COVida
TOGETHER FOR CHILDREN

FINAL REPORT

Case Profiling to Optimize Treatment Adherence Support and Improve Viral Load Suppression among Children and Adolescents Living with HIV in Mozambique

Belmiro Sousa, Grace McLain, Samantha Archie, Caximo Caximo, Aristedes Almeida, Tanya Medrano, Hayley Bryant

USAID FROM THE AMERICAN PEOPLE

MOÇAMBICANOS E AMERICANOS
JUNTOS NA LUTA CONTRA O HIV/SIDA
PEPFAR

fhi360
THE SCIENCE OF IMPROVING LIVES

ACKNOWLEDGEMENTS

CONTENTS

SUMMARY

The COVida — Together for Children project is working to improve the health, nutritional status, and well-being of orphans and vulnerable children (OVC) in Mozambique. One of COVida's priorities is to ensure that children living with HIV (CLHIV) adhere to treatment and achieve viral suppression (VS), in line with PEPFAR priorities and Mozambique national guidance. Among the 22,032 CLHIV supported by the COVida project as of June 30, 2021, 100% were on antiretroviral therapy (ART); however, only 77% of these same CLHVI were virally suppressed.

To better meet the needs of CLHIV served by the project, COVida sought to identify factors that might distinguish CLHIV who are virally suppressed from those who are not. The purpose was to inform strategies for improving the identification of CLHIV in need of enhanced ART adherence monitoring, support interventions, and services, and to optimize these interventions and services to better meet the needs of this population.

The analyses on project beneficiaries done in August 2021 included data on HIV-positive adolescents and children between the ages of 2 and 17 who initiated ART before January 2021 in four districts across three provinces. Data were collected from three sources: (1) primary data from a case profiling survey form administered to parents/caregivers during routine case management home visits, (2) program data from the child and caregiver needs assessment tools — case management tools used by activistas during intake of program beneficiaries to collect clinical and other relevant data, and (3) viral load (VL) data from CLHIV's HIV clinical records in COVida-supported health facilities. The aim of these analyses was to explore associations between VS status and various sociodemographic, treatment-related, and caregiver-related characteristics using t-test for continuous variables and chi-square test of independence for categorical variables.

Among the various relationships examined, only four factors were statistically associated with VS status: urban/rural residence, number of missed ART clinic visits in prior six months, number of missed ART doses in prior two weeks, and average number of meals per day. In supplementary analyses requested by the project, knowledge of one's HIV status was also observed to be associated with ART adherence.

This exploratory case profiling analysis serves to shed some light on potential characteristics associated with lack of VS among CLHIV who are enrolled in the COVida project; however, the analyses are also subject to several important limitations that must be considered when interpreting the results. This first exploratory effort should be viewed as a starting point for additional inquiries to better understand the underlying reasons why such a large proportion of CLHIV have not achieved VS — a status that is critical to their health and well-being.

INTRODUCTION

The COVida – Together for Children project is working to improve the health, nutritional status, and well-being of orphans and vulnerable children (OVC) in Mozambique. To achieve this, COVida works in partnership with community-based organizations and their activistas (community case workers) who provide care and support to OVC and their families using a comprehensive case management approach. This involves conducting individual needs assessments for each child and their family and developing an individualized care plan for the family to provide direct services or referrals to meet their needs.

One of COVida's priorities is to ensure that CLHIV adhere to treatment and achieve VS, in line with PEPFAR priorities and Mozambique national guidance. This is an important priority in Mozambique because VL suppression in children and adolescents (0–19 years) was only 53% in 2020, compared to 81% among adults[1]. Among the 22,032 CLHIV supported in the COVida program, 100% were on ART but only 77% were virally suppressed as of June 30, 2021.

To close outstanding gaps in adherence to lifesaving HIV treatment in Mozambique, efforts must focus on identifying and addressing the different preferences and needs of individuals, in this case, the 23% of CLHIV who are not virally suppressed through case profiling. Case profiling is a method that examines the characteristics of individuals to understand what those different needs or preferences may be. The idea is to identify an outcome, such as VS among CLHIV and, through statical analysis of data on characteristics of CLHIV that might be related to VS, explore if there are certain characteristics that make individuals more or less likely to have the desired outcome: be virally suppressed. By understanding these differences between those who have the desired outcome and those who do not, programs can optimize the focus and enhance the quality and relevance of client support, while also gaining important insights into opportunities to tailor and focus outreach and service delivery efforts in critically un- or under-served populations and geographies.

AIM AND OBJECTIVES

The purpose was to inform strategies to help the project improve the identification of CLHIV in need of enhanced ART adherence monitoring, support interventions, and services, and to optimize these interventions and services to better meet the needs of this population. Specifically, the project sought to: (1) identify differences in sociodemographic characteristics, caregiver/family characteristics, and treatment-related characteristics between CLHIV who have achieved VS and those who have not; and (2) explore associations between specific characteristics that are associated with VS status. In addition, this exercise aimed to provide insights into other relationships between factors unrelated to the VS outcome that can inform programming, such as the person responsible for administering ART and the number of doses missed in the past two weeks.

METHODS

Overview and design

This case profiling activity was conducted among HIV-positive adolescents and children between the ages of 2 and 17 who initiated ART before January 2021, and their primary caregiver (the adult in the household responsible for daily care of the child). All participants were supported by the COVida program at the time of data collection, which occurred August 2–23, 2021.

Data for the analyses were collected from three sources. Primary data were collected using a case profiling survey form administered to parents/caregivers during routine case management home visits (Appendix 1). Additional data were extracted from two existing sources: (1) program data from the child and caregiver needs assessment tools used by activistas during intake of program beneficiaries to collect clinical and other relevant data (Appendix 2), and (2) VL data from CLHIV's HIV clinical records in COVida-supported health facilities (Appendix 3).

Setting and population

The COVida program is implemented in 30 districts across seven provinces and, at the time data for this case profiling exercise were collected, served 22,032 CLHIV in total. These analyses were conducted using data from project beneficiaries in four districts across three provinces (Table 1).

Sampling design

For this exercise, provinces and districts were selected based on differing average VS rates and urban/rural status. The number of districts to be included was based on feasibility, allowing for time and funding constraints. Table 1 details the locations and key characteristics of each selected district. Within the selected districts, the project used a convenience sampling approach, collecting data on all project beneficiaries they could reach during the three-week period of data collection.

Measures

The primary outcome of interest was VS, which is defined as having a VL less than 1,000 copies/μl. The variable was dichotomized as virally suppressed (VL<1,000/ml) and not virally suppressed (VL>1,000/ml).

Additional measures (Figure 1) were selected based on potential association with VS, as well as on availability in project databases. Variables selected from the case management and clinical records included (1) child demographic information such as age, sex, and relationship to primary caregiver; (2) caregiver demographic information such as age, sex, and HIV status; and (3) child's treatment information such as ART regimen, World Health Organization (WHO) ART stage at treatment initiation, and time since ART initiation. Measures included on the supplemental questionnaire included additional demographic information such as the child's school status and the caregiver's educational status, health access information such as distance to the nearest clinic, and clinically relevant information such as ART doses missed and the child's level of independence in managing their condition. A complete list of variables is found for both the supplemental questionnaire and data extracted from the case management tool in Appendices 1 and 2.

Table 1. Distribution of sampled population

Province	District	Average %VS	Urban/rural	# of total CLHIV beneficiaries
Maputo City	Lhamankulo	72%	Urban	263
Maputo City	Kamavota	79%	Urban	301
Nampula	Monapo	68%	Rural	191
Gaza	Chibuto	92%	Rural	1,077
Total				**1,832**

Figure 1. *Additional Measures*

Child-related characteristics	Caregiver/Family-related Characteristics	Treatment-related Characteristics
• Age • Sex • Relationship to caregiver • Child's knowledge of own HIV status (11+ only) • Number of meals per day • School status	• Age • Sex • Educational level • HIV status • Disability status • History of alcohol/drug abuse • Quality of caregiver/ child relationship • People within the household that know the child's HIV status	• Time on ART • Number of ART doses missed during last 2 weeks • Number of ART clinic appts missed during last 6 months • WHO clinical stage at ART initiation and at last visit • Child's U=U* or last VL test result • Child's knowledge of U+U concept • Person responsible for administering ART to child • Availability of money for transport to ART clinic • Travel time to ART clinic • Wait time to see provider • Attitude of ART provider *** U+U: Undetectable = Untransmissable**

Data collection

Case profiling questionnaire data

Prior to data collection, activistas, who are typically responsible for carrying out case management activities through home visits and other project activities, were trained to collect data using the supplemental case profiling survey questionnaire. As part of case management home visits during the data collection period, activistas asked project beneficiaries if they would be willing to respond to additional questions for the purposes of this exercise. Caretakers verbally consented to these additional questions along with the routinely asked case management questions. Activistas recorded responses to the questions into electronic forms programmed on computer tablets using KoBoCollect software app.

Routine home visit and clinical data

KoBo Toolbox was also used to program the data extraction forms for the case management tools and the clinical records. COVida project staff again used KoBoCollect on computer tablets to record data extracted from these sources for all project beneficiaries in the target districts.

Data management

Data recorded on computer tablets were uploaded to the KoBo server daily. The datasets from the three different sources were combined using the Ministry of Health patient unique identification code (UIC) used in all health facilities. After the data were combined into a final analytic dataset, they were stripped of all identifying information, including the UIC, and assigned a case-profiling-specific ID number for analyses.

Data analyses

The primary aim of these analyses was to explore associations between VS status and various sociodemographic, treatment-related, and caregiver-related characteristics. To compare those who were virally suppressed to those who were not, we performed t-tests for continuous variables and chi-square test of independence for categorical variables. For variables and cross-tabulations having multiple cells with less than five observations, we either collapsed response categories—if appropriate, or only present descriptive results without statistical testing. Missing data are noted in the tables where relevant. We conducted complete case analyses on

these data; no imputation was done to replace missing data. All tests used a significance level of α=0.05. Data analyses were conducted using Stata statistical software.

FINDINGS

The case profiling questionnaire was completed for 2,280 children across the four districts. During data cleaning it was discovered that health facilities' UIC numbers for CLHIV were not in fact unique to each individual beneficiary across the different facilities. Rather, ID numbers were unique to individuals within a given facility, but many facilities used the same or similar IDs so that duplicate UICs existed for many CLHIV for whom data were collected or extracted. Because of duplicate UICs, we were not able to link routine home case management and clinical data to the questionnaire responses for more than half of the children. In total, case profiles were constructed for 1,042 CLHIV across the four districts (Figure 2). An additional 30 CLHIV were excluded from case profiling analyses because data on their VS status were missing, leaving 1,012 CLHIV.

Figure 2. *Number of CLHIV for Whom Data was Collected and Used in analyses*
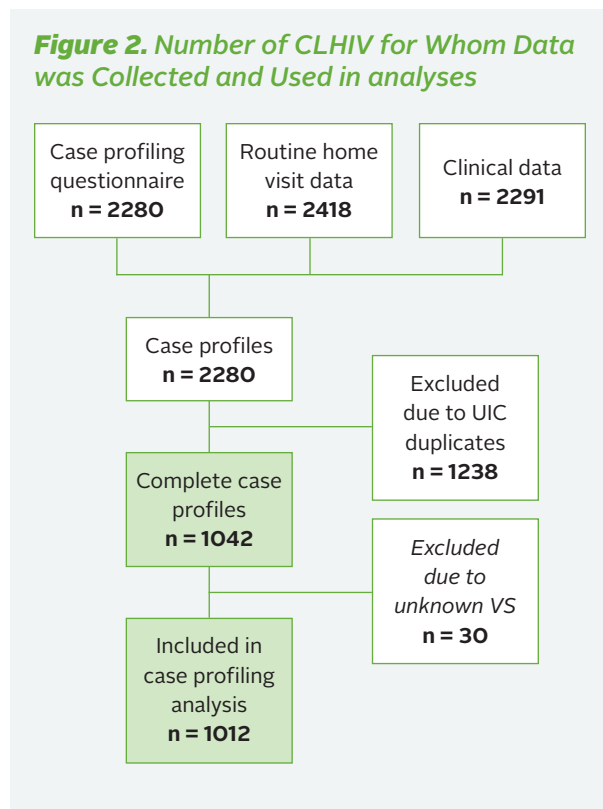
Sample characteristics

The group of children included in these analyses was almost evenly split between male and female (Table 2). Most (72.7%) were between ages 5 to 14, with fewer individuals representing the youngest and oldest age groups. More than 75% of CLHIV had been on ART for three or more years at the time of the survey.

Table 2. Sample characteristics

Characteristics	N= 1,012 n (%)
District	
Maputo City: Lhamanku	128 (12.6)
Maputo City: Kamavota	25 (2.5)
Nampula: Monapo	157 (15.5)
Gaza: Chibuto	702 (69.4)
Age group	
2–4	139 (13.7)
5–9	396 (39.1)
10–14	340 (33.6)
15–17	137 (13.5)
Sex	
Female	529 (52.3)
Male	483 (47.7)
Place of residence	
Urban	859 (84.9)
Rural	153 (15.1)
School status[1]	
In school	757 (92.4)
Not in school	58 (7.1)
Unknown	4 (0.5)
Time on ART (months)	
<12	34 (3.4)
12–23	89 (8.8)
24–35	118 (11.7)
36–59	238 (23.5)
60+	533 (52.7)
Caregiver relationship to child	
Mother	521 (51.5)
Father	24 (2.4)
Grandparent	134 (13.2)
Aunt or uncle	51 (5.0)
Other	11 (1.1)
Unknown	271 (26.8)

1. Only for those aged 6 years and older, n=813

Most CLHIV (84.9%) resided in urban areas, and school attendance was very high among those aged 6 and older with more than 90% in school. The majority of CLHIV were cared for by a parent (53.9%), typically a mother, or a grandparent (13.2%); however, data on caregivers, which was extracted from case management data on the caregiver's relationship to the CLHIV, were missing for more than a quarter of the sample.

Viral suppression and CLHIV demographic characteristics

VS was not associated with most demographic characteristics (Table 3). The one exception was urban/rural status, where a somewhat higher proportion of children who were virally suppressed resided in urban areas (88.8%) compared to the proportion residing in urban areas who were not virally suppressed (76.7%).

Table 3. Sociodemographic characteristics by viral suppression, N=1,012.

Characteristic	Suppressed N= 681 n (%)	Not Suppressed N= 331 n (%)	Test statistic	p-value
Age (continuous)	9.1	9.1	t-test	0.13
	(SD 3.8)	(SD 4.3)		
Sex				
Female	356 (52.3)	173 (52.3)	χ^2 = 0.00 DF = 1	0.99
Male	325 (47.7)	158 (47.7)		
Residence				
Urban	605 (88.8)	254 (76.7)	DF = 1	**<0.001**
Rural	76 (11.2)	77 (23.3)		
School status[1]				
In school	530 (78.6)	221 (67.1)	χ^2 = 3.7 DF = 2	0.16
Not in school	34 (9.1)	24 (15.1)		
Unknown	3 (0.4)	1 (0.3)		
Caregiver relationship to child[2]				
Mother	352 (51.7)	169 (51.1)	χ^2 = 8.7 DF = 6	0.19
Father	17 (2.5)	7 (2.1)		
Grandparent	86 (12.6)	48 (14.5)		
Aunt	30 (4.4)	18 (5.4)		
Other	10 (1.5)	5 (1.5)		

1. Only for those aged 6 years and older, n=813
2. Data missing for 270 CLHIV, n=742

Viral suppression and caregiver characteristics

The majority (95%) of caregivers for both suppressed and unsuppressed children were women, and most were between 25 to 54 years old (Table 4). More than half of all caregivers (63%) had less than a full primary education. Two-thirds of caregivers were HIV positive themselves and fewer than 5% reported any history of a disability or substance abuse.

None of the caregiver characteristics measured were statistically associated with VS among CLHIV (Table 4). CLHIV were no more likely to be virally suppressed or non-suppressed regardless of their caregiver's age, sex, education, own HIV status, or the activista's assessment of the caregiver-child relationship.

Table 4. Viral suppression and caregiver characteristics

Characteristic	Suppressed N= 681 n (%)	Not Suppressed N= 331 n (%)	Test statistic	p-value
Age (continuous)	42.0 (SD = 12.8)	42.1 (SD = 13.6)	t-test	0.91
Sex				
Female	641 (94.1)	315 (95.2)	$\chi^2 = 0.5$ DF = 1	0.50
Male	40 (5.9)	16 (4.8)		
Education[1]				
None	192 (28.3)	97 (29.3)	$\chi^2 = 2.6$ DF = 4	0.62
Some primary school	233 (34.3)	111 (33.5)		
Finished primary school	199 (29.3)	87 (26.3)		
Finished secondary school	49 (7.2)	30 (9.1)		
More than secondary	6 (0.9)	5 (1.5)		
HIV status				
Negative	207 (30.4)	106 (32.0)	$\chi^2 = 0.3$ DF = 2	0.85
Positive	458 (67.3)	217 (65.6)		
Unknown	15 (2.2)	8 (2.4)		
Disability status				
None	657 (96.5)	320 (96.7)	$\chi^2 = 0.03$ DF = 1	0.87
Has one or more disabilities	24 (3.5)	11 (3.3)		
History of alcohol/drug abuse				
Yes	20 (2.9)	5 (1.5)	$\chi^2 = 1.9$ DF = 1	0.17
No	661 (97.1)	326 (98.5)		
Quality of the caregiver/child relationship[2]				
Good	674 (99.6)	326 (99.4)	$\chi^2 = 0.12$ DF = 1	0.73
Reasonable or bad	2 (0.4)	2 (0.6)		

1. Three participants did not respond to this question, n=1009.
2. Seven participants did not respond to this question, n=1005.

Viral suppression and other factors

The relationships between VS and several additional factors such as nutrition, HIV status disclosure, and accessibility/convenience of clinic visits were also examined. Of these other factors, only the number of meals per day was associated with VS status (Table 5). A greater proportion (93.1%) of virally suppressed CLHIV reported having two or more meals per day on average, compared to virally unsuppressed CLHIV (84.9%); however, only a minority of both groups reported having fewer than two meals per day on average.

Table 5. Child's viral suppression by other treatment-related characteristics, n=1,102

Characteristic	Suppressed N= 681 n (%)	Not Suppressed N= 331 n (%)	Test statistic	p-value
Average number of meals child has per day				
2 or more	634 (93.1)	281 (84.9)	$\chi^2 = 17.3$	**<0.001**
<2	47 (6.9)	50 (15.1)	DF = 1	
Child knows own HIV status[1]				
Yes	216 (81.8)	106 (84.8)	$\chi^2 = 0.58$	0.75
Maybe	6 (2.3)	2 (1.6)	DF = 2	
No	42 (15.9)	17 (13.6)		
Child knows about U=U[1]				
Yes	192 (80.7)	88 (75.2)	$\chi^2 = 1.4$	0.24
No	46 (19.3)	29 (24.8	DF = 1	
Person responsible for administering ART to child				
Parent	544 (79.9)	262 (79.2)	$\chi^2 = 2.3$	0.52
Other family member	128 (18.8)	61 (18.4)	DF = 3	
Child	8 (1.2)	6 (1.8)		
Other	1 (0.1)	2 (0.6)		
Who else in HH know of child's HIV status				
Parents	148 (21.8)	80 (24.2)	$\chi^2 = 1.2$	0.76
Siblings	110 (16.2)	53 (16.0)	DF = 3	
Other household members	346 (50.8)	158 (47.7)		
No one	76 (11.2)	40 (12.1)		
Time in minutes to travel to clinic				
<15	46 (6.8)	23 (6.9)	$\chi^2 = 3.9$	0.42
15–0	147 (21.6)	75 (22.7)	DF = 4	
30–59	337 (49.5)	144 (43.5)		
60–120	84 (12.3)	50 (15.1)		
>120	30 (4.4)	19 (5.7)		
Able to afford transport to clinic[2]				
Always	100 (45.7)	52 (41.3)	$\chi^2 = 2.4$	0.49
Most of the time	13 (5.9)	4 (3.2)	DF = 3	
Sometimes	97 (44.3)	64 (50.8)		
Rarely	9 (4.1)	6 (4.8)		

Table 5. Child's viral suppression by other treatment-related characteristics, n=1,102

Characteristic	Suppressed N= 681 n (%)	Not Suppressed N= 331 n (%)	Test statistic	p-value
Average wait time to see provider in clinic (minutes)				
<15	4 (0.6)	2 (0.6)	χ^2 = 3.7 DF = 4	0.44
15–30	97 (14.2)	36 (10.9)		
30–59	292 (42.9)	159 (48.0)		
60–120	264 (38.8)	120 (36.3)		
>120	22 (3.2)	12 (3.6)		
Reported attitude of provider				
Friendly	608 (89.3)	309 (93.4)	χ^2 = 4.3 DF = 2	0.12
Somewhat friendly	54 (7.9)	15 (4.5)		
Unfriendly	17 (2.5)	7 (2.1)		

1. For children 11 and older only, n = 400

2. 667 participants did not respond to this question, n = 345

Viral suppression and clinical characteristics

VS was associated with a few clinical characteristics among CLHIV (Table 6). For example, more virally suppressed CLHIV missed no clinic visit appointments in the prior six months compared to those not virally suppressed; however, most CLHIV (88.9%), whether suppressed or not, missed no appointments in the prior six months.

VS was also associated with number of doses of ART missed in the prior two weeks; however, in this case, a greater proportion of those who were virally suppressed also reported missing five or more doses compared to CLHIV not virally suppressed. Overall, however, more than three-quarters (77.6%) of CLHIV in both suppressed and non-suppressed groups had not missed any ART doses in the prior two weeks. Among those who reported missing at least one dose, most in both groups reported missing five or more doses.

Current ART regimen was also associated with VS. Among those CLHIV who were virally suppressed, higher proportions of children were taking first-line regimens (ABC+3TC+DTG or ABC/3TC+LPV/r) (71.3%) compared to those who were not virally suppressed (63.4%).

Table 6. Child's viral suppression by clinical treatment characteristics, n=1,102

Characteristic	Suppressed N= 681 n (%)	Not Suppressed N= 331 n (%)	Test statistic	p-value
Current ART regimen				
ABC+3TC+LPV	73 (10.7)	44 (13.3)	χ^2 = 13.3 DF = 4	*0.01*
TDF+3TC+DTG	62 (9.1)	53 (16.0)		
ABC+3TC+DTG	263 (38.6)	114 (34.4)		
ABC/3TC+LPV/r	223 (32.7)	96 (29.0)		
Other	60 (8.8)	24 (7.3)		
Mean time on ART (months)	61.6 (SD 33.5)	58.7 (SD 31.4)	t-test	0.09

Table 6. Child's viral suppression by clinical treatment characteristics, n=1,102

Characteristic	Suppressed N= 681 n (%)	Not Suppressed N= 331 n (%)	Test statistic	p-value
Time on ART (months, grouped)				
<12	25 (3.7)	9 (2.7)	χ^2 = 3.2 DF = 4	0.52
12–23	58 (8.5)	31 (9.4)		
24–35	72 (10.6)	46 (13.9)		
36–59	163 (23.9)	75 (22.7)		
60+	363 (53.3)	170 (51.4)		
Number of ART doses missed in prior 2 weeks				
None	523 (76.8)	262 (79.2)	χ^2 = 8.1 DF = 3	**0.045**
1–2	10 (1.5)	9 (2.7)		
3–4	4 (0.6)	6 (1.8)		
5 or more	144 (21.1)	54 (16.3)		
Number of ART clinic visits missed in prior 6 months				
None	617 (90.6)	283 (85.5)	χ^2 = 12.1 DF = 2	**0.002**
1	46 (6.8)	24 (7.25)		
2+	18 (2.6)	24 (7.25)		
WHO Stage at initiation				
I	346 (50.8)	168 (49.8)	χ^2 = 0.47 DF = 3	0.93
II	159 (23.3)	86 (26.0)		
III	123 (18.1)	60 (18.1)		
IV	20 (2.9)	10 (3.0)		

ADDITIONAL ANALYSES

In addition to the analyses examining the relationships between VS and beneficiary characteristics, other analyses of interest to the COVida program were requested and are presented below.

School attendance by urban/rural status

Examining only CLHIV age 6 and older who are expected to be in school (n=832), school status (in or out of school) was statistically associated with urban/rural status (Table 7). A higher proportion of urban dwellers were out of school (11.1%) compared to rural dwellers (4.4%); however, school attendance was very high overall (90%).

Table 7. School status by urban/rural district among CLHIV age 6 and older

	Urban N=695 n (%)	Rural N=137 n (%)	Test statistic	p-value
In school	618 (88.9)	131 (95.6)	χ^2 = 0.47 DF = 3	**0.017**
Out of school	77 (11.1)	6 (4.4)		

Person responsible for administering ART and dose of ART missed

A substantial proportion of CLHIV (19.6%) reported missing five or more doses of ART in the two weeks prior to the survey, regardless of who administered the drug (Table 8). Although the absolute numbers are small, a greater proportion of youth who self-administered their ART reported missing no medication compared to those for whom a parent or someone else was responsible for administering treatment; however, the total number of youth who self-administered their medication was very small (10). No statistical testing for this relationship was done because of the small numbers (less than five) in multiple categories.

Table 8. Person responsible for administering ART by age group and number of missed ART doses

Characteristic	Number of ART doses missed in prior 2 weeks			
	None N=798 n (%)	1 to 2 N=20 n (%)	3 to 4 N=10 n (%)	5 or more N=204 n (%)
Person responsible for administering ART				
Parent	646 (81.0)	15 (75.0)	9 (90.0)	158 (77.5)
Other family or community member	140 (17.5)	5 (25.0)	1 (10.0)	44 (21.6)
Child	12 (1.5)	0 (0.0)	0 (0.0)	2 (0.9)

Missed meals and missed ART doses

Number of meals missed on average was statistically associated with number of doses of ART missed in the prior two weeks (Table 9). A greater proportion of those who ate two or more meals per day on average also reported missing five or more doses of medicine (21.1%) compared to those who reported eating fewer than two meals per day on average (5.0%).

Table 9. Number of doses missed in past 2 weeks by number of meals per day

Doses missed in past 2 weeks	Two or more meals per day N= 941 n (%)	Less than two meals per day N= 101 n (%)	Test statistic	p-value
None	719 (76.4)	89 (88.1)		
1–2	14 (1.5)	6 (5.9)	χ^2 = 23.3	
3–4	9 (1.0)	1 (1.0)	DF = 3	*<0.001*
5 or more	199 (21.1)	5 (5.0)		

CLHIV knowledge of HIV status

For CLHIV age 11 and older, an association was found between knowledge of their own HIV-positive status and whether they missed any doses within the past two weeks. A higher proportion of CLHIV who were unaware of their HIV status reported missing any doses of ART in the prior two weeks (40.0%) compared to those who knew their HIV status (19.0%) (Table 10). No significant association existed between time on ART and HIV status knowledge.

Table 10. Knowledge of own HIV status by missed ART doses and time on ART, CLHIV age 11 and older

	Child's knowledge of own HIV status			
Characteristic	**Aware** N= 332 • n (%)	**Unaware** N = 60 • n (%)	**Test statistic**	**p-value**
Missed any doses of ART in prior 2 weeks				
No	269 (81.0)	36 (60.0)	χ^2 = 23.3 DF = 3	**<0.001**
Yes	63 (19.0)	24 (40.0)		
Time on ART (months)				
<12	12 (3.6)	1 (1.7)	χ^2 = 4.6 DF = 4	0.34
12-23	23 (6.9)	7 (11.7)		
24-35	31 (9.3)	2 (3.3)		
36-59	67 (20.2)	11 (18.3)		
60+	199 (59.9)	39 (65.0)		

Missed appointments

Relatively few (11.6%) CLHIV in this sample missed one or more appointments in the past six months, with only 1.5% having missed more than two appointments (Table 11). No statistically significant association was found between travel time to the facility or ability to pay for transportation and having missed one or more appointments.

Table 11. CLHIV missed medical appointments in past 6 months by time to health facility and ability to pay for transport

	No appointments missed N= 921 • n (%)	**≥1 appointments missed** N= 121 • n (%)	**Test statistic**	**p-value**
Time to health facility[1]				
<15 minutes	62 (7.1)	7 (6.4)	χ^2 = 4.3 DF = 4	0.37
15-30 minutes	199 (22.8)	26 (23.6)		
30 minutes to 1 hour	443 (50.7)	52 (47.3)		
1-2 hours	124 (14.2)	19 (17.3)		
>2 hours	45 (5.2)	6 (5.4)		
Caregiver's ability to cover transportation costs to health facility[2]				
Always	140 (45.3)	19 (43.2)	χ^2 = 1.8 DF = 3	0.62
Most of the time	16 (5.2)	1 (2.3)		
Sometimes	138 (44.7)	23 (52.2)		
Rarely	15 (4.8)	1 (2.3)		

1. 60 participants did not answer the question about time to health facility

2. 689 participants did not answer the question about caregiver's ability to cover costs

DISCUSSION

This exercise sought to identify potential characteristics that could help COVida staff better identify CLHIV program beneficiaries who might benefit from enhanced services to reduce the number who are not virally suppressed.

Results from this case profiling exercise identified somewhat limited opportunities for the project to tailor interventions for CLHIV to improve VS (Figure 3). Among the factors statistically associated with VS, efforts to reduce missed clinic visits and missed ART doses appear to be the most readily addressable. However, the relationship between missed doses of ART and VS is the opposite of what would be expected based on extensive literature that indicates ART adherence is critical to VL suppression, thus calling it into question as a possibly spurious finding that should be further investigated

Food insecurity (eating less than two meals per day), while not an issue for the majority of CLHIV in these analyses, was also associated with VS. Fewer CLHIV who were virally suppressed reported eating less than two meals per day on average compared to those who were not virally suppressed. Though there are no specific dietary requirements for people living with HIV (PLHIV), proper nutrition is very important[2]. There is evidence that food insecurity can be a barrier to ART adherence and exacerbate poor clinical outcomes among PLHIV, even after controlling for other markers of socioeconomic status. Among

CLHIV, this effect can be acute[3, 4] and the benefit of food supplementation on ART adherence has been clearly observed[5]. Lack of food may also prompt children to refuse medication due to side effects alleviated through food consumption[6]. Ensuring project participants receive the social support interventions they need, such as food assistance, should be a priority.

The ART regimen that the CLHIV are on was also statistically associated with VS status. While the regimen is determined at the facility level, the COVida program can continue to work with clinical partners and health facilities to mobilize and refer all CLHIV on non-optimized treatment regimens to be transitioned for pediatric dolutegravir-based regimens.

In additional analyses, where associations for several factors other than VS were examined, it was observed that a significantly greater proportion of CLHIV who did not know their HIV status reported missing one or more doses of ART in the prior two weeks compared to those who were aware of their HIV status. These results highlight the importance of CLHIV knowing their HIV status so they can make healthy, informed decisions regarding their own health.

Limitations

Although these exploratory analyses provide some insight into factors associated with VS among a subset of children served by the COVida project, they are not without important limitations which must be considered when interpreting the results. The first and most important limitation is that these analyses were conducted on a convenience sample of project beneficiaries from a purposely selected sample of project districts. Findings from the analyses are specific to the sample of children who were part of the analyses and cannot be considered to represent what might be found among all children served by the project overall.

Figure 3. Summary of statistically significant relationships

Factors statistically associated with viral suppression status based on these analyses

- Urban/rural residence
- Number of missed ART clinic visits in prior 6 months
- Number of missed ART doses in prior 2 weeks
- Average number of meals per day

Secondly, the cross-sectional nature of these analyses means that it is not possible to determine if a given characteristic caused (came before) or was caused by (came after) the outcome of interest. Additionally, running statistical tests of association on multiple variables increases the chance that some findings may in fact be spurious — by chance. These analyses should be considered exploratory, providing insight into potential associations but not conclusive.

Finally, during data collection, it was discovered that the facility-generated UIC being used to combine data for individuals from the three data sources to create the case profiles were not actually unique to each child living with HIV. UICs are facility-specific and there were numerous duplicates among the data, even within the districts, which led to dropping many individuals from the analyses. Though 2,066 CLHIV and their caregivers were surveyed for this exercise, only 1,042 case profiles were completed because of duplicate UICs. Further, only 1,012 individuals were used in the analyses because of missing data on VS for 30 CLHIV.

CONCLUSION

This exploratory case profiling analysis sheds some light on potential characteristics associated with lack of VS among CLHIV enrolled in the COVida project. While a few factors that can be addressed appear to be associated with VS, these factors alone do not appear to adequately explain why a full third (32.7%) of the sample was not virally suppressed. This first exploratory effort should be viewed as a starting point for additional inquiries to better understand the underlying reasons such a large proportion of CLHIV have not achieved VS — a status that is critical for their health and well-being.

REFERENCES

1. U.S. President's Plan for AIDS Relief (PEPFAR). Mozambique country operational plan 2000: strategic direction summary. Washington (DC): PEPFAR; 2020.

2. World Health Organization (WHO). WHO technical consultation on nutrient requirements for people living with HIV/AIDS. Geneva: WHO; 2003.

3. Haberer J, Mellins C. Pediatric adherence to HIV antiretroviral therapy. Curr HIV/AIDS Rep. 2009;6(4):194-200.

4. Vreeman RC, Nyandiko WM, Ayaya SO, Walumbe EG, Marrero DG, Inui TS. Factors sustaining pediatric adherence to antiretroviral therapy in western Kenya. Qual Health Res. 2009;19(12):1716-29.

5. Bain-Brickley D, Butler LM, Kennedy GE, Rutherford GW. Interventions to improve adherence to antiretroviral therapy in children with HIV infection. Cochrane Database Syst Rev. 2011;2011(12):Cd009513.

6. Fetzer BC, Mupenda B, Lusiama J, Kitetele F, Golin C, Behets F. Barriers to and facilitators of adherence to pediatric antiretroviral therapy in a sub-Saharan setting: insights from a qualitative study. AIDS Patient Care STDS. 2011;25(10):611-21.

CASE PROFILING QUESTIONNAIRE

No	Questions	Response Categories	Code	Rel.
001	CLHIV identification code	[text]		
002	Activista's name	[text]		
003	Province and district	Maputo City: Lhamankulo Maputo City: Kamavota Nampula: Monapo Gaza: Chibuto	1 2 3 4	
101	Does the child attend school?	Yes No Unsure Do not wish to answer	1 2 3 999	
102	What type of school does the child attend?	Boarding school Government/public day school NGO/private day school	1 2 3	
201	What is the highest level of education the caregiver has completed?	None Some primary school Finished primary school Finished secondary school More than secondary Do not wish to answer	1 2 3 4 5 999	
202	What disabilities does the caregiver have? (Select all)	None Mental health condition(s) Vision Impairment Deaf or hard of hearing Physical disability Other Do not wish to answer	1 2 3 4 5 6 999	
203	Does the caregiver have a history of alcohol or drug abuse?	Yes No Do not wish to answer	1 2 99	
204	On average, how many hours per day does the caregiver spend with the child?	[integer]		
301	Who in the child's home is responsible for administering the child's ART medication?	Parent Sibling Other family member Other community member No one, the child is responsible for their own medication Do not know	1 2 3 4 5 999	

No	Questions	Response Categories	Code	Rel.
302	Who in the child's home is responsible for reminding the child to take the medication?	Parent Sibling Other family member Other community member No one, the child is responsible for remembering Do not know	1 2 3 4 5 999	
303	Who in the household knows the child's HIV status, besides the caregiver?	Sibling(s) Parent(s) Other household members No one else Unsure	1 2 3 4 99	
304	How far (in km) is the ART clinic from the child's home?	[integer]		
305	What mean(s) of transportation does the child regularly use to get to the clinic? *Select all that apply*	Walking Bicycle Public transportation Private car Animal ride Other (specify)	1 2 3 4 5 88	
306	How much time does it take to travel from the child's home to the ART clinic? [by method of transportation]	Less than 15 minutes 15 to 30 minutes 30 minutes to one hour One hour to two hours More than 2 hours Unsure	1 2 3 4 5 99	
307	How often is the caregiver able to cover the transportation costs to the ART clinic?	Always Most of the time Sometimes Rarely Never Do not wish to answer	1 2 3 4 5 999	Q305 = 3
308	How long (in mins) does the child usually have to wait to be seen by an ART provider at the clinic?	Less than 15 minutes 15 to 30 minutes 30 minutes to one hour One hour to two hours More than 2 hours Unsure	1 2 3 4 5 999	
309	How would the caregiver and/or child describe the attitude of the ART provider?	Friendly Somewhat friendly Unfriendly Do not wish to answer	1 2 3 999	

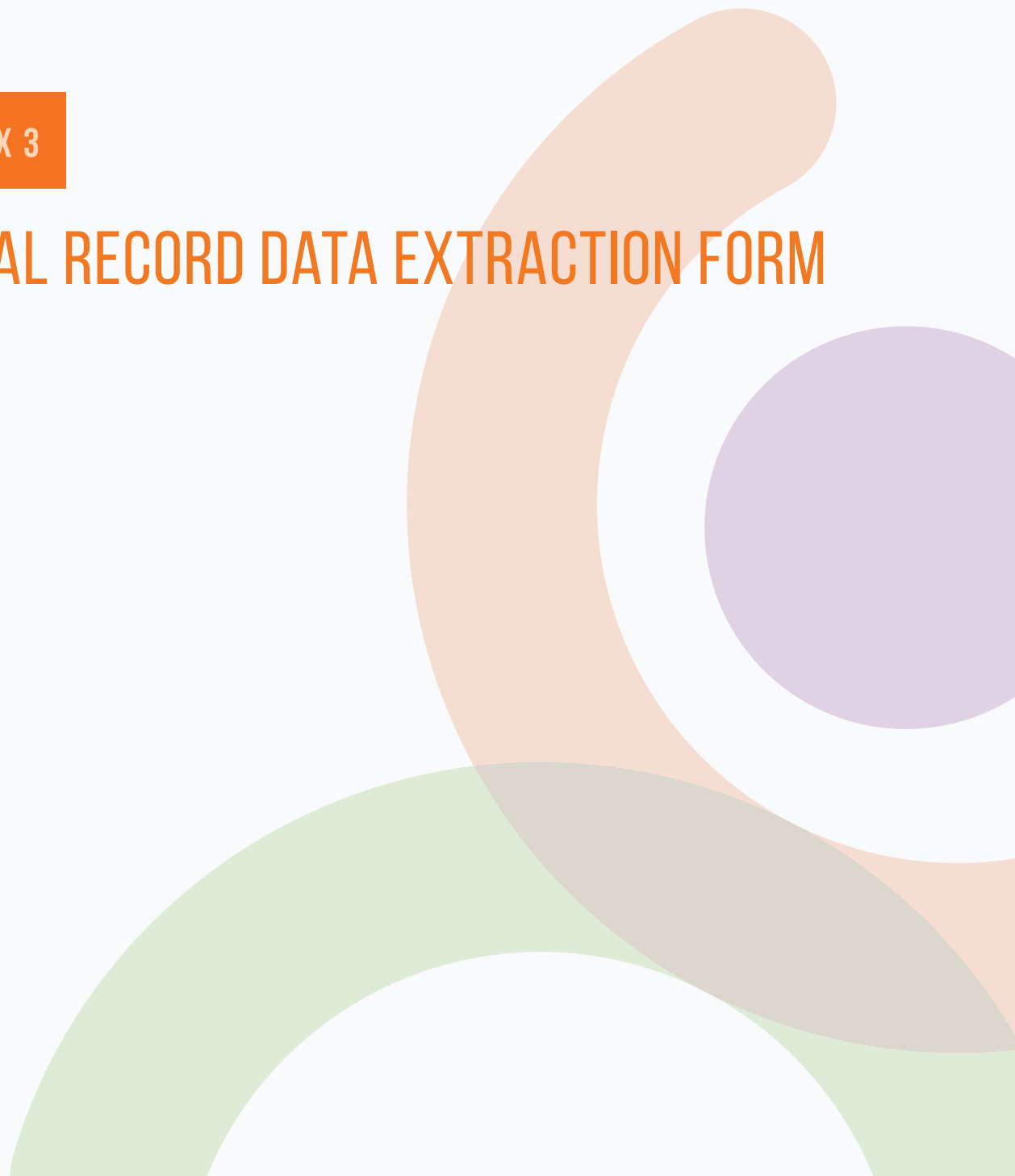| No	Questions	Response Categories	Code	Rel.
310	Child's knowledge of own HIV+ status	Aware Maybe aware/not sure Unaware No response	1 2 3 999	
311	Child's knowledge about U=U (or last VL test result if U=U is unavailable)	Aware Maybe aware/not sure Unaware		
312	Number of ART doses missed by the child during the last 2 weeks *If unknown enter 99*	[integer]		
312_dk	Please comment on why this is unknown	[text]		102=99
401	Do you have any comments or notes about any of these questions or responses? *Optional*	[text]		

HOME VISIT DATA EXTRACTION TOOL

No	Questions	Response Categories	Code	Relevant
001	CLHIV identification code	[text]		
002	Activista's name	[text]		
003	Province and district	Maputo City: Lhamankulo Maputo City: Kamavota Nampula: Monapo Gaza: Chibuto	1 2 3 4	
101	Child's age	Under 5 5 or older	1 2	
101_mos	Child's age (months)	[integer]		P101 = 1
101_yrs	Child's age (years)	[integer]		P101 = 2
102	Child's sex	Male Female	1 2	
103	Current school status	In school, full-time In school, part-time Out of school Don't know	1 2 3 99	
104	Child's relationship to his/her caregiver	Mother Father Sibling Grandparent Aunt Uncle Cousin Family friend Other (please describe)	1 2 3 4 5 6 7 8 88	
104_other	Other, please describe:	[text]		104=8
105	Nutritional status (under 5 years old)	Healthy – Green Moderate – Yellow Severe – Red	1 2 3	
106	Number of meals child has per day	2 or more meals Less than 2 meals	1 2	
301	Caregiver's age	Sibling(s) Parent(s) Other household members No one else Unsure	1 2 3 4 99	
302	Caregiver's sex	Male Female	1 2	
303	Caregiver's HIV status	Negative Positive Unknown	1 2 99	
304	Caregiver's physical health status	Good Reasonable Bad	1 2 3	

No	Questions	Response Categories	Code	Relevant
305	Caregiver's mental health status	Good Reasonable Bad	1 2 3	
306	Quality of the caregiver/child relationship	Good Reasonable Bad	1 2 3	
401	Current ART regimen	ABC+3TC+LPV TDF+3TC+DTG ABC+3TC+DTG ABC+3TC+EFV AZT+3TC+EFV AZT+3TC+LPVr AZT+3TC+NVP TDF/3TC/DTG TDF+3TC+EFV ABC/3tc+RAL OU DTG ABC/3TC+LPV/r-charope ABC/3TC+LPV/r-granulos ABC/3TC+EFV ABC/3TC+NPV Other	1 2 3 4 5 6 7 8 9 10 11 12 13 14 88	
402	ART start date (day/month/year)	[date]		
501	Do you have any comments or notes about any of these questions or responses? *Optional*	[text]		

CLINICAL RECORD DATA EXTRACTION FORM

No	Questions	Response Categories	Code	Relevant
001	CLHIV identification code	[text]		
002	Activista's name	[text]		
003	Province and district	Maputo City: Lhamankulo Maputo City: Kamavota Nampula: Monapo Gaza: Chibuto	1 2 3 4	
101	Number of ART clinic appointments missed by the child during the last 6 months *If unknown enter 99*	[integer]		
101_dk	Please comment on why this is unknown	[text]		101=99
102	WHO stage at ART initiation	Stage 1: Infection Stage 2: Asymptomatic Stage 3: Symptomatic Stage 4: AIDS/Progression of HIV to AIDS Unknown (comment)	1 2 3 4 99	
102_dk	Please comment on why this is unknown	[text]		102=99
103	WHO stage at last visit	Stage 1: Infection Stage 2: Asymptomatic Stage 3: Symptomatic Stage 4: AIDS/Progression of HIV to AIDS Unknown (comment)	1 2 34 99	
103_dk	Please comment on why this is unknown	[text]		103=5
104	Child's U=U or last VL test result *If unknown enter 99*	[text]		
104_dk	Please comment on why this is unknown	[text]		104=99
201	Do you have any comments or notes about any of these questions or responses? *Optional*	[text]		