Protocol and Operational Procedures for the Implementation of a Differentiated HIV Service Delivery Model in North-Western Tanzania: A Multicentre Implementation Research

Running Title: A Multicentre Implementation Research

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Abstract

World Health Organization's recommendation to "treat all diagnosed with HIV" challenges the capacity of health systems, especially in low- and middle- resource countries. Current Tanzanian National Guidelines for the Management of HIV and AIDS views differentiated service delivery (DSD) models as promising approaches to improve HIV services. Nonetheless, social, economic and health system factors greatly influence their efficacy and sustainability, and call for context-specific evidence. *Objectives*: This implementation research protocol outline plans to assesses the feasibility and effectiveness of a DSD intervention for stable anti-retroviral therapy (ART) clients in Tanzania. *Methodology*: Quantitative and qualitative methods will be employed to assess implementation which started in July 2018 and will run until July 2021 at four HIV clinics (CTC) located in Shinyanga (2), and Simiyu (2) regions. Stable clients (age >5 years, receiving ART first-line regimen ≥ six months, viral load (VL) ≤50 copies/ml, and no current illnesses) are offered the opportunity to join a club — community-based groups of 25-30 clients living in the same area, who receive drug refills, and health monitoring every three months (annual VL at the CTC) led by lay-workers. *Findings*: Primary outcome will be the proportion of ART clients maintaining virologic suppression within the club model over the intervention period (measured at 12, 24, and 36 months). Secondary outcomes will include retention in care, client and provider costs, and client perspectives, stratified by geographical location. *Conclusion/Recommendations:* Research finding will be published in peer-reviewed journals; and is potentially useful for informing policy and the HIV program in Tanzania.

Introduction

The 2016 guidelines of the World Health Organization (WHO) recommend HIV service delivery based on a 'Differentiated Care framework' in order to achieve Universal Test and Treat (UTT) [1]. The goal of differentiated service delivery (DSD) is — firstly to provide different groups of people living with HIV (PLHIV) with client-centred services [2]. Secondly, to cushion the impact of increased demand for HIV services on over-burdened health systems especially in low- and medium- income countries (LMICs). As DSD gains popularity, evidence about its acceptability, adaptability, and effectiveness in different settings, is required. Four types of DSD models have been described, all addressed to stable clients: client-managed groups, healthcare worker-managed groups, facility-based individual models, and out-of-facility individual models [2].

Client-managed group models, for example anti-retroviral therapy (ART) groups such as Community ART group (CAG) and Community ART support groups (CASGs) have been piloted in Mozambique and Lesotho. Compared with standard clinical care, they show better outcomes that is — reduced costs, increased time savings, improved retention, and reduced loss to follow up (LTFU) [3-6]. Healthcare worker-managed group , for example — ART adherence clubs (ACs) and fast track refills (FTRs) are implemented in South Africa, Malawi, and Guinea [7-11]. Evidence suggests that AC leads to higher rates of retention and viral suppression compared to standard clinical care, both at individual sites and at scale [12]. Out-of-facility individual models (such as community-based ART distribution, mobile outreach ART delivery, and home delivery) have been implemented in Uganda and Swaziland. All of these models show promising results in terms of retention, mortality, reduced virologic failure and costs [13, 14]. Lastly, facility-based individual models, such as within-facility AC, are one of the most widely implemented DSD models. Evidence of effectiveness of ACs has been

reported from different studies suggesting increased cost effectiveness [15], reduction in client time spent accessing health care [16], improved adherence to ART [17], in addition to better retention and viral suppression, than standard clinical care [18].

In 2017, the Tanzanian Ministry of Health, Community Development, Gender, Elderly and Children [MOHCDGEC], released the current National Guidelines for the Management of HIV and AIDS, based on the 2016 WHO guidelines recommending DSD [19]. Despite a wealth of evidence from elsewhere, there is a substantial lack of evidence about the efficacy and sustainability of DSD models in Tanzania. To address this gap, a DSD club model is currently being implemented in two socio-cultural and geographical settings in North-western Tanzania. The clubs are led by Community Health Workers (CHWs), supervised and coordinated by nurses. CHWs have been employed effectively for similar interventions in this setting, such as to improve retention in care, and adherence to ART among HIV positive mothers [20] and stable ART clients [21]. However, the potential role and contributions of this cadre of workers beyond health promotion is yet to be officially recognised in Tanzania as the latest guidelines still recommend that all DSD be conducted by any trained healthcare worker namely Doctor, Assistant Medical Officer, Clinical officer or Nurse [19].

This protocol outlines studies which aim to generate evidence on the implementation of this CHW-driven DSD club model. It provides details not just on the planned studies but also on the club model which is essential to guide the replicable implementation of the model. Findings will contribute evidence to inform the Tanzanian government's decision-making process about which type of DSD model to support and consider in the national strategy.

Methodology

Study Objectives

The overall aim of this implementation study is to assess the feasibility and effectiveness of a hybrid model of CHW-driven HIV DSD, 'Clubs and Hubs' in treating 'stable' ART in two Tanzanian regions, Shinyanga and Simiyu. There will be three specific research areas.

Clinical/epidemiological

Assesses the primary outcomes that is — effectiveness of the club model in terms of viral suppression, adherence, linkage to care and retention, and factors associated with these outcomes in routine care settings.

Social science studies

Gain insight into client and health care worker experiences in the clubs and hubs, implementation fidelity, and adaptations of the intervention protocol to clients' care needs in practice.

Costing studies

Investigate costs (client and provider), cost structure and drivers, and cost-effectiveness of delivering DSD in these settings. Additionally, estimate the quality of life among clients, and quality of care from clients' and providers' perspectives. Table 1 gives details of the study objectives and outcomes.

Setting

An estimated 1.4 million people are living with HIV in Tanzania with approximately 81,000 new cases of HIV annually among adults aged 15 to 64 years [22]. The overall adult HIV prevalence is estimated at 5%, but the regional prevalence varies widely across the country, from less than 1% to more than 11% [23]. Over 3,000 health facilities across Tanzania currently provide HIV care and treatment [23]. The recently published 2016-2017 Tanzania HIV Impact Survey estimates that 60.9% of PLHIV aged 15 to 64 years in the country know their serostatus. Among these, 93.6% are on ART while 87% are virally suppressed among those on ART [22].

In the regions of Shinyanga and Simiyu, the HIV prevalence is estimated at 5.9% and 3.9%, respectively [23]. Intervention sites include four Care and Treatment Centres (CTCs) also known as the hubs: Bugisi Health Centre (BHC) and Ngokolo Health Centre (NHC) in Shinyanga region; Songambele Health Centre (SHC) and Mwamapalala Dispensary (MD) in Simiyu region. The sites were purposively selected among health facilities owned by the Catholic diocese, to represent the wide variability of socio-cultural and economic realities existing within the Tanzanian context. Shinyanga region boasts of several truck routes and mines which attract a mobile and migrant population. BHC is located in a rural area, has a high client load and wide catchment area with clients traveling up to 3 hours to clinic. NHC is located within Shinyanga town, an urban area. In Simiyu region, the population is more widely dispersed. MD is located in a remote rural area about 15 kilometres from the regional centre. Similarly, SHC is located in a very remote area. As in 2018, the number of stable HIV+ clients in care at BHC was approximately 1300; both MD and NHC had an average of 200, while SHC had 100.

Study design

This implementation research will employ quantitative and qualitative methods to assess the effectiveness, and cost of CHW-driven club model for the management of stable ART clients within the study settings. The overall intervention period will last for 36 months. Appropriate cohort and evaluation designs will be employed to assess the primary study outcomes over the entire intervention period at 12, 24 and 36 months after enrolment in the club, depending on the duration of enrolment at the end of the study. Secondary outcomes will be assessed concurrently in nested costing, cross-sectional, mixed methods, and qualitative studies.

Participant recruitment, inclusion, and exclusion criteria

Only HIV+ clients who are enrolled in care at one of the intervention CTCs and are eligible for the studies, will be included. Stable ART clients will be defined as outlined in the Tanzanian HIV treatment guidelines (see Table 2). Accordingly, only clients with viral load (VL) of 50 copies/ml or less will be included in proposed studies as stable. However, all investigators agreed that if clients experience virologic blips that is — VL between 50–200 copies/ml [24], while remaining adherent, they continue to be managed as being stable. Participants for the clinical/epidemiology studies will be recruited during the CTC and club enrolment process. Participants for other nested studies will be recruited as appropriate from among eligible clients as they access care at the CTC clinics and the clubs.

Sampling strategy/ Sample size

Clients fulfilling the eligibility criteria (see Table 2) will be actively offered to join the club model at each visit to the clinic. On the basis of available data as of June 2018 from the CTC database, 60% and 70% of clients in Bugisi and Ngokolo, respectively, totalling 1500 clients were estimated eligible for enrolment. Clients who refuse to join the club or clients who do not meet the eligibility criteria remain in standard care.

Eligible clients will be determined per study and a representative sample will be sampled either randomly or purposively as appropriate at the hubs and in clubs. For the social science studies, four clubs per hub will be selected, two each in a remote and nearby location from the hub.

Sample size for each study planned will be determined separately depending on specific research question. All quantitative studies will however be designed to have power ≥80% and two-sided alpha of 0.05 to determine outcomes. Appropriate assumptions of differences and coefficients of variation to account for clustering where necessary will be based on evidence from literature and factored in calculations. Reaching saturation will guide the number client or groups interviewed for qualitative studies.

Consenting procedure

All clients who consent to participate in the club model will receive information about the implementation research before enrolment and during the first club meeting. Clients refusing to participate will be approached to be interviewed to gain their perspective. All participants in the nested studies will be taken through a separate consent procedure which will include access to their CTC files. This will allow for the triangulation of data collected.

Intervention

ARV clubs

Clubs are a group of 25-30 stable ART clients living in the same geographic area, who meet in their community at a venue of club members choice for example - homes, public spaces such as school classrooms or village executive offices, and if preferred, a designated space in the hub. The decision to establish a club triggers a sequence of activities (see Appendix 1). The club-nurse consults the Home-Based Carer [HBC] and potential club-members, on the best location and meeting-time of the Club. The time (working day *vs* weekend, timeframe during the day, etc.) and venue of the club meeting are agreed amongst the members of the club with the coordination of the club-responsible. After the initial agreement, a club meeting calendar will be established and communicated by the club-responsible to the members. The next appointment date will be written in the client's CTC 1 card. Clubs meeting duration are 90 minutes on average. Three distinct activities, taking approximately 30 minutes each, are conducted during club-meetings: 1. adherence counselling and health education session focusing on ART adherence, side effects, prevention of HIV transmission, and general health status; 2. brief symptoms screening, including TB screening and body weight monitoring; and 3. drug refilling and documentation.

The club schedule includes a club meeting (every 3 months), clinical consultation and review by a clinician at the hub plus laboratory monitoring – haematology and biochemistry (every 6 months) and VL monitoring (every 12 months).

Responsibilities in the Club model

Key staff involved in club activities include a CTC clinician, a trained nurse (club nurse), and a CHW (club-responsible). See Appendix 1 for details of their respective roles. In brief:

CTC Clinician

A clinician at each hub will be responsible for three main tasks: enrolling clients into clubs, collecting signed informed consent, and conducting scheduled bi-annual visits (and any unscheduled visits) during which stability is reviewed and request scheduled laboratory investigation such as VL.

Club nurse

S/he will be mainly based at the hub and will have overall responsibility for organizing the clubs. With oversight from the CTC pharmacist, s/he will pre-package anti-retrovirals (ARVs) and other medications for club use, provide training on the job to the club-responsible, and follow up clients referred back to the hub for any reason or who come for unscheduled clinical consultations. S/he communicates laboratory test results to the club-responsible to pass on to club members and document all interactions into appropriate registers.

Club-responsible

S/he will be a CHW who will be trained and supervised by the club nurse. Each CHW will oversee around 10-15 clubs to keep club operation manageable. S/he will liaise with the HBC to coordinate club meetings. S/he will receive the pre-packed medications for distribution and inform the club nurse within 24 hours of any clinical issue or concern raised during meetings. After each meeting, s/he will complete the club register, write a meeting summary, and conduct home visits together with the club-chair to clients who missed the meeting. Clients who miss the meeting for two consecutive times will be referred back to the hub.

Club chair

S/he will be an expert-client and club member residing in the community where the club is. Usually the HBC in that locality, s/he will be responsible for contacting each member before meetings and tracing club-members who fail to come to meetings. The club-chair will accompany the club-responsible on home-visits.

Data collection and management

Clinical data will consist mainly of routine HIV care and treatment data collected through the Tanzanian data management system of the National AIDS Control Program (NACP), under the MOHCDGEC. The data will be obtained from the CTC3 database which contains client-level data collected on standardized CTC cards at every clinic visit. Additional data required will be collected through specific data collection tools for example - HVL database for adherence determination, HIV testing registers for linkage efficiency determination, and club register.

Social science data will consist of focus-groups discussions with clients on experiences regarding receiving care through the clubs. Discussions will focus on adherence, family support, health system, socio-economic, socio-cultural, mental, and physical challenges, and mutual support. Perceptions of club-nurses and club-responsible about their responsibilities and information-provision will be collected similarly. Structured observations will provide information on information sharing among club members, and among club members and club staff, as well as care practices in the club meetings. Additional data about the club development and meeting processes in practice will be collected employing structured observations.

Costing for DSD services from a provider's perspective will be conducted through a micro-costing approach. We will estimate all the quantities and unit costs for all inputs

(capital, recurrent, personnel) needed to deliver this service. Observations of practice and interviews of healthcare providers will be used to allocate shared resources. As such, we will aim to estimate the real-world costs, reflecting current practice. Cost and utilisation data will be collected at different levels of service delivery that is - Community, Hub, DSD clubs using service delivery records such as - CTC2 and financial records. Start-up costs will not be included as we aim to reflect the cost of delivering the service only. We will be estimating economic costs, shadow prices will be applied for funded goods for example - ARVs or services such as ad-hoc staff employed to support intervention. In addition to the provider costs, we will also collect data on the financial burden to clients and their households (client-incurred costs like transportation, productivity losses).

Data for the nested cross-sectional study will be collected at the hubs and clubs using specific structured data-collection tools and questionnaires. For these and the social science data (not routinely collected for the NACP), data systems will be developed to capture data from registers, standardized forms, and questionnaires.

Data storage will consist of the safe retention of paper-based documents, digital data and devices connected with the electronic-based data systems. For documents and digital data that are part of the NACP, the National Guideline on HIV and AIDS data management will be followed [19]. For storage of data outside the scope of the National Program, project-specific standard operating procedures will be formulated to ensure data security. Implementation of these procedures will be facilitated by means of staff training.

Data Analysis

Quantitative

To assess the primary and secondary outcomes of the study, data will be described as proportions with 95% confidence intervals. Clients' characteristics will be described by means and standard deviations, median and interquartile ranges, or proportions and 95% confidence intervals, as applicable. Comparisons will be made using Chi-2 tests and student t-tests, as applicable. Appropriate uni- and multivariable regression models will be used to assess factors associated with study outcomes.

Qualitative

Qualitative data will be analysed using NVivo software. An inductive thematic approach will be applied. Data will be analysed for geographical location, gender, and age-group with a specific emphasis on diverging care needs or care strategies for gender and generation of stable clients. All qualitative client-level data will explicitly be triangulated with clinical outcome data.

Economic evaluation

Capital costs will be annuitized over their expected useful life. Economic costs will be depreciated using the local Tanzanian discount rate, with a 3% discount rate used in a sensitivity analysis. Financial costs will be depreciated using straight-line depreciation. Costs will be presented in the local currency and in US Dollars (USD). We will use the average exchange rate for the year of cost data collection to convert costs into USD. Any costs encountered in the past will be inflated using the local consumer price index (CPI) of Tanzania, before converting to USD.

Conclusion

While evidence suggests positive outcomes for all forms of DSD, the success recorded is not without challenges. Stigma, inadequate resources to manage increasing number of AC, gender dynamics in male-dominated societies, and data quality issues with paper-based health information systems, all remain issues in many African settings [25-29]. Emerging issues including not having conducive meeting places within the community, a growing erosion of social support as clubs become mere drug pick-up points, non-adherence to club protocols and widely varying preferences by geographical and socio-cultural contexts, all provide the impetus for more setting-based evidence of

DSD interventions such as we propose [30-33]. The diverse socio-cultural, geographic, and economic environment existing within our study setting presents a unique opportunity for auditioning a plethora of DSD interventions. Most importantly, data driven policies can be formulated to support on-going efforts and inform future strategic direction.

Ethical Approvals

Conflict of interest

None of the authors has declared any conflict of interest.

Acknowledgments

Author statement

PDN, JDK, EG and NO wrote the draft of this paper. JDK, NO, AB and SH provided input in writing of the study protocol and the development of the study materials (club register and informed consent form). SH, TRDW, AB, EvP, GG and GP contributed to reviewing and editing of the manuscript. GS, SM, AP, and BD reviewed the final version of the manuscript.

All authors read and approved the manuscript.

Funding

References

1. World Health Organization. Consolidated guidelines on the use of antiretroviral drugs for treating and preventing HIV infection: recommendations for a public health approach. World Heal Organ. 2016;155 p.
2. IAS. Differentiated Care for Hiv: a Decision Framework for Antiretroviral Therapy Delivery. Differ Care.org [International AIDS Soc. 2016;1–56.
3. Decroo T, Koole O, Remartinez D, dos Santos N, Dezembro S, Jofrisse M, et al. Four-year retention and risk factors for attrition among members of community ART groups in Tete, Mozambique. Trop Med Int Heal. 2014;19[5]:514–21.
4. Rasschaert F, Telfer B, Lessitala F, Decroo T, Remartinez D, Biot M, et al. A qualitative assessment of a community antiretroviral therapy group model in

Tete, Mozambique. PLoS One. 2014;9[3]:e91544.

5. Rasschaert F, Decroo T, Remartinez D, Telfer B, Lessitala F, Biot M, et al. Adapting a community-based ART delivery model to the patients' needs: A mixed methods research in Tete, Mozambique. BMC Public Health. 2014;14[1].

6. Vandendyck M, Motsamai M, Mubanga M, Makhakhe S, Tunggal S, Jonckheree S, et al. Community-Based ART Resulted in Excellent Retention and Can Leverage Community Empowerment in Rural Lesotho, A Mixed Method Study. HIV/AIDS Res Treat - Open J. 2015;2[2]:44–50.

7. Auld AF, Shiraishi RW, Couto A, Mbofana F, Colborn K, Alfredo C, et al. A decade of antiretroviral therapy scale-up in Mozambique: Evaluation of outcome trends and new models of service delivery among more than 300,000 patients enrolled during 2004-2013. J Acquir Immune Defic Syndr. 2016 Oct 1;73[2]:e11–22.

8. Wilkinson L, Harley B, Sharp J, Solomon S, Jacobs S, Cragg C, et al. Expansion of the Adherence Club model for stable antiretroviral therapy patients in the Cape Metro, South Africa 2011-2015. Trop Med Int Heal. 2016 Jun;21[6]:743–9.

9. Wilkinson LS. ART adherence clubs: A long-term retention strategy for clinically stable patients receiving antiretroviral therapy. South Afr J HIV Med. 2013;14[2]:48.

10. Horwood CM, Youngleson MS, Moses E, Stern AF, Barker PM. Using adapted quality-improvement approaches to strengthen community-based health systems and improve care in high HIV-burden sub-Saharan African countries. Aids. 2015;29:S155–64.

11. Grimsrud A, Sharp J, Kalombo C, Bekker L-G, Myer L. Implementation of community-based adherence clubs for stable antiretroviral therapy patients in Cape Town, South Africa. J Int AIDS Soc. 2015;18[1]:19984.

12. Tsondai PR, Wilkinson LS, Grimsrud A, Mdlalo PT, Ullauri A, Boulle A. High rates of retention and viral suppression in the scale-up of antiretroviral therapy adherence clubs in Cape Town, South Africa. J Int AIDS Soc. 2017;20.

13. Okoboi S, Ding E, Persuad S, Wangisi J, Birungi J, Shurgold S, et al. Community-based ART distribution system can effectively facilitate long-term program retention and low-rates of death and virologic failure in rural Uganda. AIDS Res Ther. 2015;12[12].

14. Jaffar S, Amuron B, Foster S, Birungi J, Levin J, Namara G, et al. Rates of virological failure in patients treated in a home-based versus a facility-based HIV-care model in Jinja, southeast Uganda: a cluster-randomised equivalence trial. Lancet. 2009/11/27. 2009;374[9707]:2080–9.

15. Babigumira JB, Castelnuovo B, Stergachis A, Kiragga A, Shaefer P, Lamorde M, et al. Cost Effectiveness of a Pharmacy-Only Refill Program in a Large Urban HIV/AIDS Clinic in Uganda.

16. Alamo ST, Wagner GJ, Ouma J, Sunday P, Marie L, Colebunders R, et al. Strategies for optimizing clinic efficiency in a community-based antiretroviral treatment programme in Uganda. AIDS Behav. 2013 Jan;17[1]:274–83.

17. Obua C, Kayiwa J, Waako P, ran Tomson G, Balidawa H, Chalker J, et al. Improving adherence to antiretroviral treatment in Uganda with a low-resource facility-based intervention.

18. Kwarisiima D, Kamya MR, Owaraganise A, Mwangwa F, Byonanebye DM, Ayieko J, et al. High rates of viral suppression in adults and children with high CD4+ counts using a streamlined ART delivery model in the SEARCH trial in rural Uganda and Kenya. J Int AIDS Soc. 2017;20:58–67.

19. Ministry of Health Community Development Gender Elderly and Children. National AIDS Control Programme Tanzania. National Guidelines For The Management Of Hiv

And Aids Sixth Edition October 2017. 2017;[October].

20. Nance N, Pendo P, Masanja J, Paul Ngilangwa D, Webb K, Noronha R, et al. Short-term effectiveness of a community health worker intervention for HIV-infected pregnant women in Tanzania to improve treatment adherence and retention in care: A cluster-randomized trial. Am. 2.

21. Geldsetzer P, Francis JM, Ulenga N, Sando D, Lema IA, Mboggo E, et al. The impact of community health worker-led home delivery of antiretroviral therapy on virological suppression: a non-inferiority cluster-randomized health systems trial in Dar es Salaam, Tanzania. BMC Health Serv Res. 2017;17[1].

22. Population Based HIV Impact Assessment [PHIA] Project. Tanzania Hiv Impact Survey [This]. 2017.

23. National Aids Control Programme. Health Sector Hiv And Aids Strategic Plan [Hshsp Iv] 2017–2022. Natl Aids Control Program Tanzania. 2017;IV:1–84.

24. Grennan JT, Loutfy MR, Su D, Harrigan PR, Cooper C, Klein M, et al. Magnitude of virologic blips is associated with a higher risk for virologic rebound in HIV-infected individuals: A recurrent events analysis. J Infect Dis. 2012 Apr 15;205[8]:1230–8.

25. Ayieko J, Brown L, Anthierens S, Van Rie A, Getahun M, Charlebois ED, et al. "Hurdles on the path to 90-90-90 and beyond": Qualitative analysis of barriers to engagement in HIV care among individuals in rural East Africa in the context of test-and-treat. Costa AB, editor. PLoS One. 2018 Aug 30;13[8]:e0202990.

26. Luque-Fernandez MA, Van Cutsem G, Goemaere E, Hilderbrand K, Schomaker M, Mantangana N, et al. Effectiveness of Patient Adherence Groups as a Model of Care for Stable Patients on Antiretroviral Therapy in Khayelitsha, Cape Town, South Africa. PLoS One. 2013;8[2].

27. Dudhia R, Kagee A. Experiences of participating in an antiretroviral treatment adherence club. Psychol Heal Med. 2015;20[4]:488–94.

28. Pellecchia U, Baert S, Nundwe S, Bwanali A, Zamadenga B, Metcalf CA, et al. "We are part of a family". Benefits and limitations of community ART groups [CAGs] in Thyolo, Malawi: a qualitative study. J Int AIDS Soc. 2017;20[1]:21374.

29. Mate KS, Bennett B, Mphatswe W, Barker P, Rollins N. Challenges for Routine Health System Data Management in a Large Public Programme to Prevent Mother-to-Child HIV Transmission in South Africa. Castro A, editor. PLoS One. 2009 May 12;4[5]:e5483.

30. Vogt F, Kalenga L, Lukela J, Salumu F, Diallo I, Nico E, et al. Brief Report: Decentralizing ART Supply for Stable HIV Patients to Community-Based Distribution Centers: Program Outcomes From an Urban Context in Kinshasa, DRC. J Acquir Immune Defic Syndr JAIDS. 2017;74[3]:326–31.

31. Mukumbang FC, Marchal B, Van Belle S, van Wyk B. "Patients Are Not Following the [Adherence] Club Rules Anymore": A Realist Case Study of the Antiretroviral Treatment Adherence Club, South Africa. Qualitative Health Research. 2018;

32. Pasipamire L, Nesbitt RC, Ndlovu S, Sibanda G, Mamba S, Lukhele N, et al. Retention on ART and predictors of disengagement from care in several alternative community-centred ART refill models in rural Swaziland. 2018;

33. Lazarus J V., Safreed-Harmon K, Nicholson J, Jaffar S. Health service delivery models for the provision of antiretroviral therapy in sub-Saharan Africa: a systematic review. Trop Med Int Heal. 2014 Oct;19[10]:1198–215.

Table 1: Objectives, outcome, and process indicators of the study

PRIMARY OBJECTIVES	OUTCOME INDICATORS	PROCESS INDICATORS
To evaluate the effectiveness of the club model in terms of treatment adherence, viral suppression, and loss to follow-up in urban and rural area in two geographical regions of Tanzania	Proportion of PLHIV maintaining virological suppression (VL <50cp/ml)* within the DSD. Proportion of clients lost to follow-up in clubs (defined as two consecutive meetings missed and no information available through CTC file consultation).	• Number and characteristics of clients referred back from Clubs to Project sites. • Number and characteristics of clients with suboptimal adherence (defined as missed ART doses on ≥2 days during the preceding 30 days). • Number and characteristics of clients with virological failure (VL >50cp/ml) measured at month 12, 24 and 36 post enrolment. • Number and characteristics of clients lost to follow-up in clubs. • Proportion of clients lost to follow up traced back through the Club staff
SECONDARY OBJECTIVES	**OUTCOME INDICATORS**	**PROCESS INDICATORS**
To examine how the DSD model (Clubs and Hubs) evolves from the original model through client and CHW/Club nurse practices.	1) Original structure of the Clubs and how these differ per hub/geographic location/type of leadership, etc. 2) Practices in Clubs (medication distribution, registration, how are decisions to send clients back made, small businesses, etc.) 3) Key factors that influence the development and changes of practices in Clubs. 4) Which types of Clubs (key determinants) provide the best retention in care services?	• Number of clients preferring to go back from the clubs to the CTCs. • Reasons for preferring to go back from the clubs to the CTCs. • Number of times club practices divert from protocol (pill-counting, weighing, referral).

To examine if the DSD model (Clubs and Hubs responds to the care needs of client	1. an overview of care needs of stable clients and how these are different by age and gender 2. Care practices provided by the different actors within the DSD-model (including self-care) 3. Gaps and inefficiencies in DSD care delivery in specific geographical and social settings (i.e. mobile populations) 4. A mapping of information-sharing on care needs different actors in the Club model	• Number and characteristics of club clients with sub-optimal adherence/self-care • Number and characteristics of club clients retained in care.
To assess total and unit costs, cost structure and drivers of service delivery	Costs per person-year on ART in the DSD model, by type of client.	• Cost per person diagnosed during community-based campaigns compared to facility-based testing Costs per person initiating ART at CTCs. • Costs per first year of ART by type of client. • Costs per person-year on ART after first year by type of client. • Costs per person-year on ART (excluding drugs) by type of client. • Total DSD model cost
To assess clients and provider perspectives comparing DSD with standard care	1. Costs to clients (financial and economic) 2. QALY 3. Health-related Quality of life (HRQoL) – Overall and dimension specific 4. Clients and providers perspective quality of care	• Medical costs per clinic or club visit e.g. lab tests and Non-medical costs per clinic visit e.g. transport, food • Productivity losses e.g. time loss, income loss • EQ-5D mean index score and VAS score • HRQoL across physical, emotional, functional, social, and cognitive functioning dimensions • Objective and subjective measures of structures, processes, and outcomes of care

PLHIV: people living with HIV; DSD: Differentiated Service Delivery; VL: viral load; CTC: Care and Treatment Centre (HIV Clinic); QALY: quality adjusted life years;

EQ-5D: EuroQol 5 dimension; VAS: visual analogue score

Table 2: Inclusion and exclusion criteria

Inclusion Criteria (Stable Clients)	Exclusion Criteria (Unstable Clients)
Age above five years	Age below five years
Received ART for at least six months;	Current ART for less than 6 months
Have no adverse drug reactions that require regular monitoring	Presence of an active OI (including TB) in the past six months
No current illnesses (OIs and/or unstable co-morbidities)	Presence of comorbidity poorly controlled
Optimal adherence to clinic visit appointments for the past six months	Poor adherence to scheduled visits (defined as >1 missed scheduled visit or >1 drug refill through treatment supporter in the past six months)
Average adherence to ART >95% during last six months	Suboptimal adherence to ART (defined as missed ART doses on ≥ 2 days in a month during the preceding six months)
On first line ARVs, with undetectable VL (≤ 50 cp/ml)	Recent detectable VL >50 cp/ml
	People who Inject drugs
	Pregnant women and lactating women
	Clients on second line ART regimen

OI: opportunistic infection; VL: viral load

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