NIGERIA INFORMATION PRODUCT

Improving Patient Retention on Antiretroviral Treatment through High-Frequency Reporting in Lagos State

NOVEMBER 2020

PEPFAR

USAID FROM THE AMERICAN PEOPLE

Data.FI Data for Implementation

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November 2020

This publication was prepared by Data.FI, Right to Care and Data.FI, Palladium staff.

Suggested citation: Adebayo, J., Crompton, T., de Nooy, A., Combet, V., Rennick, M., Akpan, F., Ondura, E., & Dauda, D. (2020). Improving Patient Retention on Antiretroviral Treatment through High-Frequency Reporting in Lagos State. Washington, DC, USA: Data.FI, Palladium

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Background

Retention of patients in HIV care is essential to controlling the HIV epidemic. Patients retained in care with undetectable viral loads are no longer infectious, breaking the HIV transmission cycle. Understanding who is lost to follow-up (LTFU) is essential for targeting tailored HIV programming to bring those patients back into care with differentiated models of service that meet their needs.

The challenge to retaining patients in care is multi-faceted with treatment fatigue, quality of care, and stigma, contributing to estimated LTFU, in addition to data quality and record keeping. A better understanding of the data can help to describe the problem, with the appropriate demographic and geographic stratifications to assist implementing partners (IPs) to improve patient retention while also focusing on new treatment initiations.

High-frequency reporting (HFR) data provides an opportunity to conduct retention analysis across the USAID-supported facilities in Nigeria. Program data from various IPs' facilities are uploaded to the Automated Partner Performance Reporting (APPR) platform via IPs' District Health Information System 2 (DHIS2) instances weekly. The indicators reported in the HFR are either weekly or monthly indicators. Weekly indicators collected in the HFR include HTS_TST, HTS_TST_POS, TX_NEW, TX_CURR, TX_PVLS_D, and TX_PVLS_N.

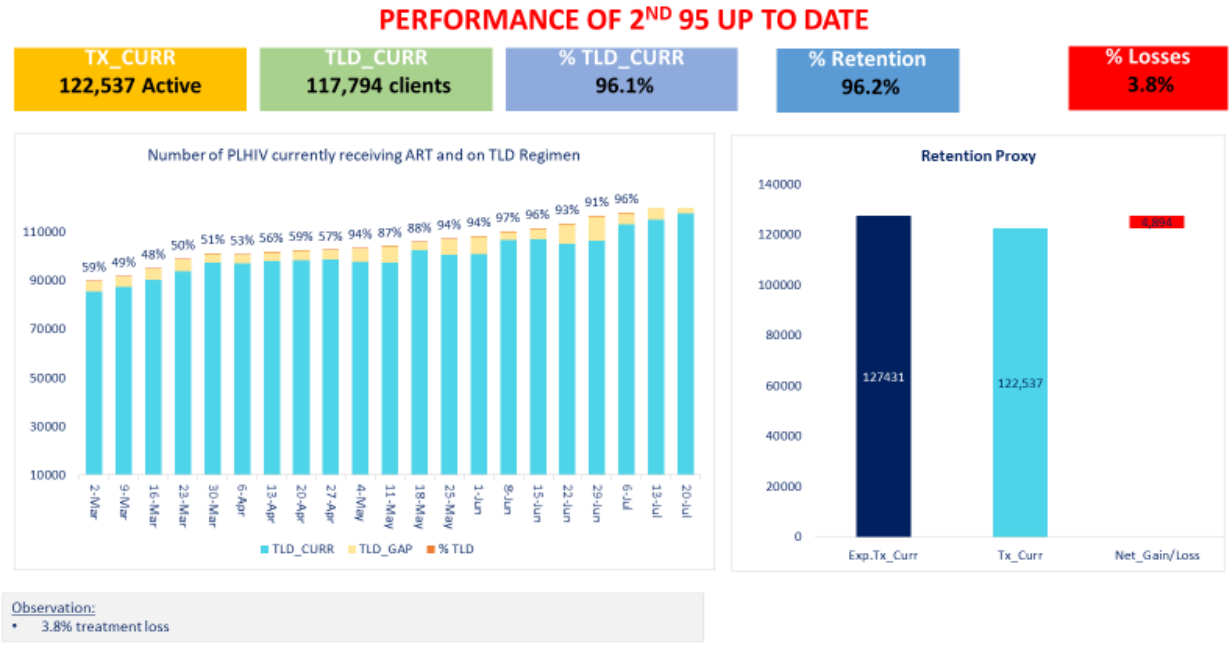
Key PEPFAR indicators of interest

TX_CURR: Number of adults and children currently receiving ART.

TX_NEW: Number of adults and children newly enrolled on antiretroviral treatment (ART).

TX_NET_NEW: The (quarterly) net increase or decrease in ART patients.

Figure 1. Current HFR dashboard snapshot for USAID-supported states



To track program achievements and gaps that may hinder the achievement of quarterly and annual targets, USAID conducts weekly data reviews of HFR dashboards with IPs. USAID and its Ips also conduct further state specific HFR data analyses to better understand sub-national trends in the HIV epidemic in states like Lagos.

The 2018 National AIDS Indicator Impact Survey (NAIIS) revealed that while the national prevalence of HIV is 1.4%, with an estimated 3.2 million people living with HIV (PLHIV) in the country as at quarter 1, 2018 (National Agency for the of Aids (NACA)), more than 50% of the PLHIV are in 7 of the 36 states. Lagos State, located in the south-western part of Nigeria, has an HIV prevalence rate of 1.4%, the same as the national prevalence rate, and an estimated burden of 207,215 PLHIV. As a result, USAID classified the state as one of the surge states, which places it in the "red" category. Lagos State is arguably the most economically important state in the country and has the nation's largest urban area. It is a major financial center and would be the fifth-largest economy in Africa if it were a country. It is the second-most populous state in the country, with a population of 12.5 million (National Bureau of Statistics) and has the highest population density of Nigeria's states.

Objectives

This brief will provide USAID and its IPs detailed information using HFR-reported data at the facility and LGA level to target retention interventions by:

- Comparing trends in retention at the facility, LGA, and state levels over time, identifying improving facilities/programs. Retention indicators include:
  - TX_NET_NEW by age and gender disaggregation
  - TX_NET_NEW ratio as a retention proxy
  - Unexplained gain/loss
- Differentiating high- and poor-performing facilities to identify possible sources of best practices and emphasize areas for targeted retention support
- Identifying any spatial relationships for retention through GIS analysis

Methodology

Data source

All USAID IPs report their program data quarterly into the agency's platform, Data for Accountability, Transparency and Impact (DATIM). USAID required IPs to submit HFR reports following the commencement of surge activities in April 2019 and began formalizing weekly data reporting for effective program management following the success of frequent program measurement from the surge activities. Following the setup of the APPR on the DHIS platform in July 2019, all backlogs of the HFR reports submitted by IPs were uploaded into the APPR, and subsequent submissions were made through the same platform.

Data cleaning and restructuring

Data.FI restructured the HFR data into a format most useful for analysis, removing facilities with no/very few populated records or facilities with low average TX_CURR values (average values in the lowest 10% quintile) to prevent these facilities from skewing the final analyses. The dataset was then checked for missing values, with missing TX_CURR values being substituted with the most prior TX_CURR value and missing TX_NEW values being assumed to have a value of zero. The HFR data contains two age groups — less than 15 years old, and greater than 15 years old. This disaggregation

was used where applicable. Cases of specific data substitutions to facilities are described in the appendix.

Data grouping

The cleaned dataset was adapted to report over four-week periods, as compared to weekly periods. This was done to increase the change in variable values over time, to reduce the number of potential undefined or infinite indicator results that would result from zero weekly change. The adaption process required TX_NEW values at the end of the period to be the summation of all weekly TX_NEW values within the period.

Indicator analysis

Following the grouping process, two further variables were included for each considered period before indicators could be calculated — TX_CURR_PREV (the TX_CURR at the end of the last period) and TX_NET_NEW (defined for this analysis as the difference in TX_CURR between two consecutive periods). Given the new variable set, two new indicators were calculated — a TX_NET_NEW ratio as a proxy for retention, as well as a value representing the unexplained gain/loss for the period (see box for formulas used). The retention proxy below was used to ensure that the result was positive and could be compared across all sites; retention proxy values can range between 0 and infinity, although most are around the value of 1.

Key PEPFAR indicators of interest

TX_CURR: Number of adults and children currently receiving ART.

TX_NEW: Number of adults and children newly enrolled on antiretroviral therapy (ART) within the quarter.

TX_NET_NEW: The differences in TX_CURR between two consecutive periods.

Formulas used

TX_NET_NEW = $TX\_CURR_{present} - TX\_CURR_{previous}$

Retention proxy = $TX\_CURR_{present} / (TX\_CURR_{previous} + TX\_NEW)$

Unexplained loss or gain = TX_NET_NEW – TX_NEW

The described indicators were then considered over time to potentially highlight trends in performance, and the retention proxy was mapped to determine if there is any correlation between retention and location.

Mapping

Using the results from the retention proxy analysis, the Inverse Distance Weighted (IDW) tool was used to create an interpolation surface of retention proxy for the state using the “mean proxy” variable. The IDW tool determines cell values by using a linearly weighted combination of health facility locations (ESRI). It assumes that the facilities that are close to one another are more alike than those that are far apart, inferring that patients tend to attend a clinic closest to their residence to receive treatment (Mcintosh, A.I et al, 2018). The result of the interpolated map was presented using a four-class manual classification break and a green-to-red color scheme to highlight the variation between good and poorly performing facilities.

Potential limitations of the analysis

HFR data does not provide detailed age breakdown information, limiting the analysis to results described only in terms of state, LGA or facility by broad age groups and sex.

Also, missing data for some facilities could lead to inaccurate findings. Lagos state had some anomalies in the data, which are described in more detail in the appendix.

Findings

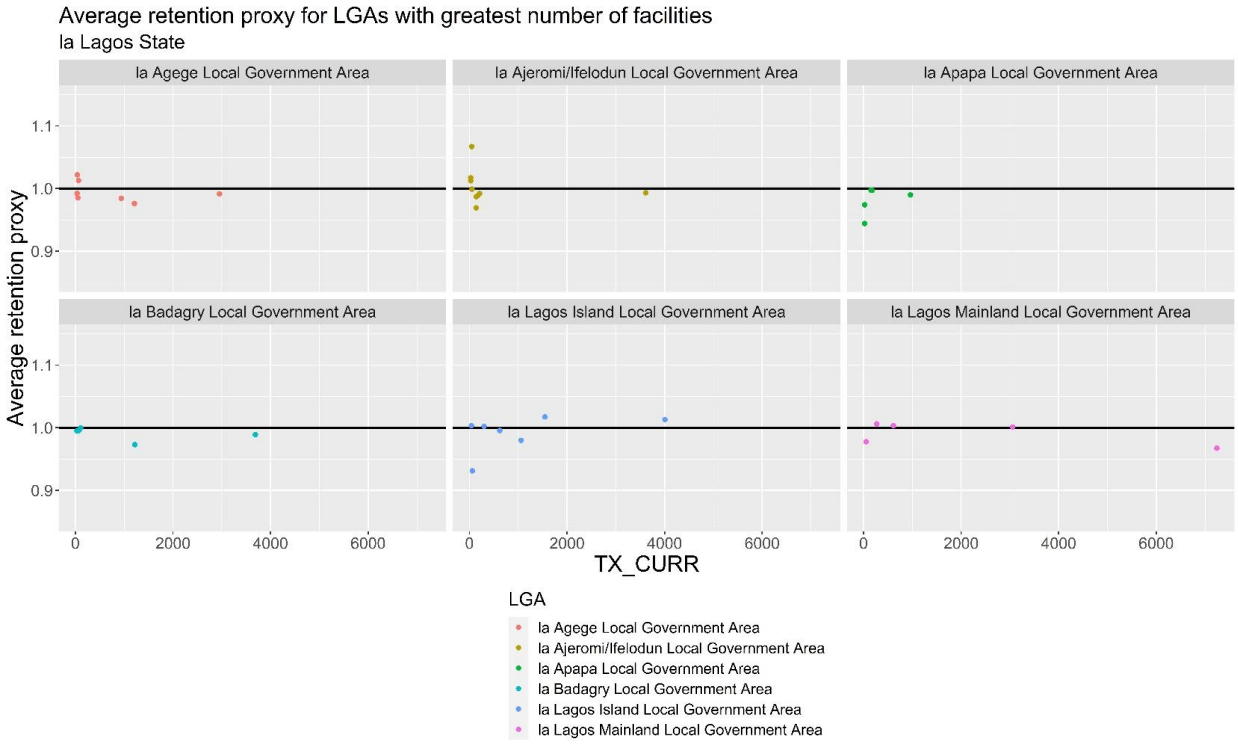
1. LGAs with retention issues identified by comparing facility-level retention in care using proxy

Figure 2 below presents the average retention proxy for each four-week interval over the time period (FY19 Week 40– FY20 Week 23) for the top six LGAs with the most facilities (77.6% of included facilities for Lagos). Retention proxy is plotted against TX_CURR, allowing for a comparison in performance between relatively large and small facilities. The static black line represents a retention proxy equal to 1. The plots also compare LGA performance.

As an initial note, Figure 2 does not highlight any clear correlation between TX_CURR and average retention. TX_CURR is, however, useful in indicating potential large facilities with low retention, which may be of concern. An example of this is the Nigerian Institute of Medical Research (NIMR), represented in the bottom right of the Lagos Mainland LGA plot, which has the potential to lose many patients if its average retention is maintained into the future.

Through analysis of each of these LGAs, Data.FI found that facilities in Apapa and Badagry LGAs tended to have average retention proxies below 1, suggesting that these LGAs are losing patients regularly. Other LGAs tend to have facilities falling above, equal to, and below 1, and it is not indicated that there is a clear LGA that is outperforming the others. It is worth noting, however, that there are facilities in Aggege, Ajeromi/Ifelodun, and Lagos Island LGAs that have average retentions above 1 and are performing well.

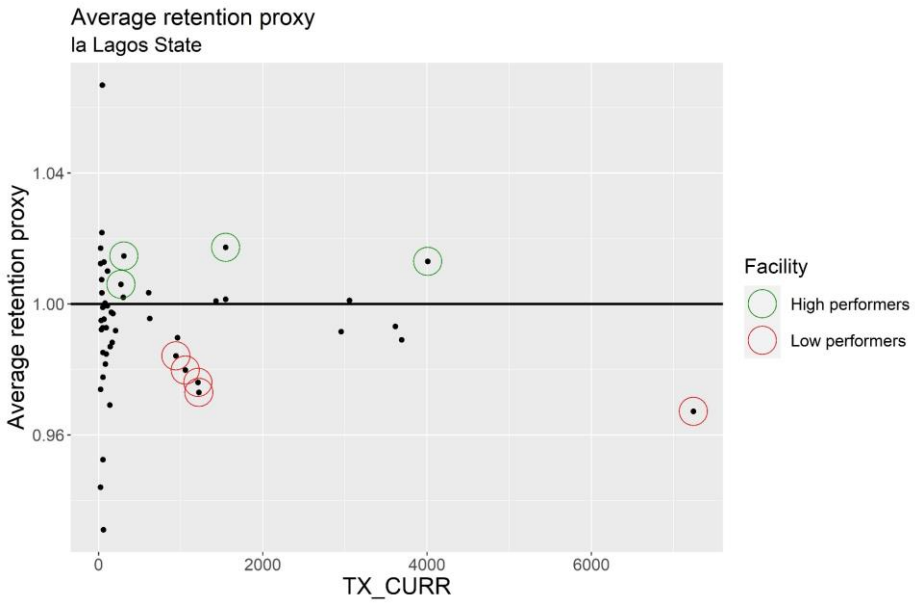
Figure 2. LGA-level TX_NET_NEW ratio as retention proxy



2. Facilities with good and poor retention pinpointed, with further examination needed

Figure 3 below plotted the retention proxy against TX_CURR for all facilities in the state over the whole data time period (FY19 Week 47 – FY20 Week 23). Circled in the plot are the top and bottom facilities with an average TX_CURR above the median and an overall retention below 0.985 or above 1.005, respectively.

Figure 3. Facility-level TX_NET_NEW ratio as retention proxy



Further analysis is required for the top- and low-performing facilities to determine potential reasons for change. This is particularly important for the low-performing facilities because given their size, a retention proxy below 1 suggests that these facilities have lost a relatively large number of patients.

The top and bottom facilities' TX_NET_NEW trends are analyzed in more detail below.

3. TX_NET_NEW examined over time for the high-traffic facilities with the highest and lowest retention performance

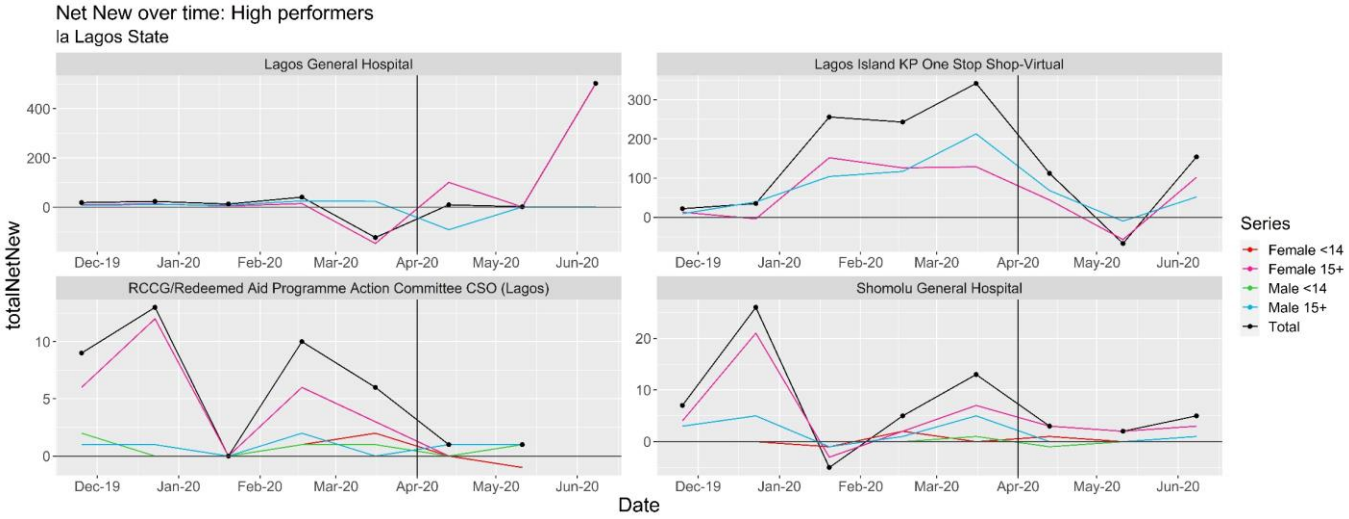
Figure 4 below showcases the change in TX_NET_NEW over time for high-traffic facilities that performed well on retention. The graph presents the total TX_NET_NEW over time, as well as the TX_NET_NEW disaggregated by age and gender categories available in the HFR.

The four facilities shown in Figure 4 performed well in terms of retention over the time period. These facilities showed consistent positive or zero TX_NET_NEW values, indicating that they were consistently either retaining all patients or gaining new ones. It is interesting to note that the RCCG/Redeemed Aid Program Action Committee CSO and Shomolu General Hospital facilities showed a decreased TX_NET_NEW around the same time period toward the middle of January. Further, all four facilities plotted show noticeable decreases just before and after the black line (April), which could be attributed to COVID-19 mitigation measures being introduced.

A further consideration is that the top performers within their age and sex brackets show that females over age 15 were mostly responsible for the total NET_NEW changes seen at each facility, likely because more females are in care than males (as shown in Figure 10). It is interesting to note that for

Lagos Island KP One Stop Shop-Virtual, the number of TX_NET_NEW for males over age 15 does exceed that of females over age 15 in March.

Figure 4. Change in TX_NET_NEW over time for high-traffic facilities with good retention



A similar deep-dive analysis of changes in NET_NEW over time was conducted for the subset of facilities that performed poorly on retention, as seen in Figure 5 below. The key features to look for in this graph are where, and how often, a facility has a negative TX_NET_NEW, as this indicates it has lost patients over the time period.

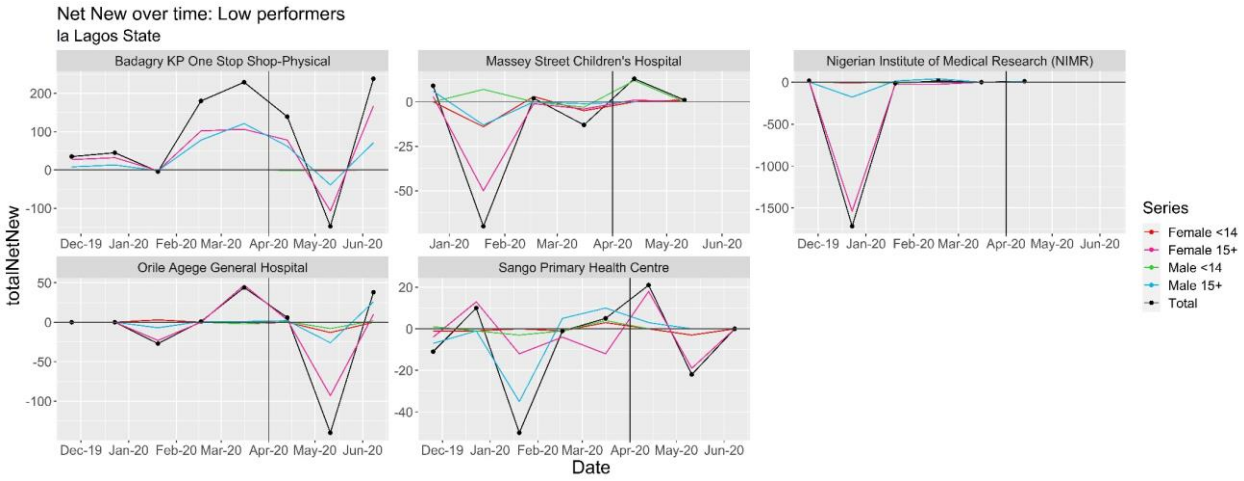
In Figure 5, the poor-performing facilities are seen to have relatively large downwards spikes in TX_NET_NEW, indicating periods of patient loss. A notable facility is the Nigerian Institute of Medical Research (NIMR), previously mentioned for Figure 2. The TX_NET_NEW plot for this facility shows a large downwards spike of more than 1,500 people around Christmas, but these patients do not appear to return to the facility after this point.

Another plot of interest in Figure 5Figure 4 is that of Badagry KP One Stop Shop-Physical, which tends to have a TX_NET_NEW that is mostly positive, suggesting it is gaining patients. However, the cohort growth is less than would be expected with newly initiated patients, resulting in poor retention performance. This is highlighted in Figure 8, which shows an almost consistent negative unexplained change.

Another aspect of note in Figure 5Figure 4 is downward points for all facilities besides NIMR around the same time period in the middle of January. Other notable drops occur for several facilities in early May. Highlighting potential causes for these drops could provide insight into preventing the same types of patient loss into the future.

Considering Figure 5 in terms of age and sex, the total changes tend to follow that of females over age 15, which speaks to the greater number of females in care (Figure 11). However, there are noticeable time points for Badagry KP One Stop Shop-Physical, for which this trend is not followed and the TX_NET_NEW for males and females over age 15 are almost equal. Sango Primary Health Centre (PHC) also does not consistently follow this trend, with positive TX_NET_NEW values for males over age 15 contributing to large losses, which is not consistent with the other facilities. Also noted is that, given Massey Street Children's Hospital larger proportion of patients under age 15 (see Figure 10), this age bracket has a bigger impact on total changes than for other facilities.

Figure 5. Change in TX_NET_NEW over time for high-traffic facilities with poor retention

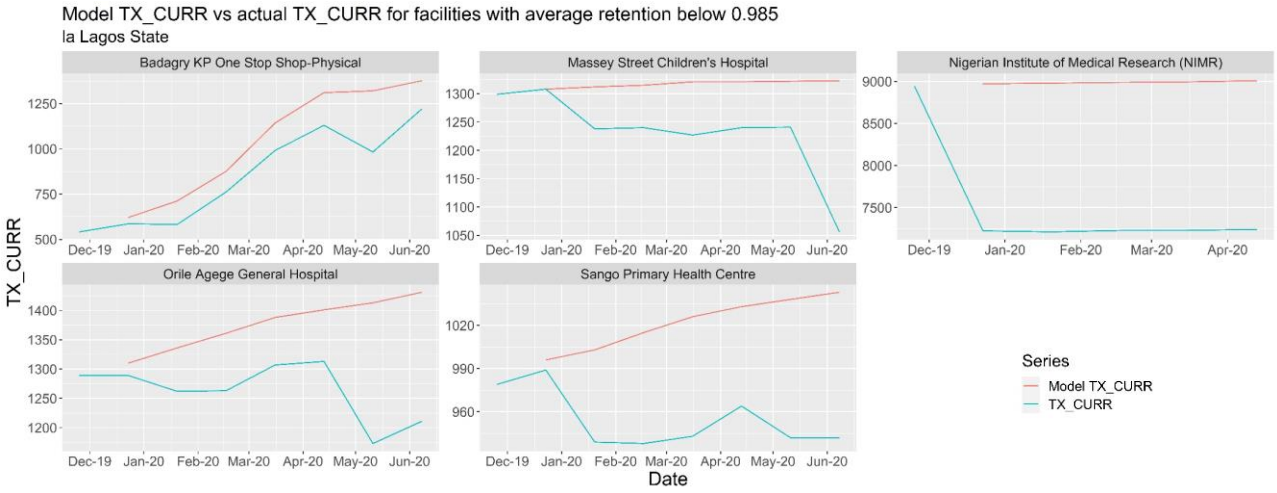


4. Data from facilities with poor retention further analyzed to establish actionable targets for patients returned to care

To get an accurate understanding of lower-performing facilities' retention issues over time, Figure 6 below plots where a facility should be if it had 100% retention over the period. In the figure, the model TX_CURR is presented in red against the actual TX_CURR in blue.

Figure 6 highlights that facilities other than Badagry KP One Stop Shop-Physical have struggled to regain TX_CURR numbers after any significant drop in cohort numbers, suggesting that these facilities may need additional support. An interesting observation for these graphs is the mostly flat red lines for Massey Street Children's Hospital and NIMR, suggesting very little treatment initiation in addition to poor recovery from retention drops. Such a large drop could indicate a data quality issue and should be considered further.

Figure 6. Week-by-week retention proxy for lower-performing facilities

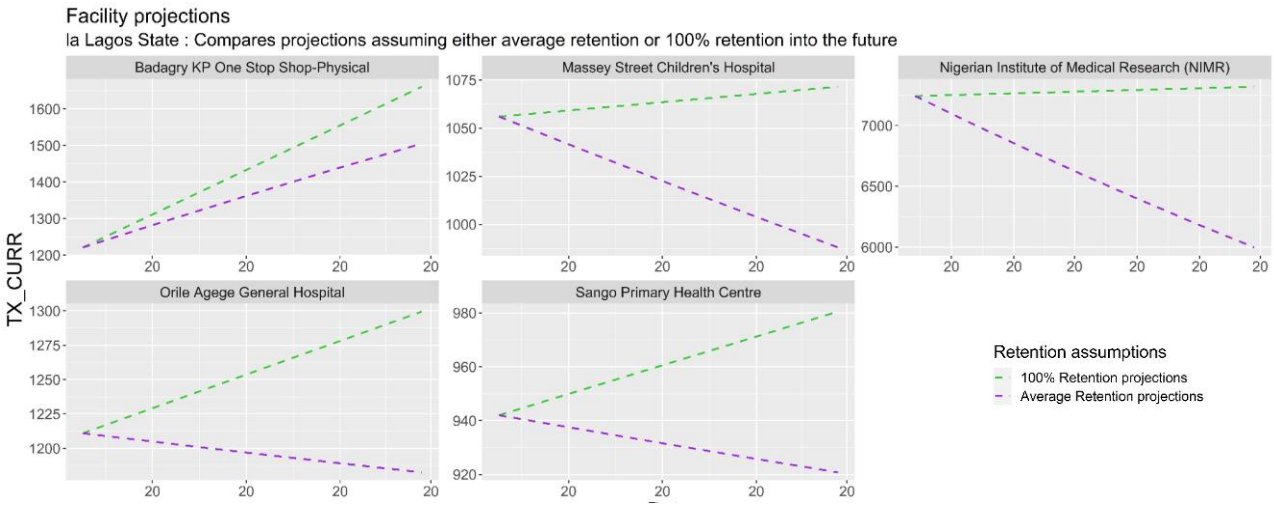


To identify the facilities most in need of technical assistance from IPs to bring patients back into care, projected TX_CURR for FY20 was plotted based on 100% retention (green dotted line) versus current average retention rates (purple dotted line). See Figure 7 below.

Facilities in Figure 7 with large gaps between the lines will potentially need careful support from IPs to rapidly return patients to care. Further, facilities with a decreasing purple line — indicating a retention

lower than 1, as well as a low average number of newly initiated patients — should be noted for support as well.

Figure 7. Projections of TX_CURR assuming 100% retention



To inform planning by facilities and IPs, the number of PLHIV who would need to be returned to care by the end of FY20 was calculated, assuming the average TX_NEW and retention rate are maintained going forward (see Table 1 below).

Table 1. Summary of FY20 back-to-care targets for poor-performing facilities

#	Facility name	FY20 back-to-care targets
1	Nigerian Institute of Medical Research (NIMR)	1321
2	Badagry KP One Stop Shop-Physical	156
3	Orile Agege General Hospital	117
4	Massey Street Children's Hospital	83
5	Sango Primary Health Centre	60

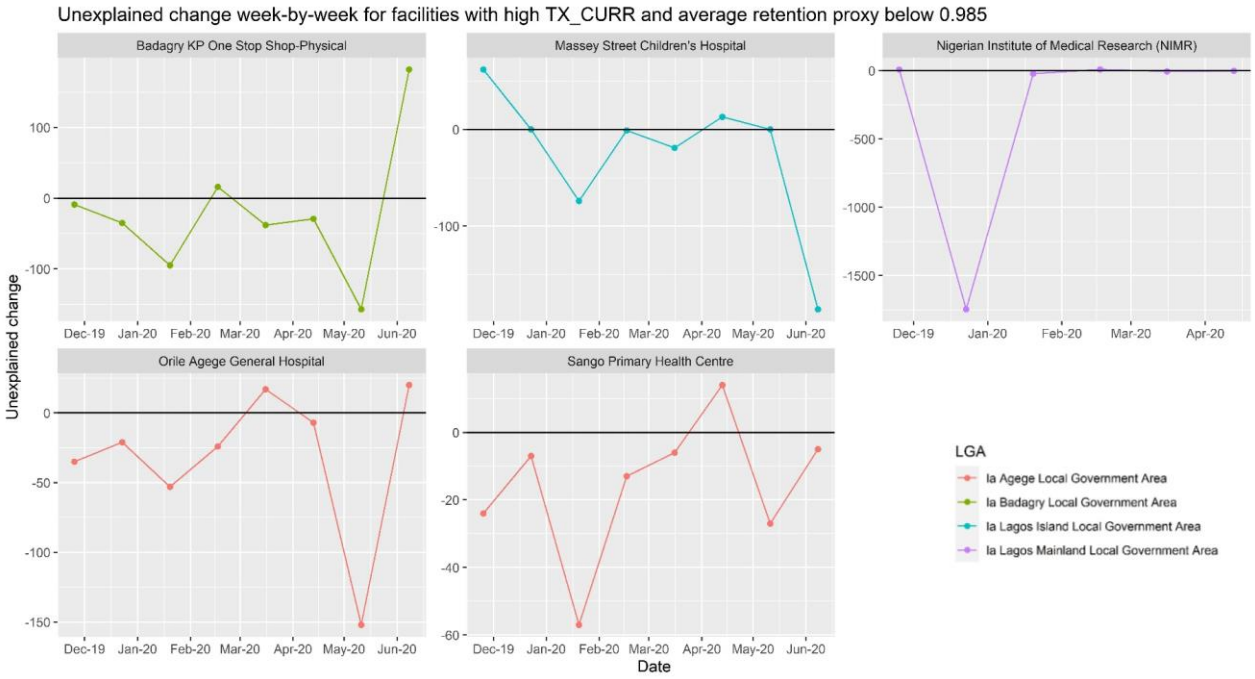
5. Unexplained gains and losses over time for low-performing facilities highlighted, with further discussion required

Figure 8 below highlights trends for unexplained changes in TX_CURR over time for the facilities with poor-retention levels.

The negative drops in Figure 8 again highlight the loss of patients seen for the facilities. Very few cases of positive unexplained gain are seen, indicating that very few lost patients are returning to care over time. Further discussion with IPs is required to understand the cause(s) of the drops and how they can be prevented into the future.

An additional point is that coloring these plots according to LGA shows that two out of the five low-performing facilities are from Agege LGA.

Figure 8. Unexplained change over time for lower-performing facilities

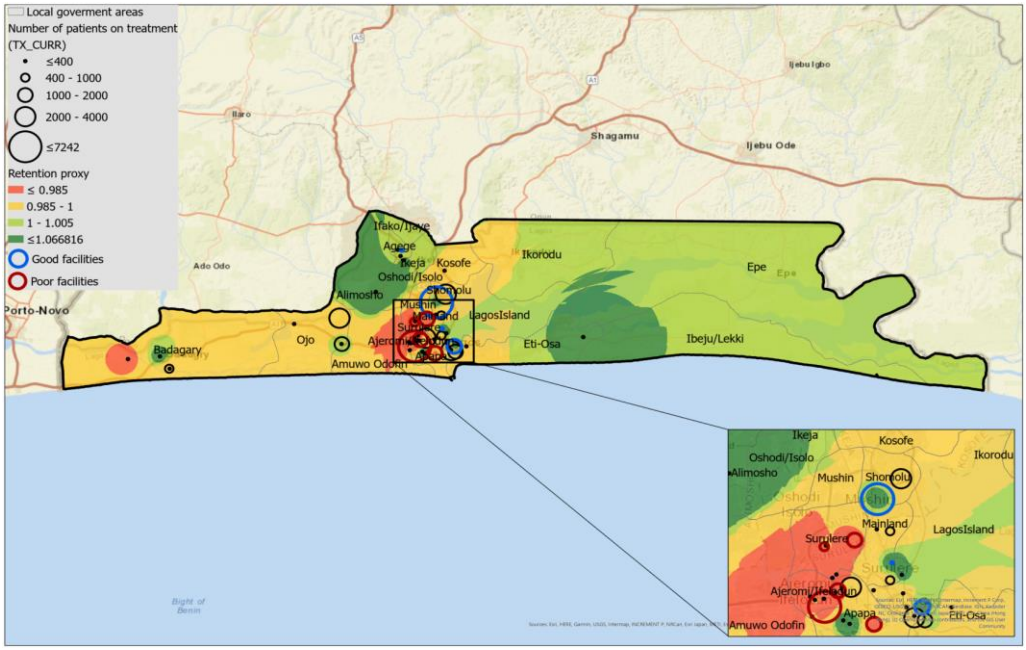


6. Retention proxy indicators mapped to visualize spatial variations

The map below highlights the spatial variation of the average retention proxy in facilities across rural and urban areas in Lagos State. Values ranged between 0.95 and 1.067, with areas in red inferring low retention proxy and areas in green inferring high retention proxy. The map shows that the eastern and northwestern parts of Lagos had good retention of ART clients, while the more urban and central parts of Lagos tended to have a retention proxy of lower than 1. The number of patients on treatment across the facilities ranged between 24 and 7,247.

The map indicates that Lagos Mainland has one good-performing facility with high TX_CURR, which could aid other facilities in areas that are struggling with retention.

Figure 9. Map of retention proxy for Lagos



Potential takeaways and recommendations based on the analysis

The weekly HFR dashboards provide a snapshot of retention and brief categorization of facilities based on that week's data. Examining trends in retention using the weekly data can provide additional insight into program interventions.

In Lagos State, generally, most facilities are **continuously initiating new patients on treatment**, which should increase their TX_CURR over time. There are **several top-performing facilities that show mostly consistent positive TX_NET_NEW trends**. These should be model facilities for retention, and a deep dive should be done to determine what is working for them. These best practices could then be disseminated through participatory workshops or a peer-to-peer mentoring program.

The Nigerian Institute of Medical Research (NIMR) showed a **significant unexplained drop in TX_CURR around Christmas**, which never recovered. A similar drop around this time was not noted for other facilities, indicating that NIMR could have a data quality issue, which should be investigated. Additionally, several facilities with both good and poor retention rates had **drops around the middle of January**, with no observed recovery in poor-performing facilities. Some drops also occurred in April and May, in both good- and poor-performing facilities, which could be attributed to COVID-19. Facilities that are known to struggle with returning patients to care should be considered for additional support during the COVID-19 period.

From the visual analysis conducted, there was **no clear correlation between TX_CURR and retention proxy.** The analysis showed that there were small and large facilities that were losing patients, irrespective of their TX_CURR numbers. In terms of the **age-gender split,** the data showed no real marked difference, as the age breakdowns are too coarse, and females appear to account for most of the cohort. In most cases, trends appeared to be the same for both genders, except for Sango PHC, which experienced a large loss of male patients during January, and Lagos Island KP One Stop Shop-Virtual, which increased male patients through the second quarter at a faster rate than female patients. Retention interventions for men from this facility should be explored in more detail.

As part of this analysis, facilities that performed poorly were provided **back-to-care targets for FY20**, which can be broken up into weekly targets and checked within the HFR weekly reporting. IPs should leverage this analysis to provide more targeted support and assist facilities to use these targets as a tool to track performance.

Additionally, some facilities may demonstrate **steady cohort growth and still have negative proxy retention**, as was the case with Badagry KP One Stop Shop-Physical. This suggests a strong focus on new initiations, which are driving the cohort growth. Further analysis of patient records should be conducted to understand if these new patients are maintained past the initial six months of care.

Mapping of facilities based on their retention performance shows spatial variation and depicts that there appears to be small pockets of poor-performing areas, while the area of Ajeromi appears to have lower retention proxy estimates of less than 1.

When considering findings from **all three states** that were analyzed (Akwa Ibom, Cross River, and Lagos), some interesting overall patterns emerged. Lagos did not have a clear pattern of retention over time, while Akwa Ibom experienced a drop in numbers around the Christmas period, and Cross River saw a drop in February.

Data protection and data use agreements

All data used for this analysis was provided by USAID. HFR data is stored on the secure APPR database platform, which has user authentication access. The data used was aggregated facility-level HFR data, which did not include any personal identification information. Data use agreements are already in place between USAID, Palladium, and Right to Care for the use of HFR data.

References

McIntosh, A. I., Jenkins, H. E., White, L. F., Barnard, M., Thomson, D. R., Dolby, T., ... & Van Helden, P. D. (2018). Using routinely collected laboratory data to identify high rifampicin-resistant tuberculosis burden communities in the Western Cape Province, South Africa: A retrospective spatiotemporal analysis. *PLoS medicine*, *15*(8).

Appendix 1. Visual analysis of patients on ART by age and sex

1. Age and sex distribution for facilities with good and poor retention

Figure 10 below presents the age and sex distribution over time for facilities deemed to have good retention, while Figure 11 presents facilities with poor retention. These plots show that females over age 15 make up the biggest proportion of TX_CURR for each of these facilities, indicating why the TX_NET_NEW values are most impacted by the TX_NET_NEW for this group.

Figure 10: Age and sex distribution of TX_CURR for facilities with good retention

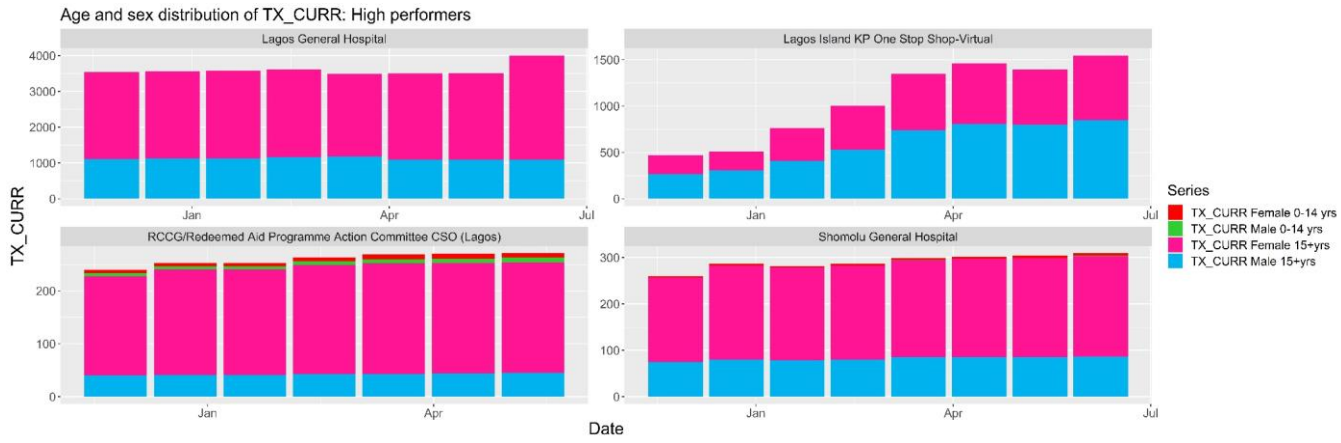
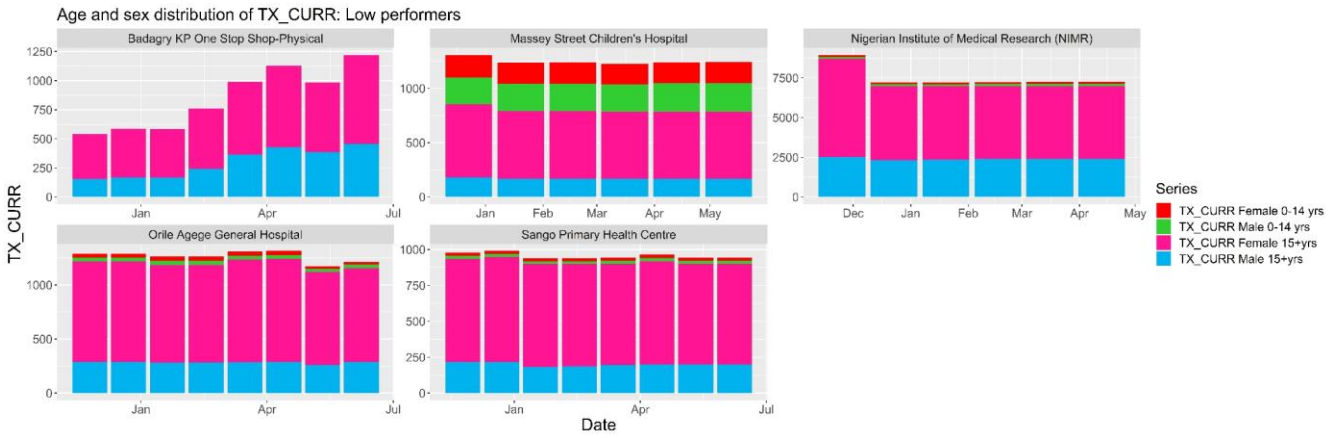


Figure 11: Age and sex distribution of TX_CURR for facilities with poor retention



2. Data changes

Through the analysis of the initial dataset, certain manual data substitutions were made. The most important substitution was to the Week 14 data for most facilities in Lagos. A noted consistent doubling was occurring in the data, in which Week 13 and Week 15 had similar values, whereas Week 14 was approximately double. This was confirmed as a result of a changeover in reporting partners, during which reporting from both partners was included. To adapt for this, it was assumed that week 14 had a value that was an average between Week 13 and Week 15.

In cases in which the doubling problem described was seen in the age and sex dataset, the process described above was followed to substitute data. Other data substitutions for the age and sex

TX_CURR numbers were made for Weeks 43 and 44 for Lagos General Hospital. Data for these weeks were missing and were substituted with data from the surrounding weeks, given that the total TX_CURR numbers provided were consistent between the substituted weeks and the surrounding weeks used to inform the substitution. TX_NEW numbers for Masset Street Children's Hospital at week 14 were also adjusted, given that they matched TX_CURR numbers being seen. This was assumed to be a data entry error, and TX_NEW numbers for this period were given a value of zero.

IP-20-8

Data for Implementation (Data.FI) is a five-year cooperative agreement funded by the U.S. President's Emergency Plan for AIDS Relief through the U.S. Agency for International Development under Agreement No. 7200AA19CA0004, beginning April 15, 2019. It is implemented by Palladium, in partnership with JSI Research & Training Institute (JSI), Johns Hopkins University (JHU) Department of Epidemiology, Right to Care (RTC), Cooper/Smith, IMC Worldwide, Jembi Health Systems, and Macro-Eyes, and supported by expert local resource partners.

November 2020

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