

Effectiveness of Cellphone Calls in Reaching Children and Adolescents Lost to Follow-Up in an HIV Treatment Programme in Anambra State, Nigeria

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ABSTRACT

Background: Cellphone tracking is a key method for re-engaging HIV-positive clients lost to follow-up (LTFU). Although >95% of Nigerians have access to cellphones, re-engagement in HIV care remains a significant challenge. **Objectives:** To ascertain the success rate of cellphone calls in reaching LTFU children and adolescents living with HIV (CALHIV) at a tertiary facility in Anambra State, from 2012-2022. **Materials and methods:** This retrospective study extracted data on all LTFU CALHIV using proforma. Clients were classified as LTFU if they failed to attend clinic for ≥ 3 consecutive months after their last scheduled appointment and had no documented evidence of transfer, death, or treatment discontinuation. Tracking involved calling caregivers using provided cellphone numbers, with three additional attempts at different times within 7 days if the first call failed. **Results:** Two hundred and sixty-eight CALHIV were studied. Their mean age was 10.0 ± 6.73 years, and the male-to-female ratio was 1:1.3. Majority had their parent(s) as primary caregivers (221; 82.5%) and were already on antiretroviral therapy (222; 83%). The GSM providers of available contact numbers were MTN (224; 83.6%), Airtel (23; 8.6%), Globacom (12; 4.5%), and 9-Mobile (9; 3.4%). About 62% (165) of participants couldn't be reached due to switched-off lines (90; 54.5%), unreachable numbers (27; 16.4%), wrong ownership (31; 18.8%), or non-existent lines (17; 10.3%). **Conclusions:** The success rate of cellphone tracking for LTFU CALHIV was low due to issues with validity and availability of provided phone numbers. Routine updates, secondary contacts, and hybrid approaches combining digital tools with home visits are recommended.

Keywords

CALHIV, Disengagement from care, mobile phones, re-engagement, South-East Nigeria

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INTRODUCTION

Engagement in HIV care is essential for achieving successful treatment outcomes and ensuring a good quality of life for HIV-positive children and adolescents. Despite global progress toward HIV treatment targets, children and adolescents continue to lag behind. In 2014, UNAIDS launched the 90-90-90 goals—to ensure that by 2020, 90% of people living with HIV would know their status, 90% of those diagnosed would be on antiretroviral therapy (ART), and 90% of those on treatment would achieve viral suppression.[1] These targets were updated in 2020 to 95-95-95, aiming for attainment by 2025.[1] However, by 2022, only 57% of HIV-positive children were receiving treatment and just 46% were virally suppressed, compared to 77% and 72% respectively among adults.[1] This treatment gap contributes to higher AIDS-related mortality in the paediatric population, with an estimated 271 children and adolescents (ages 0–19) dying daily from AIDS-related causes—nearly 100,000 deaths in 2022 alone.[1]

Disengagement from care remains a major barrier to reaching global HIV goals, as it reduces retention and worsens clinical outcomes. Studies across African settings report that 23–50% of HIV-positive clients become lost to follow-up (LTFU) within 24 months of enrollment. [2-5] This increases the risk of drug resistance and hampers efforts to achieve viral suppression. To mitigate this, effective and sustainable tracking strategies are essential—particularly in high-burden countries like Nigeria, where HIV prevalence is approximately 1.4%.

Traditional methods of tracing LTFU patients, such as home visits, are often labor-intensive and costly, requiring dedicated personnel, transportation, and logistical support—resources that are frequently lacking in low- and middle-income countries. Geographic barriers, safety concerns, and limited funding further restrict their feasibility in remote or under-resourced areas. The widespread adoption of mobile phones presents a viable, cost-effective alternative. Mobile health interventions—

particularly the use of cellphone calls—have shown promise in improving ART adherence and retention. [6-7] Cellphone tracking has emerged globally as a key strategy for re-engaging LTFU HIV-positive clients, enabling providers to deliver timely reminders or reach out directly to those who have disengaged from care. In Nigeria, as of March 2024, mobile phone ownership exceeded 95%, with a national teledensity of 101.2%. [8] Several studies also report high mobile phone access among people living with HIV in Nigeria. [9-11]

This widespread mobile connectivity offers an opportunity to scale up cellphone-based interventions for patient re-engagement. However, despite the increasing use of such strategies, evidence on their effectiveness in tracking and re-engaging LTFU CALHIV in Nigeria remains limited. This study was therefore conducted to determine the success rate of cellphone calls in reaching LTFU CALHIV receiving care at Nnamdi Azikiwe University Teaching Hospital (NAUTH), Nnewi, Anambra State, South-east Nigeria.

MATERIALS AND METHODS

This was a retrospective descriptive study conducted at the Paediatric and Adolescent HIV Clinic of NAUTH, Nnewi, Anambra State, Nigeria. The clinic provides comprehensive HIV care, including ART, to CALHIV. The study covered an 11-year period, from January 2012 to December 2022.

The study included all children and adolescents aged 0–19 years who were enrolled in HIV care at NAUTH Nnewi and classified as LTFU during the period under review. For the purpose of this study, a client is considered LTFU on failing to return to care within 3 consecutive months of last scheduled appointment.

Data were extracted from patient medical records and the HIV clinic database. Information collected included age, sex, address, caregiver relationship, ART status, and the cellphone number(s) provided at enrollment or during follow-up visits. The study also recorded the network providers (e.g., MTN, Airtel,

9Mobile, Globacom) associated with the contact numbers. Data was collected between 1st February and 31st March 2023.

Tracking was done using a proforma similar to the standard tracking register. The tracking process involved attempting to reach the caregivers of LTFU CALHIV through the cellphone numbers on their records. If the initial call was not successful, three further calls were made within 7 days. The calls were staggered with respect to time and day of the week. Outcomes of the cellphone calls were documented and categorized as follows: successful (the caregiver disengaged from care, as well as those who could not be reached by phone, were referred to the Home-Based Tracking Unit (HBTU) for further follow-up and possible home visits.

Ethical clearance for the study was obtained from Health Research Ethics Committee of NAUTH Nnewi. All aspects of the study were carried out in accordance with relevant guidelines and regulations/declaration of Helsinki. All caregivers provided informed consent to be called on phone, in the event of loss to follow-up, for the purpose of tracking. Confidentiality was maintained for all data

RESULTS

Out of 297 CALHIV who were LTFU during the period under review, 268 (90.2%) whose caregivers provided phone contact(s) and had consented to phone calls were studied. Table 1 presents the socio-demographic and treatment-related characteristics of the 268 LTFU CALHIV. The age of the LTFU CALHIV ranged from 0 to 19 years with a mean of

was reached and a conversation took place), switched off (the phone line remained switched off throughout the calling period), unreachable (calls did not connect and the phone line was reported as unreachable), not picked (the phone rang persistently without any response), wrong number (the number reached did not belong to the purported caregiver, and the recipient denied knowledge of the client), or non-existent (the line was not recognized as a valid number). All CALHIV confirmed to be alive but not currently in care were encouraged to return to the clinic. Additionally, details of those alive but

obtained during the study by anonymizing patient data and limiting access to the research team only.

Data were analyzed using SPSS version 22. Descriptive statistics were used to summarize the characteristics of CALHIV who were LTFU. Categorical variables were presented as frequencies and percentages, while continuous variables were summarized using means and standard deviations. Differences in categorical variables were assessed using Pearson's Chi-square test. A p-value of <0.05 was considered statistically significant.

10.0 ± 6.73 years. The male: female ratio was 1: 1.3. Of the 268 CALHIV who were lost LTFU, the majority were students or apprentices (260; 97.0%) and had their parent(s) as primary caregivers (221; 82.5%). Approximately two-thirds (205; 76.5%) resided more than 15 kilometers from the health facility. Most of them (222; 82.8%) were on ART at the time of last contact, and among these, 59 (22.0%) had a last refill duration of 30 days or less.

Table 1: Socio-demographic characteristics of LTFU CALHIV and duration of last ART refill

Characteristics	Frequency	Percentage
Age Category (Years)		
≤9	128	47.8
10-14	46	17.2
15-19	94	35.1
Sex		
Female	151	56.3
Male	117	43.7
Employment status		
Employed	8	3.0
Student/apprentice	260	97.0
Place of residence		
Same state ≤15 km from site	63	23.5
Same state > 15 km from site	147	54.9
Other states	58	21.6
Last refill duration		
<30 days	15	5.6
30 days	44	16.4
60 days	107	39.9
90 days	56	20.9
Not yet commenced on ART	46	17.2
Relationship with primary caregiver		
Parent	221	82.5
Sibling	8	3.0
Extended family members	29	10.8
Others	10	3.7
Total	268	100.0

As shown in Figure I, the GSM network providers of the provided phone contacts were MTN (224; 83.6%), Airtel (23; 8.6%), 9-Mobile (9; 3.4%), and Globacom (12; 4.5%). Figure II displays that approximately two-thirds (165; 61.6%) of the provided cellphone numbers could not be reached. As illustrated in Figure III, this was mainly due to the phone numbers being switched off in more than half of the cases (90; 54.5%).

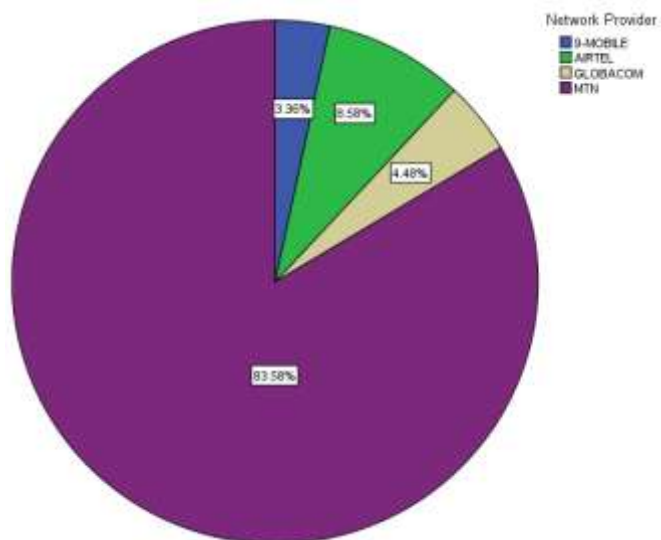
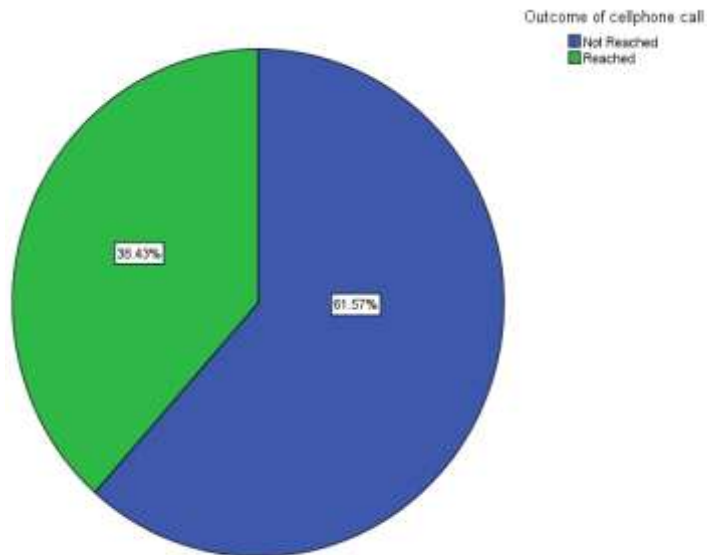
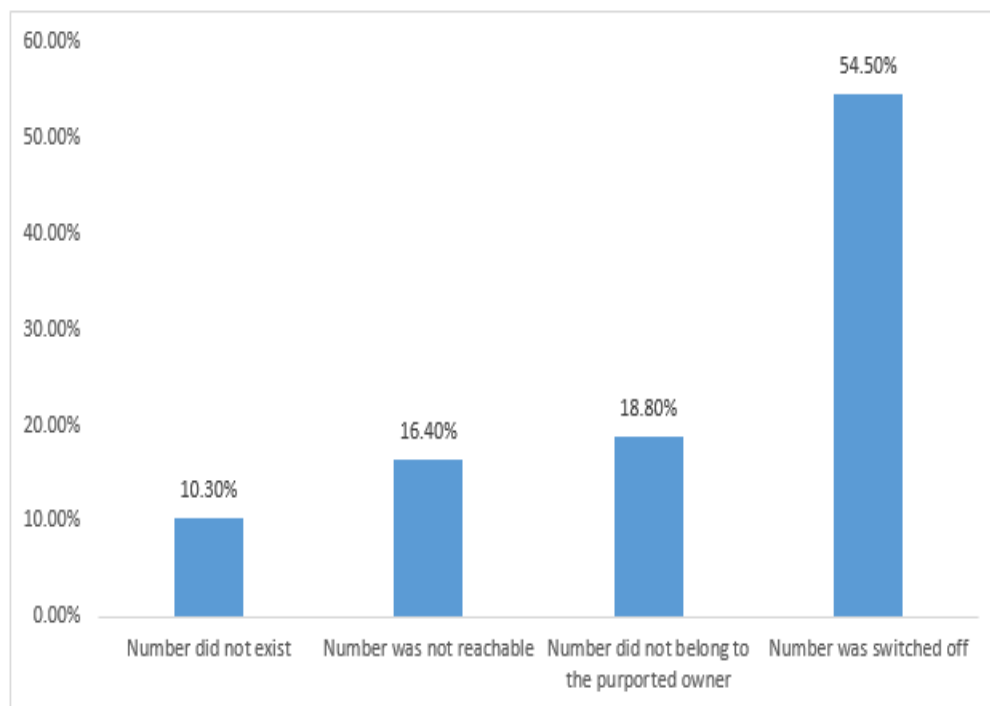
Figure I: Network providers of available phone numbers

Figure II: Outcome of cellphone call of available phone numbers**Figure III: Response from cellphone numbers which could not be reached.**

As shown in Table 2, neither the type of network provider, nor other factors examined was significantly associated with ability to reach provided phone number.

Table 2: Factors associated with ability to reach cellphone contact of LTFU CALHIV

Characteristic	Reached	Unreached	p-value	Total (%)
Network Provider				
9-Mobile	4(44.4)	5(55.6)	0.731	9(3.4)
Airtel	10(43.5)	13(56.5)		23(8.6)
Globacom	3(25.0)	9(75.0)		12(4.5)
MTN	86(38.4)	138(61.6)		224(83.6)
Age (years)				
0-9	47(36.7)	81(63.3)	0.721	128 (47.8)
10-14	20(43.5)	26(56.5)		46(17.2)
15-19	36(38.3)	58(61.7)		94(35.1)
Gender				
Female	59(39.1)	92(60.9)	0.807	151(56.3)
Male	44(37.6)	73(62.4)		117(43.7)
Employment status				
Employed	5(62.5)	3(37.5)	0.267	8(3.0)
Student/apprentice	98(37.7)	162(62.3)		260(97.0)
Place of residence				
Same state ≤15 km from site	25(39.7)	38(60.3)	0.283	63(23.5)
Same state > 15 km from site	51(34.7)	96(65.3)		147(54.9)
Other states	27(46.6)	31(53.4)		58(21.6)
On ART				
Yes	12(26.1)	34(73.9)	0.059	46(17.2)
No	91(41.0)	131(59.0)		222(82.8)
Last refill duration (n=222)				
<30 days	5(33.3)	10(66.7)	0.873	15(6.8)
30 days	18(40.9)	26(59.1)		44(19.8)
60 days	43(40.2)	64(59.8)		107(48.2)
90 days	25(44.6)	31(55.4)		56(25.2)
Relationship with primary caregiver				
Parent			0.610	
Sibling	88(39.8)	133(60.2)		221(82.5)
Extended family members	2(25.0)	6(75.0)		8(3.0)
Others	11(37.9)	18(62.1)		29(10.8)
	2(20.0)	8(80.0)		10(3.7)

DISCUSSION

This study found that a substantial proportion of LTFU CALHIV could not be reached through the cellphone numbers provided. Specifically, 61.6% (165 out of 268) of the contacts were unreachable due to switched-off lines (90; 54.5%), unreachable numbers (27; 16.4%), wrong ownership (31; 18.8%), and non-existent lines (17; 10.3%). Neither the type of network provider nor other factors assessed showed a statistically significant association with the ability to reach the provided phone numbers. These findings highlight the limitations of relying solely on cellphone tracking for re-engaging LTFU CALHIV

and underscore the need for improved data accuracy and the integration of alternative strategies such as home visits.

Building on our findings that a substantial proportion of LTFU CALHIV could not be reached through the phone numbers provided, this study aligns with previous reports and underscores a broader regional challenge. Similar difficulties with phone-based tracking have been documented across other African countries. For example, in Ghana and Togo, only 36.2% and 20.1% of LTFU HIV-positive clients, respectively, had an active and reachable phone

number on record. [4,14] In Mozambique, just 42% of LTFU HIV-infected children could be contacted by phone, primarily due to invalid or outdated numbers. [15] These findings emphasize that maintaining accurate and functional contact information remains a persistent barrier to the effectiveness of cellphone-based reengagement strategies throughout sub-Saharan Africa.

One contributing factor to the high rate of inactive phone numbers may be the provision of incorrect

contact information. This could stem from fear of accidental disclosure of HIV status during phone calls, which may result in discrimination, stigmatization, or abandonment. Additionally, almost all clients were unemployed and likely had limited access to personal phones, relying instead on caregivers—typically their parents—for communication. It is therefore possible that some caregivers or owners of the listed phone numbers were deceased. This possibility is supported by several studies from African settings, which report that a significant proportion of HIV-positive clients classified as LTFU were, in fact, deceased. [4,5,7,15,16]

Another factor contributing to inactive phone numbers is the high turnover of SIM cards in Nigeria. Deactivated lines are often recycled and reassigned to new users after a period of inactivity. This may explain our finding that 18.8% of unreachable LTFU CALHIV were linked to phone numbers that no longer belonged to the intended recipients. According to data from the Nigerian Communications Commission (NCC), there were 96.7 million unused or abandoned lines across MTN, Airtel, Globacom, and 9mobile networks as of February 2023. [10,17] The NCC mandates telecom operators to deactivate any line unused for revenue-generating activity for six months, after which owners have an additional six months to reactivate it before the number is permanently reassigned. Moreover, the ease of SIM card acquisition in Nigeria increases the likelihood that caregivers may own multiple lines, some of which may not be documented during clinic visits. These factors

present significant challenges to using mobile phones for tracking LTFU clients, particularly in settings like ours, where alternative tracking methods are limited.

Furthermore, the absence of a statistically significant association between any sociodemographic characteristic of the LTFU CALHIV and the ability to reach them via phone is unsurprising. These children and adolescents are typically dependent on adult caregivers for communication with healthcare providers. To improve tracking efforts, programmes should consider documenting contact information for secondary caregivers or other reliable proxies, especially for older CALHIV who may soon be able to own personal phones.

This study highlights critical barriers to re-engaging CALHIV who are LTFU through cellphone-based tracking. These barriers have significant implications for retention in HIV treatment programmes, particularly for younger populations who are highly dependent on adult caregivers for communication and health service navigation. While cellphone tracking remains a potentially valuable and cost-effective strategy within broader retention efforts, its utility is heavily reliant on the availability of accurate, functional, and up-to-date contact information. When phone numbers are invalid, switched off, or no longer owned by the intended recipient, the likelihood of successful re-engagement drops significantly. To address these challenges, health programmes must prioritize the routine updating and verification of contact information. ART programmes should establish protocols to review and confirm clients' phone numbers at every visit and, where possible, obtain multiple contacts, including those of secondary caregivers. Periodic testing of recorded phone numbers—by sending verification messages or conducting brief test calls—can help ensure the continued accuracy and relevance of contact information in medical records.

Given the limitations of cellphone tracking alone, HIV programmes should adopt a hybrid approach that combines digital outreach with home-based follow-up and community-based support. Findings

from an African systematic review and meta-analysis suggest that incorporating home visits into tracing strategies for LTFU HIV-positive clients is strongly associated with higher success rates compared to relying solely on telephone calls. [16] The inclusion of home visits was predicted to increase the probability of successful tracking from approximately 20% to 60%, with an odds ratio (OR) of 5.71. This highlights the importance of blending digital tracking with more direct, personal methods like home visits to enhance re-engagement efforts. [16]

This study has several strengths, including its focus on a vulnerable population—CALHIV—and the use of real-world programme data from a resource-limited setting, which enhances the practical relevance of the findings. However, the outcomes could not be verified for all unreachable clients, potentially introducing bias in estimating the true success rate of re-engagement.

CONCLUSION/RECOMMENDATION

The success rate of cellphone tracking for re-engaging CALHIV lost to follow-up was low, primarily due to issues with the validity and availability of the provided phone numbers. This underscores the importance of routinely verifying and updating contact information, collecting alternative phone numbers from secondary caregivers, and integrating complementary strategies such as home visits and community-based follow-up.

To enhance re-engagement outcomes, HIV programmes should implement hybrid approaches that combine digital outreach with in-person support, tailored to the communication needs of children and adolescents. Policymakers and programme implementers are encouraged to incorporate these strategies into national HIV retention frameworks, with emphasis on improving data quality, building children and adolescent-friendly systems, and investing in community engagement and digital health infrastructure. Future studies should assess the effectiveness of such hybrid models and explore

innovative, children/adolescent-centered digital platforms to support retention in HIV care.

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Author contributions

CUO and EFU conceptualized and designed the study. CUO and NEN handled data extraction and entry. CUO and EFU were responsible for data analysis and interpretation. The initial manuscript was prepared by CUO. All authors were involved in revising the manuscript. The authors read and approved the final manuscript and agree to be accountable for all aspects of the work.

Data Availability

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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No funding was received for this study.

Conflict of Interest

The authors declare no conflict of interest.

Ethical Approval

Ethical clearance for the study was obtained from the Health Research Ethics Committee of NAUTH, Nnewi.

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