

NIGERIA INFORMATION PRODUCT

Do Site Improvement Indicator Results Make a Difference in Patient Retention?

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Table of Contents

Abbreviations	iii
Background	1
Study Purpose and Objectives.....	2
Methods.....	2
Results	4
Objective 1: Describe the data and determine any statistically significant differences in facility retention based on SIMS facility scores	4
Comparing SIMS and retention results for low-scoring facilities highlighted key areas of improvement for better service delivery quality at the facility level.	7
Objective 2: To correlate SIMS facility scores with retention	9
Improving Service Delivery Performance, as Measured by CEEs, Was Positively Correlated with Retention.....	9
Objective 3: To predict the NET_NEW Standardized Ratio for the next quarter based on the average score of the SIMS indicators pertaining to supply chain reliability and management, patient tracking, and appointment spacing and MMD	10
Discussion	11
Limitations	12
Recommendations	12
References	13
Appendix A. Selected SIMS Core Essential Elements	14
Appendix B. Table for each of the CEEs that were analysed in relation to retention	17

FIGURES

Figure 1. Raw data for CEEs by SIMS category	4
Figure 2. Independent samples Mann-Whitney U test for CEE S4_02 Patient Tracking	6
Figure 3. Independent samples Mann-Whitney U test for CEE S2_06 appointment spacing and MMD	7
Figure 4. Scatterplot of TX NET_NEW standardized ratio	9

TABLES

Table 1. CEEs related to patient retention from the SIMS	2
Table 2. Overall results for patients per SIMS category	5
Table 3. Comparison of means for supply chain management CEEs*	5
Table 4. Comparison of means for patient tracking CEEs*	6
Table 5. Comparison of means for appointment spacing and multi-month dispensing (MMD) CEEs....	7
Table 6. Results of comparison between SIMS and retention for low-scoring facilities*	8
Table 7. Results of fitting the data to a linear curve.....	10
Table 8. Coefficients	10
Table 9. Analysis of variance	10
Table 10. Regression results	11

Abbreviations

ART	antiretroviral therapy
ARV	antiretroviral
CEE	core essential element
DATIM	Data for Accountability, Transparency and Impact Monitoring
DBS	dry blood spotting
GHSurvey	Global Health Survey
LTFU	lost to follow-up
MMD	multi-month dispensing
PEPFAR	President's Emergency Plan for AIDS Relief
PLHIV	people living with HIV
PMTCT	prevention of mother-to-child transmission
POC	point of care
SIMS	Site Improvement through Monitoring System
S/N	Serial Number
USAID	United States Agency for International Development

Background

For people living with HIV (PLHIV), consistent care plays a critical role in achieving good health outcomes and preventing continued HIV transmission. Good retention in care correlates strongly with viral load suppression, improved health outcomes, and lower risk of HIV transmission. Despite tremendous advances in HIV treatment, a significant proportion of PLHIV do not consistently receive antiretroviral therapy (ART), often due to poor engagement in long-term clinical care (Horberg et al., 2013; Crawford, 2014; Zinski, et al., 2015; Sabin, et al., 2017; Li, Purcelle, Sansom, Hayes, & Hall, 2019).

ART clinics in Nigeria have seen an increase in the number of PLHIV, leading to overcrowding, long waiting times, constraints on human resources for health, and lower quality of care. Interruptions in the supply of HIV medicines also puts individual patients at risk of disease progression and death. These factors diminish client satisfaction, resulting in patients lost to follow-up (LTFU), and damage to the credibility of ART programs in the eyes of patients, community, and healthcare providers, which inadvertently endanger public health (Daniel, Tegegnetwork, Demissie, & Reithinger, 2012).

In order to achieve HIV epidemic control, individual, community, and provider/facility barriers affecting patient retention in HIV care must be addressed. Epidemic control strategies, both in Nigeria and globally, are focused on initiating and retaining patients in care as part of strategies to reach the 90-90-90/95-95-95 goals. To assess patient care and retention, the U.S. President's Emergency Plan for AIDS Relief (PEPFAR) uses several tools, including the Site Improvement through Monitoring System (SIMS) and the TX NET_NEW Standardized Ratio. SIMS measures the quality of care delivered at a facility (see detailed criteria in Annex A). By linking several facility-level service delivery criteria with program reporting indicators, SIMS increases program accountability for facility-level care and incentivizes quality improvement across the HIV care continuum. Retention in PEPFAR-supported programs is typically measured by changes in the treatment cohort, after adjusting for new initiations, based on data in the Data for Accountability, Transparency and Impact Monitoring (DATIM) system. This proxy indicator, TX NET_NEW Standardized Ratio, can be calculated for specific facilities at least every quarter to facilitate data-driven decision making at the facility, district, and state levels.

Data for Implementation (Data.FI) analyzed attributes within the SIMS data and DATIM retention indicators to determine whether there was any variance and to identify possible targeted site-level improvements correlated with positive patient retention. Investments in these areas should lead to improved patient retention when combined with other proven programmatic approaches (e.g., supply chain management, tracking and tracing of patients LTFU, appointment spacing, and multi-month dispensing [MMD] of drugs).

Assessing Quality of Care at the Facility Level through the SIMS

When conducting SIMS assessments, only the core essential elements (CEEs) funded by PEPFAR in each site are assessed. Each CEE is assessed based on whether it meets international standards and is scored depending on how well those conditions are met. There are two types of SIMS assessments: comprehensive assessments and follow-up assessments.

Service delivery points, such as facilities, receive both comprehensive and follow-up assessments, while SIMS above the site level—typically at district and provincial level—receive only comprehensive assessments once a year. Follow-up assessments are conducted within six months of the comprehensive assessments and are targeted at CEEs scoring yellow or red during the comprehensive assessment.

Study Purpose and Objectives

The study sought to determine whether ART-related indicators from the SIMS assessments made a difference in ART patient retention at the facility level. Specific objectives were to:

1. Describe the data and determine any statistically significant differences in facility retention based on SIMS facility scores
2. Correlate SIMS facility scores with retention
3. Predict the NET_NEW Standardized Ratio for the next quarter based on the average score of SIMS indicators pertaining to supply chain reliability and management, patient tracking, and appointment spacing MMD

Methods

The SIMS data were collected using SIMS assessment tools and subsequently entered in Global Health Survey (GHSurvey) software for Q3 to Q4 FY19. Patient retention data (standard monitoring and evaluation [M&E] data from PEPFAR) were collected using the DATIM system for the same period. The data were analyzed with Microsoft Excel and SPSS version 26 to leverage the strengths of each software.

A descriptive analysis was conducted to determine whether significant positive correlations existed between the SIMS assessment data (quality of services) and patient retention in Q3 and Q4 FY19 for 165 facilities using the United States Agency for International Development (USAID) methodology for SIMS scoring. The core essential elements (CEEs) for quality of service related to ART delivery are shown in Table 1.

Table 1. CEEs related to patient retention from the SIMS

	S/N - SIMS Category
Supply chain Management	1_10 - Supply Chain Management
	1_12 - Supply Chain Reliability—Adult Antiretrovirals (ARVs)
	4_21 - Supply Chain Reliability (Early Infant Diagnosis) dried blood spot (DBS) or point of contact (POC)
Patient tracking	2_02 - Patient Tracking—ART Patients (General Population)
	2_19 - Patient Tracking—ART Patients (Pediatrics)
	4_02 - Patient Tracking—ART Patients (Prevention of Mother-to-Child Transmission [PMTCT])
Appointment spacing and multi-month dispensing	2_06 - Appointment Spacing and Multi-Month Drug Dispensing (General Population)
	2_24 - Appointment Spacing and Multi-Month Drug Dispensing (Pediatrics)
	4_05 - Appointment Spacing and Multi-Month Drug Dispensing (PMTCT)

SIMS categorizes results as green, yellow, and red, where green indicates “meeting or exceeding quality standards,” yellow indicates “requires improvement,” and red “requires immediate remediation.” These color categories were converted to numerical scores (green=3, yellow=2, and

red=1) as determined by USAID to simplify analysis. Overall SIMS facility scores were then calculated by averaging all criteria scores for a facility; the final facility SIMS score was further categorized from 1 to 1.49, 1.50 to 2.49, and 2.5 to 3.0.

M&E data from DATIM for Q3 and Q4 were used to calculate retention indicators NET_NEW and the NET_NEW standardized ratio. Data.FI calculated NET_NEW by subtracting TX_CURR Q3 from TX_CURR Q4. A proxy for retention was calculated to avoid negatives by using:

$$\text{NET_NEW Standardized Ratio} = \frac{\text{TX_CURR (current period [Q4])}}{\text{TX_CURR previous period (Q3)]} + \text{TX_NEW [current period (Q4)]}}$$

To assess the absolute size of people no longer counted as being on treatment, Data.FI calculated the number of unexplained gain/loss by subtracting TX_NEW from TX_NET_NEW. The latter does not indicate if the size of loss is within acceptable limits of non-retention, nor does it provide reasons why there is loss (or gain) from the program.

USAID also calculates a retention proxy, which we included as our primary indicator of interest:

$$\text{USAID retention proxy} = \frac{\text{TX_NewCum} - \text{TX_Net_NewCum}}{\text{TX_Currprev} + \text{TX_NewCum}}$$

This proxy provides overall percentage of patients retained from one period to the next. It is weighted to account for the volume of patients in the treatment program, and it indicates whether the size of loss is within acceptable limits of non-retention.

Descriptive techniques were used to determine the mean, median, standard deviation, variance, coefficients of variance, and Z-scores of all data elements pertaining to the SIMS and retention. The data were transformed since they violated the assumptions of a normal distribution.

Differences between the means were determined by running the means for the SIMS categories as independent variables in SPSS, and NET_NEW Standardized Ratio and unexplained gain/loss as dependent variables.

A correlation was performed to correlate SIMS scores to the NET_NEW Standardized Ratio. All CEEs for SIMS pertaining to supply chain management, patient tracking, and appointment spacing and MMD were averaged. This was followed by creating dummy variables for the three SIMS categories individually (where red was recoded as 1 with all else being 0, yellow as 1 with all else being 0, and green as 1 with all else being 0) before performing a regression analysis in SPSS. Outliers were removed twice using Cook's distances. The final multiple regression model included 117 facilities after removing outliers.

It should be noted that not all SIMS CEEs are implemented as an intervention in all facilities. Therefore, the denominator changes from CEE to CEE.

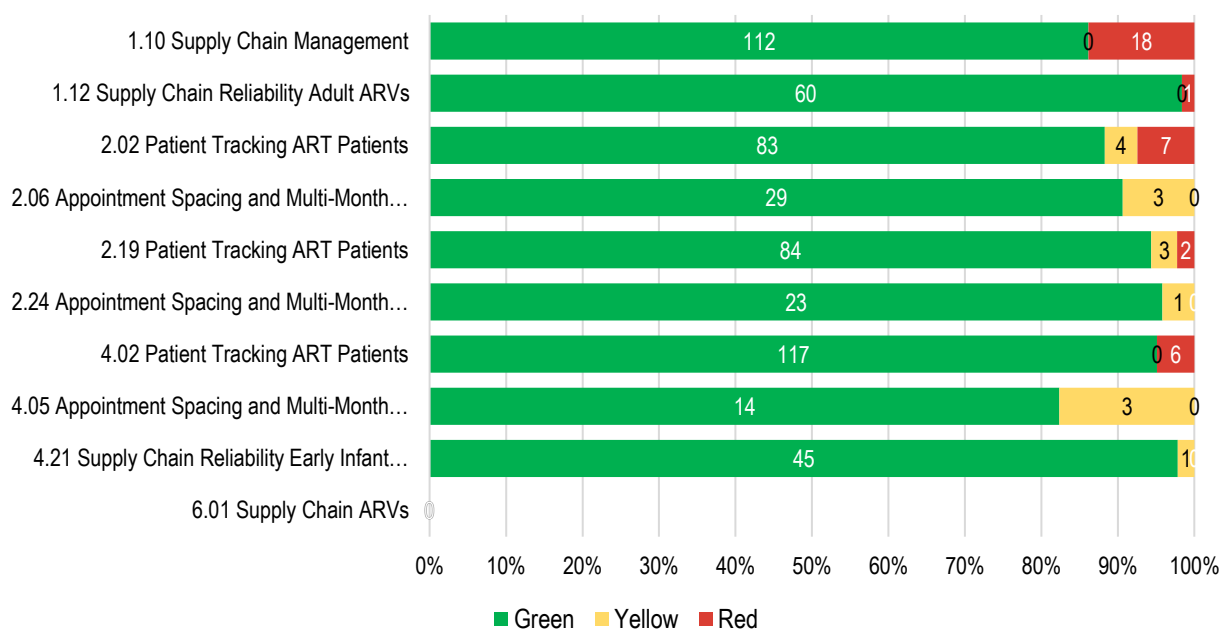
Results

Objective 1: Describe the data and determine any statistically significant differences in facility retention based on SIMS facility scores

Based on their SIMS rating, facilities were performing well overall.

SIMS data vary by facility, as only certain CEEs are conducted depending on the package of interventions delivered by the facility. **Error! Not a valid bookmark self-reference.** shows that according to the raw data, 18 out of 130 (5%) facilities have issues with their supply chain management interventions (CEE 1_10), and seven out of 85 (8%) experienced challenges with their patient tracking interventions (CEE 2_02). The overwhelming majority of facilities averaged a green SIMS rating for the assessed SIMS CEEs (117 out of 133).

Figure 1. Raw data for CEEs by SIMS category






As previously noted, the small comparison sample can complicate extrapolations.

When comparing SIMS results to the NET_NEW Standardized Ratio, Data.FI found that the NET_NEW Standardized Ratio for facilities that scored red showed better retention (1.015) than facilities that scored yellow (0.982) or green (0.994). Retention ratios for facilities that scored yellow and green fell below 1, indicating a loss of patients from quarter to quarter. It should be noted that 26 facilities scored red in at least one of the three categories, namely supply chain management, patient tracking, and appointment spacing and MMD (see Table 2).

Next, we averaged the score and assigned an overall score of red, yellow, or green. As shown in Table 3, 18 facilities scored red for supply chain management.

Facilities scoring red and yellow made up only 15 percent of the total number of patients. Facilities scoring green served an average of 796 patients per facility, while those scoring yellow served 760 patients per facility. Facilities scoring red served an average of 924 patients, suggesting that these were perhaps larger facilities.

Table 2. Overall results for patients per SIMS category

	Red	Yellow	Green
Facilities	26	8	131
TX_CURR Q3	21 822	6 081	104 349
TX_CURR Q4	24 041	6 214	108 896
TX_NEW Q3	1 318	206	4 160
TX_NEW Q4	1 855	246	5 209
TX_NEW cumulative	3 173	452	9 369
TX_NET_NEW	2 207	133	4 525
USAID retention proxy	3 179	456	9 396
Unexplained gain/loss	365 	-113 	-671 
TX_NET_NEW standardized ratio	1.015	0.982	0.994

Significant differences existed between CEE mean scores for supply chain management and retention.

Data.FI found significant differences between the means of S1_02 and unexplained gain/loss ($p < .047$). Facilities scoring red gained 72 patients, whereas facilities scoring green only gained an average of three patients. It should be noted, however, that only one facility scored red, whereas 60 facilities recorded a green score (see Table 3).

Table 3. Comparison of means for supply chain management CEEs*

Indicator	S1_10 Supply Chain Management		S1_02 Supply Chain Management		S4_02 Supply Chain _EID	
	Red	Green	Red	Green	Yellow	Green
Valid N	18	112	1	60	1	45
Unexplained gain/loss	7	-7	72	3	0	1
Valid N	15	104	1	54	1	40
TX_NET_NEW Standardized Ratio	0.989	0.990	1.093	0.981	1.000	0.989

*A missing score for red, green, or yellow (no column or zero) indicates missing results for that category. A difference in the valid N indicates that there are missing categories

A total of 18 facilities scored red on CEE 1_10 Supply Chain Management, suggesting challenges with the supply of essential HIV medicines which affected a total of 12,739 patients (11% of the total number of patients).

The impact of patient tracking CEEs on retention varied based on score and focus area.

Facilities scoring red on the SIMS related to patient tracking seemed to be retaining their patients, while facilities scoring yellow seemed to be losing patients. Facilities scoring green for CEEs S2_19 and S2_02 retained patients, while a small loss of patients was noted for facilities scoring green for S4_02. Table 4 does not contain statistically significant differences.

Table 4. Comparison of means for patient tracking CEEs*

Indicator	S2_19 Patient Tracking			S2_02 Patient Tracking			S4_02 Patient Tracking	
	Red	Yellow	Green	Red	Yellow	Green	Red	Green
Valid N	2	2	84	7	2	83	6	117
Unexplained gain/loss	103	-34	-8	9	-34	-6	48	-8
Valid N	2	2	83	7	2	81	6	105
TX_NET_NEW Standardized Ratio	1.004	0.907	1.001	1.094	0.907	1.003	1.034	0.982

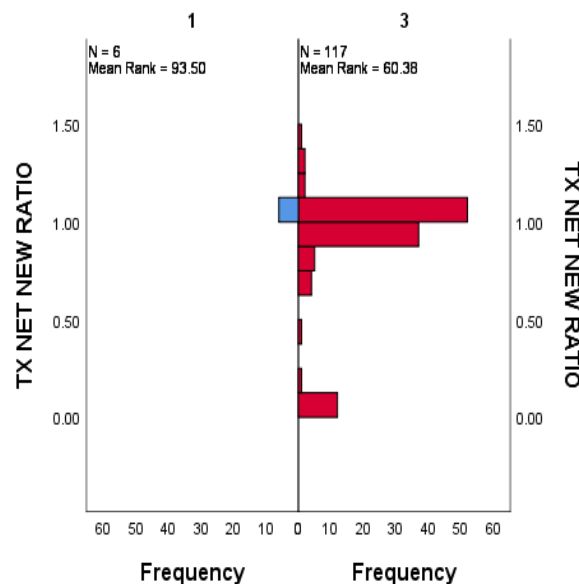
*A missing score for red, green, or yellow (no column or zero) indicates missing results for that category. A difference in the valid N indicates that there are missing categories.

It should be noted that only a small number of facilities for which the S2_02 Patient Tracking SIMS were completed scored yellow (two facilities) or red (seven facilities). This accounts for 3,768 (3%) of the 103,806 patients where we know S2_02 Patient Tracking was applied (see Annex B). Patient tracking as assessed by S4_02 (red) accounted for 11,197 (11%) of all patients.

The difference between the means for the NET_NEW standardized ratio for CEE 4_02 was 0.982 for facilities scoring green, compared to 1.034 for facilities scoring red (Table 4).

Due to the small sample sizes and violation of assumptions for an ANOVA test, Data.FI used a Mann-Whitney U test to compare whether there was a significant difference in the NET_NEW Standardized Ratio for facilities scoring red and those scoring green (see Figure 2). Significant differences were noted overall (U=162, p=.026).

Figure 2. Independent samples Mann-Whitney U test for CEE S4_02 Patient Tracking



Facilities scoring green for appointment spacing and MMD CEEs had slightly better retention ratios.

As seen in Table 5, SIMS scoring are only implemented in selected facilities even though MMSD are implemented country-wide. Facilities scoring green were close to retaining all of their patients, while facilities scoring yellow lost patients over the quarter. Facilities scoring green for appointment spacing and MMD CEEs S2_06 and S4_05 had unexplained gains of 10 and 17 patients, while a loss of 28

patients was recorded for the 23 facilities scoring green for S2_24. Facilities that scored yellow for CEEs S2_06, S4_05, and S2_24 had unexplained losses of 10, eight, and 11 patients, respectively.

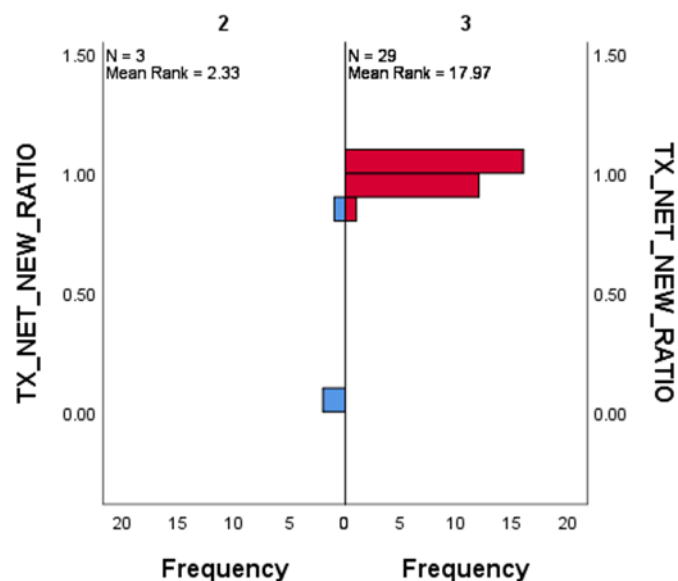
Table 5. Comparison of means for appointment spacing and multi-month dispensing (MMD) CEEs

	S2_06 Appointment Spacing and MMD		S4_05 Appointment Spacing and MMD		S2_24 Appointment Spacing and MMD	
	Yellow	Green	Yellow	Green	Yellow	Green
Valid N	3	29	1	23	3	14
Unexplained gain/loss	-10	10	-11	-28	-8	17
Valid N	1	29	0	23	3	14
TX NET_NEW Standardized Ratio	0.887	0.998	0.918	0.984	0.918	0.985

*A missing score for red, green, or yellow (no column or zero) indicates missing results for that category. A difference in the valid N indicates that there are missing categories.

Significant differences were seen in terms of the NET_NEW standardized ratio for facilities scoring yellow and those scoring green (Figure 3), with $U=86$, $p=.001$. The difference between the means for the NET_NEW standardized ratio for CEE 2_06 appointment spacing and MMD was 0.887 for facilities scoring yellow, compared to 0.998 for facilities scoring green.

Figure 3. Independent samples Mann-Whitney U test for CEE S2_06 appointment spacing and MMD



Comparing SIMS and retention results for low-scoring facilities highlighted key areas of improvement for better service delivery quality at the facility level.

Table 6 shows a comparison of the SIMS average for all facilities and retention ratios for low-scoring facilities. As shown in the bottom three rows, facilities scoring green have an unexplained loss of 837 patients and a NET_NEW Standardized Ratio of 0.984.

Table 6. Results of comparison between SIMS and retention for low-scoring facilities*

SNU1 Name	DATIM Location	1_10	1_12	4_21	6_01	2_02	2_19	4_02	2_06	2_24	4_05	Score	TX_CUR R Q3	TX_CUR R Q4	TX_NEW_Q3	TX_NEW_Q4	TX_NEW_Cumulative	TX_NEW_PROXY	USAID Retention	Unexplained Gain/Loss	TX NET NEW RATIO
		Supply Chain Management	Supply Chain Reliability	Supply Chain Reliability		Supply Chain Reliability	Patient Tracking ART	Patient Tracking ART	Patient Tracking ART	Appointment Spacing and MMD	Appointment Spacing and MMD										
Anambra	Aguata Primary Health Centre	1						3				2.0	11	12	2	1	3	1	4	1	1.00
Lagos	Ajeromi General Hospital	3	3			2	2	3				2.6	3 515	3 606	89	123	212	91	212	-32	0.99
Lagos	Akere Primary Health Centre	3	3	3		2	2					2.6	175	162	16	22	38	-13	38	-35	0.82
Anambra	Amichi Diocesan Hospital	1	3	3		3	3	3	3	3	3	2.8	120	118	4	5	9	-2	9	-7	0.94
Cross River	Anderson Primary Health Centre	1				1	3	3	2		2	2.0	47	47	7	6	13	0	13	-6	0.89
Bauchi	Azare General Hospital	1		3		3	3	3				2.6	380	408	19	36	55	28	55	-8	0.98
Jigawa	Bamaina Primary Health Centre	1										1.0	9	10	2	1	3	1	3	0	1.00
Cross River	Diamond Hill Health Centre	1		3		3	3	3	3	3	3	2.8	31	33	6	2	8	2	8	0	1.00
Cross River	Ekpo Abasi Primary Health Centre	3	3	3		3	3	1	3	3	3	2.8	377	407	26	24	50	30	50	6	1.01
Akwa Ibom	Enwang Primary Health Centre	1				3	3	3				2.5	1 723	2 922	558	1 070	1 628	1 199	1 628	-129	1.05
Akwa Ibom	Etim Ekpo General Hospital	1		3		1	3	3			3	2.3	1 192	1 288	190	249	439	96	439	-153	0.89
Lagos	Faleti Medical Centre	3	3			1						2.3	20	43	6	3	9	23	8	20	1.87
Akwa Ibom	Fletcher Memorial Hospital	1	3			3	3	3	2	2		2.4	9	0	3	2	5	-9	7	-11	0.00
Niger	G. HOSP MOKWA	1	1			3	3	3	3			2.2	729	845	37	44	81	116	81	72	1.09
Kwara	GH Lafiagi	1	3	3		3	3	3	3	3	3	2.8	358	394	17	8	25	36	25	28	1.08
Bauchi	Giade Maternal & Child Health Clinic	3						1				2.0	19	22	1	2	3	3	3	1	1.05
Jigawa	Gwaram Primary Health Centre	1										1.0	6	9	1	4	5	3	5	-1	0.90
Edo	Irrua Specialist Hospital	3	3	2		3	3	3				2.8	1 495	1 552	53	57	110	57	110	0	1.00
Lagos	Massey Street Children's Hospital	3	3	3		1	1		3	3		2.4	1 300	1 295	97	22	119	-5	119	-27	0.98
Lagos	Nigerian Institute of Medical Research (NI	3	3	3		1	1	1	3		3	2.3	7887	8192	72	152	224	305	152	153	1.02
Edo	Notre Dame Hospital	3	3	3		1		1				2.2	31	40	9	9	18	9	18	0	1.00
Cross River	Ogoja Santa Maria Clinic	1	3	3		3	3	3	3	3	2	2.7	110	107	13	13	26	-3	26	-16	0.87
Lagos	Ojo Primary Health Centre	3	3	3		1	3	3	3	3		2.8	1 192	1 291	88	102	190	99	190	-3	1.00
Adamawa	Shelleng NYSC Clinic	1						3				2.0	12	0	1	1	2	-12	3	-13	0.00
Lagos	Surulere Able God Hosital	3	3	3		3		3	2			2.8	11	0	2	1	3	-11	4	-12	0.00
Kwara	Surulere Medical Centre	3	3	3				1				2.5	11	12	0	0	0	1	0	1	1.09
Kwara	Temitope Hospital	1	3					3				2.3	10	11	1	0	1	1	1	1	1.10
Anambra	Ukpo Comprehensive Health Centre		3	3		3	3	3	3	3	2	2.9	719	740	23	22	45	21	45	-1	1.00
Adamawa	Wauro-Jabbe Health Centre	1						3				2.0	34	37	4	3	7	3	7	0	1.00
Bayelsa	Yenagoa Federal Medical Centre	1				3	3	1				2.0	2 373	2 524	103	103	206	151	206	48	1.02
Adamawa	Yola Federal Medical Centre	1				3	3	3				2.5	3 831	3 974	43	73	116	143	116	70	1.02
Red		18	1	0	0	7	2	6	0	0	0		15	19	3	5	8	4	9	-1	0.95
Yellow		0	0	1	0	2	2	0	3	1	3		13 674	14 356	533	597	1 130	682	1 062	86	1.01
Green		129	69	100	30	101	24	138	15	51	2		90 675	94 530	3 619	4 692	8 311	3 855	8 333	-837	0.99

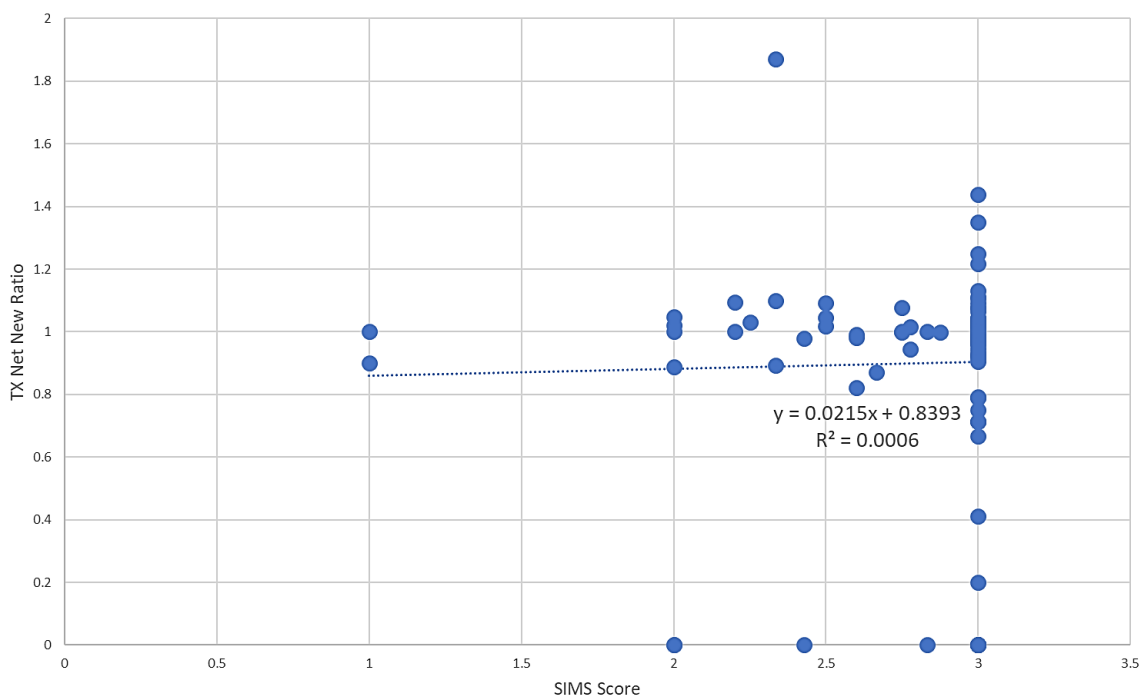
*The totals were calculated after the average score was converted to red (0–1.49), yellow (1.50–2.49), and green (2.50–3.0).

Objective 2: To correlate SIMS facility scores with retention

Improving Service Delivery Performance, as Measured by CEEs, Was Positively Correlated with Retention.

According to Cohen's guidelines (Cohen, J. 1988) this was a moderate correlation, where 0.1 is weak, 0.3 is moderate, and 0.5 is strong. Data.FI found a negative correlation of $-.366$ between a yellow SIMS rating and the TX NET_NEW Standardized Ratio, and a moderate positive correlation of $.366$ between a green SIMS rating and the TX NEW_NEW standardized ratio (Figure 4). This implies that improving CEEs from red to green is positively correlated with improving the number of ART patients in care.

Figure 4. Scatterplot of TX NET_NEW standardized ratio



Data.FI also completed an analysis of variance (ANOVA) for the composite score (e.g., the average of the SIMS scores). Data.FI found a statistically significant difference ($p=0.000$ for both yellow and green) below 0.05 for the mean for the proxy retention ratio, 0.89 for the NET_NEW Standardized Ratio, and 1.0 for the sites scoring green. The analysis confirmed that sites scoring yellow lost more patients than sites scoring green over one quarter.

Strong positive correlations were evident between CEE 2_06 related to general population and CEE 2_24 related to pediatrics appointment spacing and MMD SIMS scores and patient retention, with correlations of 0.84 and 0.95, respectively.

Objective 3: To predict the NET_NEW Standardized Ratio for the next quarter based on the average score of the SIMS indicators pertaining to supply chain reliability and management, patient tracking, and appointment spacing and MMD

Overall Average SIMS Scores Can Be Used as a Tool to Predict Retention Using the NET_NEW Standardized Ratio as a proxy.

The data met the assumption of nonzero variances (average SIMS score, variance=0.100; TX_NET_NEW Standardized Ratio, variance=0.106). Using a linear regression in SPSS, Data.FI found that the green SIMS scores explained a significant amount of the variance (13.4%) in the value of retention over one quarter ($F=14.237$, $p < 0.000$, $R^2=.366$, R^2 adjusted=0.134), with $p < 0.05$ as indicated in Tables 7 and 8.

Table 7. Results of fitting the data to a linear curve

Model Summary ^a					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.366 ^b	.134	.125	.04226187275	2.109

^a Dependent variable: TX_NET_NEW_RATIO

^b Predictors: (Constant), SIMS cat=3.0

Table 8. Coefficients

Coefficients ^a								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.890	.030		29.792	.000		
	SIMS cat=3.0	.114	.030	.366	3.773	.000	1.000	1.000

^a Dependent variable: TX_NET_NEW_RATIO

Further analysis showed that the SIMS for facilities scoring green significantly predicted retention over one quarter ($\beta=.190$, $t=3.773$, $p < .000$) (see Table 9).

Table 9. Analysis of variance

ANOVA ^a						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	.025	1	.025	14.237	.000 ^b
	Residual	.164	92	.002		
	Total	.190	93			

^a Dependent Variable: TX_NET_NEW_RATIO

^b Predictors: (Constant), SIMS cat=3.0

Table 10 shows the regression results after outliers were removed. Data.FI found an unexplained loss of 159 patients for facilities scoring yellow and an unexplained gain of 419 patients for facilities scoring green based on the composite SIMS score comprised of supply chain management, patient tracking, or appointment spacing and MMD CEEs. The predicted values for the NET_NEW standardized ratio was 0.890 for facilities scoring yellow and 1.003 for facilities scoring green.

Table 10. Regression results

SIMS Category	TX_CURR Q3	TX_CURR Q4	TX_NEW Q3	TX_NEW Q4	TX_NET_NEW	USAID Proxy Retention	Unexplained Gain/Loss	TX_NET_NEW Standardized Ratio	Predicted TX_NET_NEW Standardized Ratio
Yellow	1,239	1,335	197	255	96	453	-159	0.890	0.920
Green	84,389	89,240	3,436	4,432	4,851	7,873	419	1.002	1.003
Total	85,643	90,594	3,636	4,692	4,951	8,335	259	0.999	1.000

Discussion

The data clearly indicated that only a few facilities were scoring red or yellow (15%).

Data.FI found significant differences between CEE scores and retention for S1_02 Supply Chain Management and 4_02 Patient Tracking. Facilities scoring yellow for supply chain management (S1_02) gained 72 patients, whereas a gain of three patients was seen in facilities scoring green. It should be noted, however, that only one facility scored yellow, namely General Hospital Mokwa, whereas 60 facilities recorded a green score. With regards to patient tracking (4_02), Data.FI found a better standardized retention ratio in a small number of facilities scoring red based on CEE 4_02 (1.034), compared to the larger group of facilities scoring green (0.982) (see Table 4, Figure 3).

The NET_NEW standardized ratio related to 2_06 appointment spacing and MMD was 0.887 for facilities scoring yellow compared to 0.998 for those scoring green (Figure 3), suggesting that facilities scoring green had higher retention than sites scoring yellow over one quarter.

Six facilities scored red on patient tracking in the SIMS (Table 6), suggesting a limited effort to trace patients who missed appointments. Although this was a small number of facilities, it represented 11 percent of the assessed cohort (11,197 patients).

Data.FI noted that larger facilities, such as Etim Ekpo General Hospital, G. Hospital Mokwa, Massey Street Children's Hospital, Nigerian Institute of Medical Research (NIMR), Notre Dame Hospital, and Ojo Primary Health Centre, which served a total of 12,911 patients, all scored red for numerous CEEs (Table 6).

Using a linear regression in SPSS, it was found that the green SIMS facility scores explained a significant amount of the variance (13.4%) in the value of retention over one quarter ($F = 14.237$, $p < .0001$, $R^2 = .366$, R^2 adjusted = .134) (Table 7).

Facilities with an average green score for SIMS CEE indicators related to supply chain management, patient tracking, and MMD quality had higher overall patient retention (Table 9).

The analysis shows that SIMS scores that were green overall significantly predicted positive retention over one quarter ($\beta = .190$, $t = 3.773$, $p < .000$). An unexplained loss of 159 patients was evident where the SIMS scored yellow, there was an unexplained gain of 454 patients where the SIMS scored green. Data.FI found the NET_NEW Standardized Ratio to be 0.890 for facilities scoring yellow and 1.002 for those scoring green (Table 10).

Limitations

The SIMS was not implemented in all sites during Q3 and Q4 FY19. Of 688 USAID-supported sites, only a maximum of 133 (19%) per CEE had both SIMS and DATIM program data for the time period. Additional outliers were removed from the data as discussed in Methods.

Data.FI notes that the SIMS provides limited insight, as several factors found to affect patient retention in the literature are not captured by the CEEs, including overcrowding, long waiting times, and human resource healthcare constraints. This could explain why so many facilities had green quality scores despite an average cohort retention below 1.

Recommendations

The SIMS facility scoring may not provide enough detail to truly identify service delivery quality concerns that affect patient outcomes. Of the 133 facilities assessed, 88 percent had green quality scores, despite an average cohort retention below 1 for all facilities.

As noted, patient tracking remains a weakness for several facilities and affects data management and continuity of care. This issue is amplified by the fact that proxy retention estimates do not accurately account for transfers between facilities; therefore, a greater number of patient referrals from higher-volume facilities may not be properly accounted for. However, if the patients were being referred to other USAID-supported facilities, the total standardized retention ratio should still be at or near 1. The fact that the average cohort retention ratio remains below 1 for all facilities highlights the need for continued investment in proper patient tracking and better data management of transfer ins and outs. The latter will improve retention, reduce LTFU estimates, and maintain better patient care continuity, especially for the facilities that performed poorly with regards to the patient tracking CEEs. The SIMS serves as an important way of standardizing packaged interventions and implementing quality of care and treatment.

Another key factor affecting patients' experience at point of care is supply chain management. The literature indicates that interruption of the supply of HIV medicines puts individual patients at risk of disease progression and death. Interruption in supply can result in the development of resistance to medicines and hampers progress toward universal access. Therefore, it is essential that the quality of supply chain management be maintained.

The lack of variance among the SIMS scores (minimal facilities and indicators with scores other than green) makes it difficult to extrapolate from these data; however, it is interesting to note that the facilities with red scores for supply chain management had improved retention compared to facilities scoring green. This may be a result of actions taken as a result of poor SIMS scores. If so, more analysis should be conducted to investigate this. More importantly, SIMS assessments should be used to drive the quality-improvement process tied to improving clinical indicators and not be seen as punitive scores. Addressing a poor SIMS outcome may help achieve desired clinical outcomes.

CEE 1_10 Supply Chain Management affected 11 percent (12,739) of the total number of patients. Many facilities had paper-based systems for supply chain management and patient tracking; therefore, it is recommended that as part of investments in supply chain management and patient tracking, an online system be explored which could provide real-time information about key commodity procurement and distribution needs based on patient tracking. A proper supply chain management system with a forecasting component could help improve last-mile delivery and patient care in larger facilities by preventing stockouts.

Online systems may be considered in larger facilities such as Ajeromi General Hospital, Enwang Primary Health Centre, Etim Ekpo General Hospital, Irrua Specialist Hospital, Massey Street Children's Hospital, Nigerian Institute of Medical Research (NIMR), Ojo Primary Health Centre, Yenagoa Federal Medical Centre, and Yola Federal Medical Centre.

MMD is supposed to be implemented in all facilities in Nigeria, while the SIMS is implemented in a small proportion—only 23 of the 688 (3%) facilities where MMD is provided. Where the SIMS is implemented, data indicate that facilities scoring green for MMD CEEs had better retention scores. It is therefore recommended that the SIMS scoring for MMD be implemented in more facilities as a way to improve the quality of MMD interventions, as the latter are also associated with better retention.

In summary, the data indicate that where the SIMS is implemented as a package of standardized interventions, the structuring or measurement of the quality of interventions results in less variance and better patient retention. Thus, the SIMS should be implemented in more facilities to ensure consistent delivery of a standardized package of interventions.

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Appendix A. Selected SIMS Core Essential Elements

S/N	Core Essential Elements (CEEs)	Key Areas
1	S_01_12 Supply Chain Reliability—Adult ARVs	<ul style="list-style-type: none"> ▪ The site provides ARVs for adults and has not had a stockout in the past three months that resulted in an interruption of first- or second-line ART (or a delay in ART initiation) for any patients at this site. ▪ Has a stockout or low stock status of ARVs in the past three months required substitution of specific ARVs for any patients at this site? ▪ Has a stockout or low stock status of ARVs in the past three months required substitution of specific ARVs for any patients at this site? ▪ In the past three months, were any patients given appointments at short intervals to ration ARVs due to decreased ARV supply?
2	S_01_15 Supply Chain Reliability—Pediatric ARVs	<ul style="list-style-type: none"> ▪ Has a stockout of pediatric formulations of first- or second line ARVs in the past three months resulted in an interruption of ART (or a delay in ART initiation) for any children at this site? ▪ Has any stockout or low stock status of ARVs in the past three months required substitution of specific pediatric ARVs for children (or were children given adult formulations when such a substitution was not otherwise indicated or planned)? ▪ In the past three months, were any children given appointments at short intervals to ration medications due to a decreased supply of pediatric ARVs?
3	S_02_02 Patient Tracking—ART Patients [Care & Treatment GEN POP]	<ul style="list-style-type: none"> ▪ Are there standard procedures for identifying and tracking adult and adolescent ART patients who have missed an appointment? ▪ What percentage of tracking documents reviewed, from ART patients who missed their most recent appointment, had evidence documented of more than one attempt to bring the patient back into care (e.g., names of those with missed appointments, evidence of phone calls, linked to outreach workers)? Note: Tracking documents include logbooks, registers, and patient files, among others. ▪ Numerator: Number of ART tracking documents reviewed, for ART patients who missed their most recent appointment, that included evidence of more than one attempt to bring the patient back into care (e.g., names of those with missed appointments, evidence of phone calls, linked to outreach workers)
4	S_04_02 Patient Tracking—ART Patients [Care & Treatment PMTCT] (DUP)	<ul style="list-style-type: none"> ▪ Are there standard procedures for identifying and tracking pregnant and breastfeeding ART patients who have missed an appointment? ▪ Review tracking documentation for the last 10 pregnant and breastfeeding ART patients who missed their most recent appointment. ▪ What percentage of tracking documents reviewed, from ART patients who missed their most recent appointment, had evidence documented of more than one attempt to bring the patient back into care (e.g., names of those with missed appointments, evidence of phone calls, linked to outreach workers)? Note: Tracking documents include logbooks, registers, and patient files, among others. ▪ Numerator: Number of ART tracking documents reviewed, for pregnant and breastfeeding ART patients who missed their most recent appointment, that included evidence of more than one attempt to bring the patient back into care (e.g., names of those with missed appointments, evidence of phone calls, linked to outreach workers) ▪ Denominator: Number of ART tracking documents reviewed for pregnant and breastfeeding ART patients who missed their most recent appointment

		<ul style="list-style-type: none"> ▪ Review tracking documentation for the last 10 ART patients who missed their most recent appointment. ▪ What percentage of tracking documents reviewed, from pregnant and breastfeeding ART patients who missed their last appointment, have the result of tracking efforts (e.g., transferred out, new appointment, not found, refusal, death) documented? Note: Tracking documentation includes logbooks, registers, and patient files, among others. ▪ Numerator: Number of ART tracking documents reviewed, for pregnant and breastfeeding ART patients who missed their most recent appointment, that included evidence of more than one attempt to bring the patient back into care (e.g., names of those with missed appointments, evidence of phone calls, linked to outreach workers) ▪ Denominator: Number of pregnant and breastfeeding ART patient tracking documents reviewed for patients who missed their most recent appointment
5	S_02_19 Patient Tracking—ART Patients [Care & Treatment PEDS] (DUP)	<ul style="list-style-type: none"> ▪ Are there standard procedures for identifying and tracking pediatric ART patients who have missed an appointment? ▪ Review tracking documentation for the last 10 pediatric ART patients who missed their most recent appointment. ▪ Is ART patient tracking documentation updated with evidence of more than one attempt to bring the pediatric patient back into care (e.g., names of those with missed appointments, evidence of phone calls, linked to outreach workers)? Note: Tracking documentation includes logbooks, registers, and patient files, among others. ▪ Numerator: Number of ART tracking documents reviewed, for pediatric ART patients who missed their most recent appointment, that included evidence of more than one attempt to bring the patient back into care (e.g., names of those with missed appointments, evidence of phone calls, linked to outreach workers) ▪ Denominator: Number of ART tracking documents reviewed for pediatric ART patients who missed their most recent appointment ▪ Review tracking documentation for the last 10 pediatric ART patients who missed their most recent appointment. ▪ What percentage of tracking documents reviewed, from ART pediatric patients who missed their last appointment, have the result of tracking efforts (e.g., transferred out, new appointment, not found, refusal, death) documented? ▪ Numerator: Number of ART tracking documents reviewed, for pediatric ART patients who missed their most recent appointment, that included evidence of more than one attempt to bring the patient back into care (e.g., names of those with missed appointments, evidence of phone calls, linked to outreach workers) ▪ Denominator: Number of ART patient tracking documents reviewed for pediatric patients who missed their most recent appointment
6	S_02_02 Appointment Spacing and Multi-Month Drug Dispensing [Care & Treatment GEN POP]	<ul style="list-style-type: none"> ▪ Are there standard procedures for identifying and tracking adult and adolescent ART patients who have missed an appointment? ▪ What percentage of tracking documents reviewed, from ART patients who missed their most recent appointment, had evidence documented of more than one attempt to bring the patient back into care (e.g., names of those with missed appointments, evidence of phone calls, linked to outreach workers)? Note: Tracking documents include logbooks, registers, and patient files, among others. ▪ Numerator: Number of ART tracking documents reviewed, for ART patients who missed their most recent appointment, that included evidence of more than one

		<p>attempt to bring the patient back into care (e.g., names of those with missed appointments, evidence of phone calls, linked to outreach workers)</p> <ul style="list-style-type: none"> ▪ Denominator: Number of ART tracking documents reviewed for patients who missed their most recent appointment
7	S_02_24 Appointment Spacing and Multi-Month Drug Dispensing [C&T PEDS]	<ul style="list-style-type: none"> ▪ Each site offers differentiated models of service delivery for pediatric patients (e.g., appointment spacing, MMD, and community dispensation) to meet the needs of stable ART patients and triage or fast-track appointments for unstable ART patients and those with advanced HIV infection. ▪ Does this site distinguish between stable and unstable patients, and have a standard definition of a “stable ART patient” for pediatric patients? ▪ Does the site use or provide the following for pediatric patients? Check all that apply: (1) three- to six-month routine follow-up visits for stable ART patients, (2) multi-month (≥ 3 months) ARV prescribing for stable patients, (3) multi-month ARV dispensing (≥ 3 month supply) for stable ART patients, (4) fast-track pharmacy pick-up of ARVs for stable ART patients, (5) community service delivery models (e.g., community ART groups or distribution points such as home distribution)
8	S_04_05 Appointment Spacing and Multi-Month Drug Dispensing [Care & Treatment PMTCT] (DUP)	<ul style="list-style-type: none"> ▪ Does this site distinguish between stable and unstable patients, and have a standard definition of a “stable ART patient” for pregnant and breastfeeding patients? ▪ Does the site use or provide the following for pregnant and breastfeeding patients? Check all that apply: (1) three- to six-month routine follow-up visits for stable ART patients, (2) multi-month (≥ 3 months) ARV prescribing for stable patients, (3) multi-month ARV dispensing (≥ 3 month supply) for stable ART patients, (4) fast-track pharmacy pick-up of ARVs for stable ART patients, (5) community service delivery models (e.g., community ART groups or distribution points such as home distribution)

Appendix B. Table for each of the CEEs that were analysed in relation to retention

Indicators	SIMS Categories				Total	S1_10 Supply Chain Management		S1_02 Supply Chain		S4_21 Supply Chain EID		S2_19 Patient Tracking			S2_02 Patient Tracking			S4_02 Patient Tracking		S2_06 Appointment Spacing and MMD		S2_24 Appointment Spacing and MMD		S4_05 Appointment Spacing and MMD	
	Red	Yellow	Green			Red	Green	Red	Green	Yellow	Green	Red	Yellow	Green	Red	Green	Yellow	Green	Yellow	Green	Yellow	Green	Yellow	Green	Yellow
Facilities	26	8	131		165	18	112	1	60	1	45	2	2	84	7	2	83	6	117	3	29	1	23	3	14
TX_CURR Q3	21 822	6 081	104 349		132 252	10 985	92 650	729	33 476	1 495	29 325	9 187	3 690	90 843	11 669	3 690	88 447	10 698	91 144	67	28 717	9	23 667	876	13 386
TX_CURR Q4	24 041	6 214	108 886		139 141	12 739	95 423	845	34 945	1 552	30 708	9 487	3 768	95 046	12 196	3 768	92 449	11 197	95 106	47	30 060	0	24 176	894	13 958
TX_NEW Q3	1 318	206	4 160		5 684	1 011	3 128	37	1 238	53	1 244	177	105	3 781	477	105	3 501	219	3 741	12	1 035	3	1 090	43	315
TX_NEW Q4	1 855	246	5 209		7 310	1 621	3 569	44	1 317	57	1 327	94	145	4 881	463	145	4 532	210	4 862	9	1 058	2	1 157	41	333
TX_NEW Cumulative	3 173	452	9 369		12 994	2 632	6 697	81	2 555	110	2 571	271	250	8 662	940	250	8 033	429	8 603	21	2 093	5	2 247	84	648
TX_NET_NEW	2 207	133	4 525		6 865	1 742	2 773	116	1 469	57	1 383	300	78	4 203	527	78	4 002	499	3 950	-20	1 343	-9	509	18	572
USAID retention proxy	3 179	456	9 396		13 030	2 638	6 717	81	2 570	110	2 582	271	250	8 668	940	250	8 040	429	8 629	24	2 095	7	2 249	85	650
Unexplained gain/loss	365	-113	-671		-445	34	-796	72	52	0	56	206	-67	-378	64	-67	-330	289	-999	29	385	-11	-648	23	39
TX Net New Standardized Ratio	1.015	0.982	0.994		0.997	1.011	0.992	1.093	1.004	1.000	1.002	1.022	0.983	0.993	1.005	0.983	0.994	1.026	0.991	0.618	1.010	0.000	0.974	0.975	1.017

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