants either had virological failure, LTFU or withdraw from the trial (adjusted rate ratio [RR] 0.88, 95% CI; 0.70-1.10) (145). They also reported on the cost associated with the intervention. The cost for Home-based care was found to be cheaper for patient and service provider (patient cost to access care - $18, Health service cost- $ 793) compared to the cost for facility-based (patient cost to access-$54, health service cost- $838) (145).

5.3. Point of care viral load testing (POC VLT)

POC VLT is an evolving technology for testing HIV viral RNA. It provides same-day results of VLT and enables early intervention as required, especially in resource-constraint setting (146) (147). The test does not require laboratory staff and facilities to conduct, and it is cost-effective (148)(149)(150). The technology is yet to be applicable in Nigeria for VLM; however, a RCT is currently conducted (151) to compare the impact of the technology to the routine SOC VLT as well as the treatment outcome, feasibility, and acceptability.

Studies have shown that the technology reduces the cost of improving access to VLT in resource-constraint and remote settings. In a study on geospatial cost model for POC instrument placement for optimizing viral load testing in Zambia, POC VLT placed in hubs and spokes site reduced transport costs and increased utilization. They found that POC VLT placed in hub and spokes sites expends $39.58 per test compared to an expended transport network system for sample referral (centralized model) at $53.40 per test (152).

Drain et al. (2020) conducted a STREAM (Simplifying HIV TREAtment and Monitoring) study in South-Africa on Point-of-care HIV viral load testing combined with task shifting to improve treatment outcomes. In the RCT, 390 HIV-positive adults (18 years above) presenting for their first VLT after six months of ART initiation were randomly assigned to nurses to receive POC VLT (intervention group[n=195]) or laboratory VLT (SOC group [n=195]). 90% (175) of the participant in the intervention group and 76% (148) of the participant in SOC group were retained in care with viral suppression, a difference of 13.9% (95% CI 6·4–21·2; p<0·00040). In the intervention group, 93% (182) had viral suppression in comparison with 83% (162) in the SOC group (difference 10·3%, 3·9–16·8; p=0·0025);the retention in care was 92% (180) and 85% (162) (7·7%, 1·3–14·2; p=0·026) respectively (34)**.** Furthermore, Nicholas et al., examined the outcome of POC VLT in a decentralized HIV program among 21,4000 patient and reported a VL coverage of 85% (18182/21400) and a high suppression rate of 89% (16150/18182) among those tested (153).

5.4 Adapting mHealth (Mobile Health) initiative in the HIV program

Mobile health initiative is the use of a mobile device to support medical and public health practice (154). In mHealth, a variety of applications are enabled on a mobile phone to improve point of service data collection (155), service delivery (156), and patient information and communication (157). It also involves using other wireless devices for real-time monitoring of medication and adherence support (158). The use of mHealth is not new in Nigeria as several studies have examined its usefulness HIV and TB programs, maternal and child health, immunization and adolescent sexual and reproductive health programs (159)(160)(161).

Studies show the influence of mHealth on ART clinic visits. In a prospective cross-sectional study a cohort of PLHIV on ART in rural Uganda, Kunutsor et al., (2010) found that out of 560 appointments scheduled, 62 (11%) missed clinic visit and after a phone call, 79% of the episodes of missed appointment returned for clinic visit within an average of 2.2 days (SD = 1.2 days)(162). Likewise, SMS weekly remainder was reported to improve ART adherence amongst PLHIV in rural Kenya (163). Missed appointment is a significant risk factor for virological treatment failure in ART (164). These findings have shown the effect of the initiative in improving clinic visit with the likelihood for VLM in PLHIV.

Chapter 6: Discussion

The study identified several but interrelated factors that strongly determine PLHIV VLM in Nigeria based on the SEM used for the study. Factors that influence PLHIV in seeking health care create the demand for VLM. They include age, gender, knowledge and attitude, personal beliefs, relationship and support from family and communities, stigma, and discrimination. They have all been implicated in influencing adherence to treatment which is associated with VLS. The responsiveness of the health system to supply services is also very crucial for VLM. The factors identified include cost, quality, security and geographic condition, health workforce, health workers S&D towards PLHIV, health information and technology, and logistics, including policies and legislation. These factors also influence the uptake of VLM services.

6.1 Relationship between the demand-side factors and their influence on Viral Load Monitoring

The age of PLHIV is a determinant of treatment outcome. The likelihood of VLS is higher in adults than in younger PLHIV (adolescents and paediatrics). Although Ekong et al., argued that older age is likely to have ARV resistance which is due to the effect of age that lowers their immunity, his studies did not consider younger PLHIV and their constitutional factors. The increased chances for virological failure in younger PLHIV may be due to the complexity in adjusting their ARV. The effect of S&D and non-disclosure of status by caregivers also contributes to poor adherence levels.

The level of education and SES of PLHIV influences the ability to access and utilize VLM services. Due to reduced funding, service providers introduced user fees meaning sufficient income is required to cover for the fees, including transportation cost (53). These charges are a significant barrier to PLHIV of low SES in adhering to treatment and the likelihood for VLT service. Furthermore, the extent to which PLHIV understands the importance of ART will determine their level of adherence to treatment.

The influence of knowledge and attitude affects the behaviour of PLHIV to access and obtain VLM services. As found in this study, PLHIV that are well informed on the impact of HIV on their health will display a positive attitude towards ART. Nevertheless, these determinants are not in insolation, as they are intertwined with their personal beliefs. These beliefs are based on affiliation to varying socio-cultural and religious practices in Nigeria that may not encourage ART adherence. Those who adhere to this belief tends to default and LTFU on treatment (59). From field experience, ART clinic defaulters who mostly are less educated and of low SES with less support believe they are cured after sessions of religious rituals and use of complementary medicines and will not require ART. Most of them present later with virological failure and deteriorating health status. Inarguably, building the knowledge and attitude and changing the beliefs of PLHIV who are not well informed on ART, will improve adherence and VLM.

Relationship between PLHIV and family significantly influence VLM services uptake. For optimal adherence to ART, establishing a relationship with family is required to enable the provision of support. However, creating a relationship is dependent on HIV status disclosure to family and friends. For fear of stigma, PLHIV finds it difficult to disclose status and non-disclosure of status is a predictor of poor adherence, with the likelihood of missed opportunity for VLM. PLHIV who disclose status to family and friends build relationship and network that

enables adherence as reported in the studies. From my experience in HIV program implementation in rural communities, PLHIV have a support network that help subsidize transport costs to attend clinic. They assist themselves in proxy drug pick up for those that cannot make it to the clinic for other reasons and encourage clinic defaulters to return to care. The benefits significantly decrease the tendency for non-adherence and missed opportunity for VLM.

Being a male living with HIV may be a predictor of non-VLS. Males are likely to have poor adherence level, and LTFU in care due to the roles they play in the society. Uzochukwu gave a contrary opinion that being female, on the other hand, is associated with non-adherence. However, his finding is limited due to the study design and small sample size, which may not present an appropriate representation of the population. More so, evidence abounds that women attend clinic more than men and, in most cases, get drug refills for their spouse. The men use excuses for being at work to default clinic visits (54) and for the fact that they can get drug refill through their partners and also with support by HCWs encourages non-adherence. It also implies that they are at a higher chance of having a poor treatment outcome

Stigma and discrimination (SAD) from the community significantly influence VLM demand creation. PLHIV suffer the impact of stigma from family, friends, and the community greatly. HCWs who stigmatize PLHIV do not offer quality and adequate service which put the health of PLHIV at increased risk for poor treatment outcome (71). SAD may be propagated indirectly by certain legislation, as seen in the study findings. The KPs who are significant contributors to the HIV epidemic were indirectly affected and refused seeking ART services due to increased stigma.

6.2 Relationship between supply-side factors and influence their influence on Viral Load Monitoring

The supply-side factors for VLM are expected to provide the appropriate platform and process to enable VLM in PLHIV. These factors also influence the health-seeking behaviour of PLHIV. HIV services across the treatment cascade in Nigeria free. However, user fees were introduced due to the apparent decline in funding. From the findings, the user fee by health discourages PLHIV from accessing care, especially those in the low SES and the rural areas. User fees enable service providers to generate revenue to offer other essential non-HIV services, such as admissions that may be related to HIV care (77). From experience, in private facilities, revenue generated is used to engage more HCW, including training them to deliver quality services. Quality of services delivery encourages PLHIV adherence to ART and to achieve VLS. But quality service provision is dependent on the capacity of the HCW to deliver the necessary services. This is irrespective of the type and cadre of staff as studies have shown that CHW led-ART delivery was associated with improved adherence and VLS. This does not discredit the capacity of higher cadre of staffs to provide services, rather appropriate and specific training is what is recommended. For instance, doctors not trained in HIV care for KP may not be able to attend to their specific and sensitive health needs. When this is noticed by the patient, they will not return for subsequent appointments (95). Another important finding is the negative effect of insecurity that disrupt service delivery and utilization (88), destroys infrastructure, and promotes non-adherence. From field experience, the period of insecurity records a higher number of clinic defaulters and LTFU in care. But when normalcy returns the

present with deteriorating condition. This is similar in other conflict settings, where an increased number of missed appointments was observed (88). Furthermore, a far distance health facility burdens PLHIV with transportation cost. In most cases, the scheduled time for service delivery might have closed before their arrival. This discourages adherence to clinic visits and availability for VLM (68).

In VLM, test results availability for both PLHIV and HCWs is very much important as the test for informed decisions on treatment. Although, no specific evidence to substantiate how these issues influence VLM in Nigeria, this study compares evidence from other LMIC (165) and the findings corroborates with the report from NACA. The long TAT prevents clinicians from providing timely interventions that can improve PLHIV treatment outcome. The delay or short supply of VLT laboratory consumables hinders sample collection from PLHIV. When samples are collected, poor packaging and storage can alter the test result. The poor transport network prolongs the TAT for results. However, an improvement in VLM is seen when measures such as the use of POC devices that gives immediate results; establishment of well-coordinated transport network especially in remote areas, and the consistent supply of VLT consumables, are put in place (114)(120) (117).

Health information and technology (HIT) positively influence VLM through by improving adherence and retention. Its importance (124) cuts across activities and processes in the care of PLHIV. HIT is useful in storing data such as patient information, clinic appointments and results; and use of mobile phones for appointment reminders, tracking activities and result dissemination (126). With these instruments, patient's management can easily be monitored and evaluated, including executing interventions promptly. Inarguably, a significant number of PLHIV with poor adherence to ART, default on clinic appointment without been noticed, and this put them at risk of virological failure. But using EMR and mHealth enables early identification of these defaulters, prompt tracing for their retention to care (128) and shortening VLT results TAT for use in decision making. This study, therefore, identifies that HIT influences the supply of services that contributes to adherence and VLM and should be strengthened. It will require upgrading the existing facilities and building the capacity of HCWs in using the technology for efficient service provision.

From the study, reducing HIV funding promoted the introduction of user fee, which is a significant barrier to demand creation for HIV services (77). On the part of the health system, the reduced funding disabled efficient and quality service provision and further widen the gap in the access and supply of VLM. Other policies that have shown positive influence on the access to and supply of services is the HIV service decentralization which brings service closer to the people in a context-specific to them and thereby promotes adherence across the treatment continuum. A major factor is the issue of legislation reported in the study, which indirectly prevents the uptake of HIV services by KP. It is important that, when policies and laws are being enacted, it should be examined thoroughly to avoid unwanted influence on HIV services and treatment outcome.

This study identified practices that have the potentials to improve VLM which includes interventions on HIV status disclosure, task shifting for HIV services, point of care viral load testing (POC VLT), and adapting mHealth in VLM.

Interventions on HIV status disclosure are very beneficial in addressing a broad range of factors influencing PLHIV VLM. In our environment, HIV status disclosure is a difficult task for

both PLHIV and HCWs because of negative responses (shame and blame). Negative responses may result in self-stigma, including enacted stigma from society and subsequent disconnection from family and friends. The aftermath is usually non-adherence to treatment and non-suppressed viral load due to lack of support. Interventions on HIV status disclosure will help prevent and reduce these effects. In implementing safe HIV status disclosure, HCWs at all cadres should undergo mentorship and coaching on handling more challenging scenarios related to the disclosure. They should also have their capacity built to train PLHIV on self-status disclosure to family and friends. The intervention has been used in Ghana (137) and Tanzania (136) and had improved safe disclosure. Encouraging status disclosure improves the opportunities for adherence and VLM.

6.3 The roles of the promising practices in addressing the influencing factors

Task-shifting intervention has been recommended by WHO to address shortage with health workforce, a major challenge in Nigeria. Task-shifting has been applicable to other programs (139)(138)(140) with varying success in Nigeria. However, it is yet to be fully adopted in the HIV program. For instance, the initiation of ART is solely the role of doctors who are in short supply and unevenly distributed with more in the urban areas than the rural areas; and engaged in a higher level of the health system than the primary care level. Other category and cadre of staffs can take the roles of clinicians to relieve workload pressure and allow clinicians to concentrate on more specialized care. For instance, CHW are closer and have a better relationship with patients which enables acceptance of health programs (166) and promoting adherence. When task-shifting is applied in decentralized HIV service delivery as seen in South-Africa (141) and Uganda, (145) it improved adherence and treatment outcome, cost-effective and provided access to more PLHIV (142)(143)(144). Task-shifting is feasible in Nigeria, as there are existing structures for its implementation. Service decentralization for HIV has been implemented as a platform that enables task-shifting. Several health institutions that train HCW can adjust their training curricula to prepare HCW in accommodating task-shifting duties. CHW who are majorly based in the rural areas providing HIV services can be enabled to offer VLM services by having their capacity built on the guidelines and protocols for VLM. Their services can be routinely assessed by higher cadres of staff in charge of the decentralized site to ensure compliance. Also, VLM consumables should be made available at the decentralized sites. Overall, the feasibility is dependent on the willingness of policymakers in creating policies that enable the intervention (144).

Point-of-care VLT is a promising intervention that improves VLM, which is yet to be implemented on a large scale. The technology has been applicable in HIV testing and EID (148)(149). It addresses the long TAT of laboratory test results due to logistics challenges. With this technology, results are provided while the patient is in the clinic to enable early intervention. This encourages PLHIV adherence and availability and increases the chance for VLM. In settings where it has been tried, it improved the coverage of VLT as more people were tested and also reduced the associated cost (152). This study identifies POC VLT as a promising intervention for Nigeria. Although the technology is undergoing development and not commercially available for use on a large scale, it is designed for easy use and interpretation, and is potentially cheaper, requiring less infrastructure and laboratory facilities and skills (167)(168). The technology provides an opportunity to decentralize HIV service and together with task-shifting it improves viral load testing coverage and suppression, including

retention to care, and access to quality and efficient HIV services (169)(147)(170). Just as success was recorded with the use of other POC testing such as for blood sugar and gas estimation (171), POC VLT has the potential of being successful in Nigeria. Policymakers could leverage on the advantages of POC VLT and adopt it into the existing HIV service decentralization when it becomes available for large-scale. Policies on health workers training on task-shifting with POC VLT should be made.

The use of mobile health in HIV program improved adherence and VLM. The intervention is adopted in PMTCT HIV program to improve maternal and child health in Nigeria (172), and in other settings such as in WELTEL PMTCT trial in Kenya (173), RapidSMSMCH in Rwanda (174) and in South Africa MomConnect (175). Adopting this intervention in HIV VLM in Nigeria will help reduce missed clinic appointment and the likelihood of LTFU, and thereby improve retention. Overall, it is cost-effective as mobile technology is highly in use amongst the populations in both urban and rural areas irrespective of SES. In adapting this intervention, structures that enable effective operation should be in place. Mobile network and phones are key instruments for this intervention, and they are available in Nigeria. Strengthening the HIS to allow for data gathering, analysis, interpretation, and storage is required. HCWs training on its applicability is needed as well as programming the application in a context, specific to PLHIV for easy use. For instance, it can be programmed in local languages that can be understood. Also, the security apparatus for encryption of data and information should be instituted for privacy of information, especially for the KP. This intervention will also address S&D as PLHIV can communicate with HCW without always coming to the facility, as they build a virtual support network, and also report the incidence of stigma anonymously (176).

Viral load monitoring provides information and data to evaluate HIV program implementation at population and program level. The data provided offers an in-depth insight into HIV surveillance and epidemic trend. From a population-level perspective, the data gives information on HIV transmission risk. Programmatically, the data are related to quality of service delivery, coverage, and the inequities in treatment access and uptake. With this, it can be used as a tool for advocacy to establish the differences in service delivery and resource allocation to enable evidence-informed policies. Therefore, to ensure progress towards control of HIV in Nigeria, evidenced-informed policies should be instituted based on VLM.

Finally, the factors that influence VLM in Nigeria are not limited to those explored in this research. The SEM is complex and cumbersome with multiple factors that are impossible to study within the scope of this research. Other factors, such as religion and culture that might have a significant role in VLM in Nigeria was not studied due to the choice of selection. The conceptual framework could be strengthened by including these aspects.

Study limitation and Bias

The study has limitations that should be considered: The use of "Adherence" as proxy due to the dearth of literature on VLM in Nigeria may not provide apparent findings related to viral load monitoring for analysis. Also, the limitation with word count limits the number of factors to be studied and as such factors were selected with a possibility of missing out relevant factors.

Chapter 7: Conclusion and Recommendation

7.1 Conclusion

The study identified the influence of interrelated factors contributing to poor viral load suppression in Nigeria. On the demand side, the most influence on VLM uptake by people living with HIV (PLHIV) include poor knowledge and negative attitude towards HIV which promote ignorance to ART adherence; non-disclosure of HIV status that disconnects PLHIV from building relationships required for adherence support; and the effect of HCWs stigma that affects the quality of services offered.

For the supply-side, the influencing factors include the cost for non-HIV services and transportation which burdens PLHIV of low SES; the perceived poor quality of service by unskilled HCW discouraging further service utilization; civil unrest that disrupts health service provision; lack of laboratory consumables and weak logistics prolong TAT for results in treatment decision-making; and weak health information system preventing adequate monitoring for adherence and retention to care for VLM.

Practices identified to improve VLM include, HIV status disclosure programs which train PLHIV on safe disclosure; and task-shifting that allows HCW to assumes higher responsibilities in the provision of ART services and more access to VLT. Other practices identified include point-of-care VLT, a promising intervention that addresses the short-comings of VLT logistics; and mHealth that enable health system vigilance on PLHIV VLM.

7.2 Recommendations

The impact of these factors reflects non-targeted policies and interventions on viral load monitoring in Nigeria (VLM). Subsequent to the findings from this study, the following evidence-informed recommendations should be considered on VLM practices, future research and methodology.

- The government should enforce the existing laws on stigma and discrimination and also review the policies that indirectly discourage the utilization of HIV services, especially by MSM and collaborate with NGOs to promote desensitization programs. These will mitigate the impact of stigma, promote HIV status disclosure, and enable support from family and friends in encouraging PLHIV access and adherence to ART and VLM.
- Specifically, the government should increase the domestic allocation to the HIV program to cushion the effect of funding reduction by donors to address the challenges with user fees. Also, it will enable the availability of resources for VLM services, including well-motivated health care workers.
- The government should work with health workers association and health institutions in formulating policies that enable task-shifting. The policy will include adjusting the roles of HCWs and reviewing medical training curricula to accommodate task shifting. The introduction of these policies will address the shortage of skilled workers and allow incorporation of task-shifting in HIV service decentralization which will improve access to VLT, especially in rural areas.
- The government should upgrade the existing health information system structures, and seek the support of NGOs implementing HIV programs in building the skills of

HCWs on the use of the system for service delivery. The structural upgrade and skill-building will enable efficient monitoring of HIV services, including VLM and also provide data for evidence-informed decisions on policymaking.

- Furthermore, more research on VLM improvement strategies such as the point of care VLT should be supported by the government in preparation for adoption when available for large-scale use. Also, at the facility level, HCWs should undergo coaching and mentorship in conducting quality improvement initiatives in VLM by relevant NGOs. The initiative will address the challenges faced within the facility and community early in time.
- Lastly, the government and stakeholders should always involve PLHIV when making policies related to their care for inclusiveness and acceptability of programs. More PLHIV should be employed to render VLM services. Their engagement will further encourage others to access and utilize HIV services and VLM.

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Appendices

Table 2: Search Strategy for Study Objectives

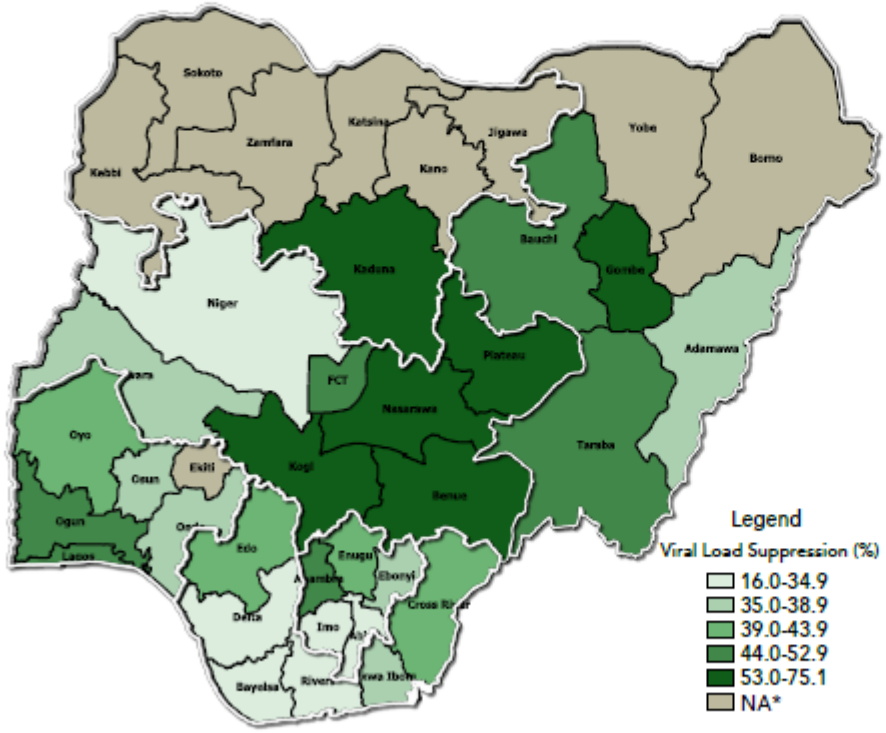
		Category 1: HIV	Category 2: VLM cascade	Category 3: Factors	Category 4: Geographic areas	Platform
		AND				
Objective 1: Demand-side factors	**OR**	PLHIV	• Viral load testing • Viral load suppression • Viral load monitoring • Antiretroviral adherence	• Age • Gender • Education • Socioeconomic status • Knowledge • Attitude • Belief • Relation with Family • Social support • Stigma • Gender	• Nigeria	VU Library, PubMed
Objective 2: Supply-side factors	**OR**	PLHIV	• Viral load testing • Viral load suppression • Viral load monitoring • Antiretroviral Adherence	• Cost • Quality of care • Security • Geography • Health Worker Capacity • Health Worker Relationship • Health Technology • Logistics • Medical Supply • Health Information System • Policy • Legislation	• Nigeria	VU Library, PubMed
Objective 3: Interventions		Improvement	• Viral Load Monitoring • Viral Load Testing • Viral Load Suppression	• Accessibility • Cost-effectiveness	• Other settings	Google Scholar

Figure 5: Viral Load Suppression among PLHIV Age 15-64 years across the geo-political regions in Nigeria.

Among PLHIV age 15-64 years, VLS varied across Nigeria, with the highest VLS in North Central Zone and the lowest VLS in South South Zone.

Zones	Viral Load Suppression (%)	95% CI†
North Central	65.6	61.2–70.0
North East	49.7	40.5–59.0
North West	44.4	35.2–53.7
South East	38.2	32.9–43.4
South South	33.7	29.5–37.9
South West	43.1	36.7–49.5

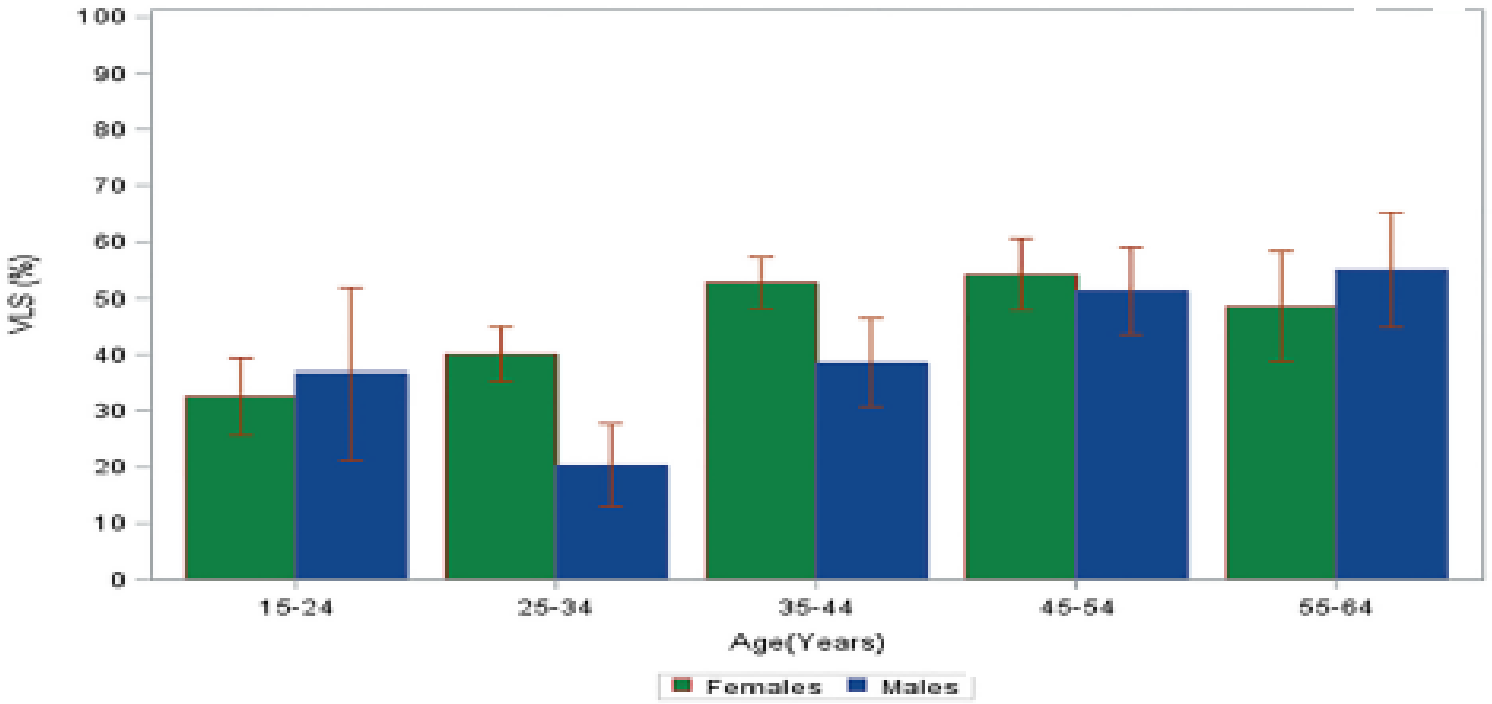
† The 95% CI (confidence interval) indicates the interval within which the true population parameter is expected to fall 95% of the time.



* NA – Data not presented due to an unweighted sample size less of than 30 people.

Source NAIIS report, 2019 (31)

Figure 6: Showing the overall viral load suppression among PLHIV between ages 15-64 in Nigeria.



Source NAIIS report, 2019 (31)

Figure 7: Showing HIV prevalence and viral load suppression in males and females in Nigeria.

	Female		Male		Total		
HIV Indicator	%	95%CI*	%	95%CI	%	95%CI	Unweighted sample size
HIV prevalence †							
0-14 years	0.2	0.1–0.3	0.2	0.1–0.3	0.2	0.1–0.3	32,555
15-49 years	1.9	1.7–2.0	0.9	0.8–1.0	1.4	1.4–1.5	147,849
15-64 years	1.9	1.8–2.0	1.1	1.0–1.2	1.5	1.4–1.6	174,564
Viral load suppression ‡							
15-49 years	45.3	42.4–48.3	34.5	29.7–39.3	42.3	39.6–44.9	2,241
15-64 years	46.2	43.4–48.9	40.9	36.8–45.0	44.5	42.0–46.9	2,777

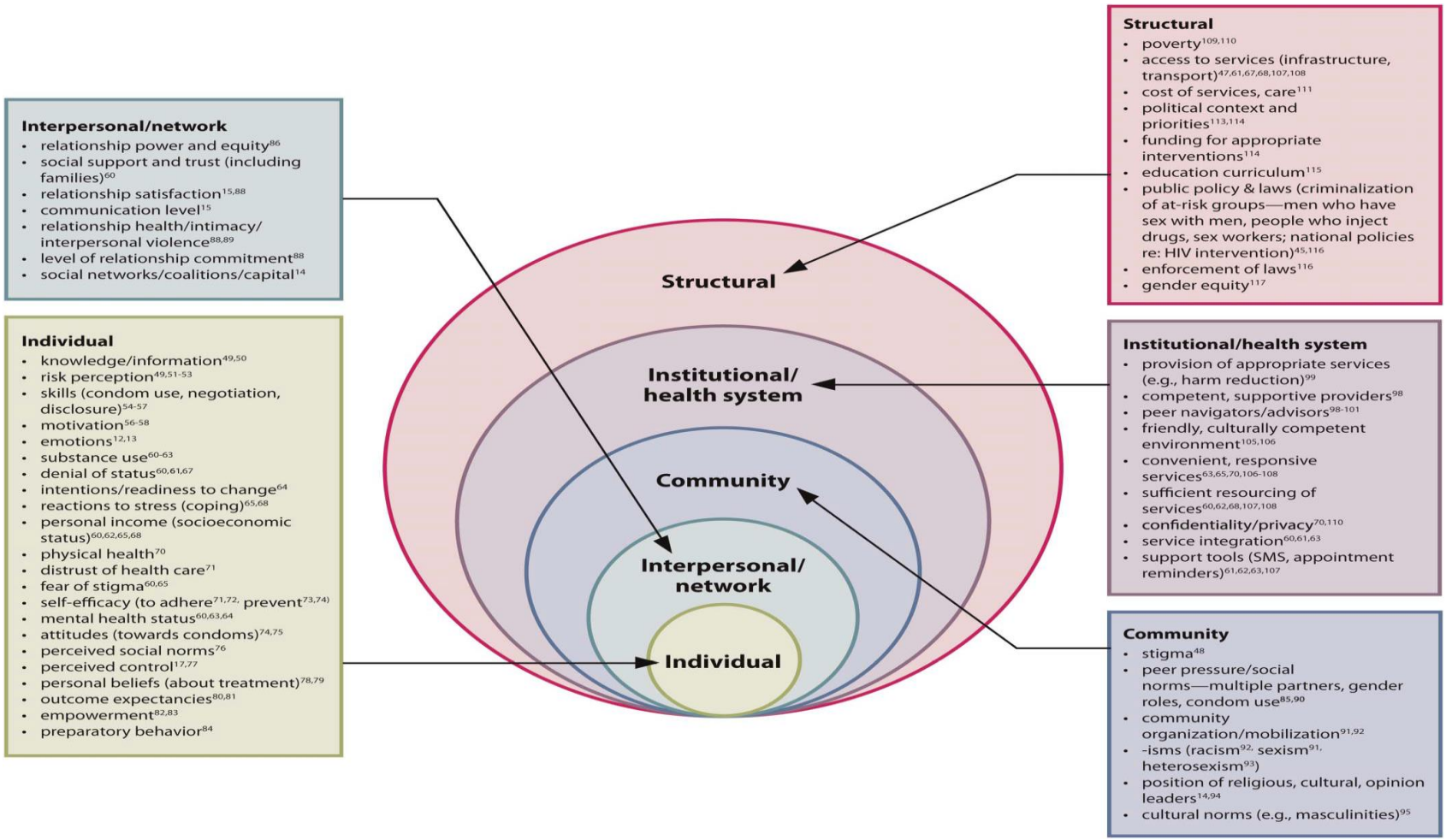
* The 95% CI (confidence interval) indicates the interval within which the true population parameter is expected to fall 95% of the time.

† The numerator for HIV prevalence is the number of people tested HIV-positive in each subgroup. The denominator is the number of people tested in each subgroup.

‡ Viral load suppression is defined as HIV RNA <1,000 copies per ml of plasma. The denominator for viral suppression is the number of PLHIV in each age group.

Source NAIIS report, 2019 (31)

Figure 8: The Socioecologic model



Source: Kaufman et. al 2014 (49)