



Reasons for Missed Visits and Influence of Phone Call Reminders on Retention of HIV-Infected and Uninfected Children Followed in Cameroon: The ANRS-PEDIACAM Cohort

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Abstract

Background

As many longitudinal studies, follow-up in the ANRS-PEDIACAM study is disrupted by repeated absences of participants to scheduled visits. This lead to missing data which influence the quality of results. We describe reasons for participants absence or non-compliance (NC) and assess the influence of phone call reminders (CR) on retention in care.

Methods

From November 2007 to 2011, 611 infants divided in three groups were included and followed in three referral hospital in Cameroon: HIV-infected children followed from the first week of life or not but diagnosed before seven month of life (n=210), HIV-uninfected children born to HIV-infected (HEU) (n=205) mothers or not (HUU) (n=196). From 2014 to 2017, CR were reinforced to record reasons of missing visits. we used frequency, chi-square or Fisher test for categorical variables; means, median (IQR) and non-parametric Kruskal Wallis test for continuous variables. A multistate transition modelling approach was used to analyse the retention care cascade. The R software was used to perform all statistical analysis.

Results

During the study period, 45.1% (246/546) of children were NC at least once of which 16.3% (25/153), 58% (116/200), 54.4% (105/193) respectively among HIV-infected, HEU and HUU-children. Among NC, 69.5% (171/246) has been reachable at least once and 22.2% (38/171) of them returned to follow-up after a median delay of 32 days (IQR: [2.0 – 110]); 44.4% (109/246) were not seen throughout the study period (HIV-infected: 12/153, HEU-children: 57/200, HUU-children: 40/193). A total of 276 reasons have been reported among 54%(115/213) of the NC, mainly related to delocalisation (30.4%), lack of time (23.6%), wish to stop follow-up (11.6%), travelling (9.8%), schooling (9.4%), forgetting (7.2%). Comparing before and after period, CR allowed to divided by three adjusted relative risk ratio to miss one clinical visit (RRR [CI]: 0.35[0.24 – 0.52]), However CR effect was not significant among children who are non-compliant.

Conclusion

Our finding suggest that maternal HIV and socio-economic status are related to attendance of children in HIV care. Also, the CR are an effective strategy to improve attendance. However, to make this strategy effective for children who are non-compliant, it needs to be strengthened by community monitoring.

Introduction

The Human Immunodeficiency Virus (HIV) infection remains a major problem in sub-Saharan Africa countries with bear the heaviest global burden with nearly 67% of persons living with HIV (PLWH) in 2019 (1). The scale-up of HIV testing and antiretroviral therapy (ART) has helped to control the disease and

improve the survival and quality of life of PLWH (2). These global efforts had also an impact on the prevention of new HIV infection among children born to HIV infected mother, leading to a 60% reduction of the number of HIV pediatric infection in sub-Saharan Africa between 2002 and 2013 (3) and increasing of the number of HIV-exposed uninfected (HEU) children.

Coverage of ART among HIV-infected children has also improved during these last years. In 2017, 52% of HIV-infected children received ART. However, ART programmatic success requires both a sustainable supply of ART at the facility level and lifelong adherence to treatment by PLWH (4). Poor ART retention in care and adherence may lead to virological failure, reducing future therapeutic options (5, 6), in the context of very limited access to the second and third lines regimens, and a hindrance in achieving UNAIDS 90-90-90 targets set for 2020 (7, 8). Retention in care also concerned HEU-children as it has been demonstrated that they are at high risk of mortality and morbidity compared to children born by HIV-uninfected mother (HUU) during the first year of life (9–11). The mechanisms of occurrence are not fully understood (12–14).

The ANRS-PEDIACAM cohort is constituted of HIV-infected, HEU and HUU children groups followed in Cameroon. As most prospective studies, it is threatened in its management by episodic and repeated absences to scheduled visits (8, 15). In that cohort, the proportion of “Non-compliant (NC)” children increased gradually during follow-up, especially among HIV-uninfected children. This could have consequences not only on their health, but also on the analysis and interpretation of the results. The reminders methods based on mobile telephony tools might help in improving patient adherence in health facilities (16–18). Based on that hypothesis, we reorganized and intensified the use of phone calls within the ANRS-PEDIACAM study from April 2014.

The aims of this study were to describe the reasons for missing scheduled visits and to assess the influence of phone call reminders (CR) on retention.

Methods

Study setting: the ANRS-PEDIACAM cohort study

This study was developed within the framework of the ANRS-Pediacam cohort which is an ongoing longitudinal study coordinated by the Centre Pasteur of Cameroon, designed to assess the feasibility of early HIV-diagnosis and early treatment of HIV-infected children in resources limited settings (19, 20). From November 2007 to October 2011, a total of 611 children were included in three groups and followed in three referral hospital in Cameroon (the Mother and Child Center of the Chantal Biya Foundation (MCC-CBF) and the Essos Hospital Center (EHC) in Yaounde, and the Laquintinie Hospital in Douala (LHD)). These groups consist of: HIV-infected (n=210), HEU-children (n=205) and HUU-children (n=196). Follow-up was scheduled three-monthly until the age of two years, then six-monthly for HIV-infected children; while HIV-uninfected children were followed six-monthly.

Study population

Our study population consisted of children followed in the ANRS-PEDIACAM cohort. By April 2014, 65 (10.6%) died (figure 3) leading to 546 children including 153 HIV-infected, 200 HEU, and 193 HUU considered in this study. Of these children, 160 (29.3%) were considered as non-compliant.

Intervention phone reminders strategy and data collection

From April 2014 to April 2017, we issued every week a list of expected children for their visit. Phone calls were conducted by a Clinical Research Assistant as follow:

- *At week i , all the NC children of the week.*
- *If not seen, wait two weeks before calling back*
- *If still not seen restart the procedure immediately for HIV-infected children or wait for two months before restarting for uninfected children.*

The topics discussed on phone were: *children vital status, reminder of the missed visit, reasons for missing, and taking an appointment to return to care.* The collected data were then entered into an Access database.

Data used

We used socio-demographic data collected at the study inclusion, the subject history of missing visit, the reasons for non-return to the visit for NC children and phone reminder from April 2014 to April 2017.

Outcome definition

A child was considered to have missed a visit ' V_i ' if he did not come to the expected date of the visit ' V_i ', and never returned since that date until his next scheduled visit ' V_{i+1} '.

The outcome was "Non-compliant (NC)" defined as children alive or unknown status who missed at least two consecutive visits.

Statistical analysis

Socio-demographic parameters and reasons for missed visits were described and compared between groups using respectively frequency, chi-square or Fisher test for categorical variables; means, median (IQR) and non-parametric Kruskal Wallis test for continuous variables. A multistate transition modelling approach was used to analyse the retention care cascade. Follow-up time was discretized into intervals centred on the scheduled visit date for each child. At each time interval, four discrete states were defined using children-level data: seen, alive and not seen only at the current visit (missed visit), alive and not seen since the last scheduled visit (Non-Compliant), and deceased. Figure 1 is a graphical representation of the states and possible transitions. States transition matrix was calculated under the first-order Markov dependence assumption. To evaluate the influence of the call reminder enhancement performed on retention, we use a multinomial regression model (characterized by: retention to the care; duration of

consecutive missing scheduled visit and mortality) to estimate the Relative Rate Ratio (RRR) (21) associated with each. A p-value of 0.05 or less was considered to be statistically significant. The R software *version 3.3.3* was used to perform all statistical analysis.

Results

Population characteristics

Of the 546 children considered at the start of this sub-study, 193 (35.3%) were HUU, 200 (36.6%) HEU and 153 (28.0%) HIV-infected. Among them, 48.5% (n = 265) were included at the MCC-CBF, 27.8% (n = 152) at EHC in Yaounde, and 23.6% (n = 129) at the LHD in Douala. The children characteristics at inclusion differed significantly among groups (Table 1). Compared to the HIV-infected group, mothers of uninfected groups (HUU and HEU) were more likely to be educated, employed, and involved in a stable relationship.

Non-compliance to visit

At the beginning of this study, 29.3% (160/546) were NC (April 2014), mostly HIV-uninfected children (36.9% (145/393) vs 9.8% (15/153), $p < 0.001$) (Fig. 3). Non-compliance status was also associated with the site of inclusion and follow-up group (Table 1). Among children who were NC at the beginning of our intervention, 68.1% (109/160) did not return for follow-up during the entire evaluation period with a median delay from the last visit of 71 months (IQR: [60–83]); respectively, 80% (12/15), 72.1% (57/79), 60.6% (40/66) from the HIV-infected, HEU, and HUU groups. From the 386 compliant children at the beginning, 77.7% (300/386) remained compliant during the study period and the remaining 22.3% (86/386) became NC with a median cumulative delay from the last visit of 34.2 months (IQR: [27.6–44.3]). This leads to a total of 35.7% (195/546) NC to visit at the end of the evaluation in April 2017; showing about 6.4% increase of the number of NC.

A total of 45.1% (246/546) of children had been considered NC at least once including 16.3% (25/153), 58% (116/200), and 54.4% (105/193) respectively in HIV-infected, HEU, and HUU groups (Fig. 3).

Figure 2 shows the number of children with available data as a function of the potential length of follow-up time. The number of children not seen was more important in the HEU and HUU group and increased during follow-up. However, in the HIV-infected group, the gap observed is attributable to mortality in the early follow-up period.

Tables 3 and 4 provide a summary of state transition rates before and after call reminder enhancement (CRE), using all data aggregated over time. Entries in the upper left indicate the cyclic nature of retention in care: among those seen at their current scheduled visit, the rate of retention in care is 84% and 89% respectively before and after CRE. Among those not seen only at the last visit, about 47% and 54% respectively before and after CRE, become NC at the current visit. The estimated probability transition matrix shows that children who are NC have a higher risk to not return for follow-up.

Phone calls results

About 1069 phone calls were made for the 868 visits scheduled to NC children when they were NC during April 2014 to April 2017, among these calls 693(64.8%) were unreachable. Of the 376(35.2%) reachable phone calls which resulted in an interview, 168(44.7%) ended with an appointment and 26.2%(44/168) were subsequently realized (Fig. 4). The proportion of unreachable phone calls increased significantly with a long delay since the last visit (35% for ≤ 7 months; 45% for 7–12 months, and 65% for > 12 months, $p < 0.001$). About 80.3%(171/213) of called children were at least once reachable while 19.7% (42/213) were always unreachable during the evaluation of which 71.4%(30/42) were already NC before the evaluation period.

Reasons why children and parent's pairs weren't returning for follow-up

Of the 376 reachable phone calls realized, about 54%(115/213) of contacts provided reasons ($n = 276$) why they did not come back to visits (Fig. 4 and Table 2). These reasons were mainly: changing of residence (30.4%), lack of time (23.6%), wish to stop follow-up (11.6%), parent and/or child trip (9.8%), school attendance by children (9.4%), forgetfulness (7.2%), illness or death of a relative (4.7%) and 3.3% other reasons including lack of motivation. This distribution did not change with those of children who were always NC. No significant difference was found between the reasons given in each follow-up group. Two-third of parents whose reason of non-returning for follow-up was changing of residence have always been non-compliant (Table 2).

Impact of phone reminders on retention to care

Of the 160 NC children at the beginning of this evaluation, 31.8% ($n = 51$) returned to follow-up (Fig. 3). Among children, whose parents were called and reached at least once, 21.2% (38/171) returned to follow-up (Fig. 4). We also noted that among the 2046 visits completed, 32.2% (659/2046) were after the scheduled date of appointment; and among them, 91% (600/659) were achieved through phone calls.

Factors associated with state transition probability

Tables 5, 6, and 7 show the effect of covariates on the state transition probabilities in terms of relative rate ratio. Among the key findings:

- The adjusted relative rate ratio (RRR) of death among HIV-infected children who missed their last visit was significantly higher (RRR [CI]: 12.32 [3.54–42.85]) compared to HEU children who were missed at their last visit. The RRR of death among HIV-infected children who were NC at their last visit was significantly higher (RRR [CI]: 8.76[1.60–47.9]) compared to HEU-children;
- The RRR of death among children who are missed their last visit, whose mothers are housewives or unemployed was significantly higher (RRR [CI]: 3.24 [1.8–13.0]) compared to children whose mothers have a paid activity;
- The RRR of missing visit among children seen at their last visit was divided by three (RRR [CI]: 0.35 [0.24–0.52]) after enhancement of call reminder. However, call reminder had no significant effect among children who were missed or non-compliant at their last visit;

- The RRR of missing visit among HIV-infected children who were seen at their last visit was reduced by one third (RRR [CI]: 0.65 [0.53–0.82]) compared to HEU children who are missed their last visit;
- HIV-infected children (0.14 [0.08–0.23]) and HUU children (0.65 [0.44–0.94]) were less likely to be non-compliant compared to HEU children;
- Children included in the PEDIACAM cohort in 2011 and seen at their last visit had a higher relative rate ratio (RRR [CI]: 1.70 [1.11–2.61]) to miss their current visit compared to children included in 2008. The RRR of death among children included in 2009 and who missed their last visit was significantly lower (RRR [CI]: 0.38 [0.15–0.93]) compared to children included in 2008 who are missed their last visit. Children included in 2009 were less likely (RRR [CI]: 0.60 [0.33–0.95]) to be non-compliant compared to those included in 2008 (Table 6);
- Children included in LHD were less likely to be non-compliant (RRR [CI]: 0.55 [0.37–0.82]) compared to children included in MCC-CBF. While children included in EHC were most likely to be non-compliant (RRR [CI]: 1.74 [1.66–2.60]) compared to those included in MCC-CBF;
- The RRR in Table 7 indicates that children from a low-income family (< 50000) are most likely to remain non-compliant compared to children from high income family (> 150000).

Discussion

This paper describes the reasons for missing scheduled visits and the influence of phone reminders on missing visit in the ANRS-PEDIACAM cohort from April 2014 to April 2017; which is an ongoing longitudinal study set up for more than ten years. Also, the influence of phone reminders on missing visit state, from inclusion to April 2017 was modelled using discrete time multistate framework characterized by: retention to the care; duration of consecutive missing scheduled visit and mortality.

Overall, about 45% of children followed had been considered NC at least once during the evaluation period. The proportion of NC was significantly higher (56%) among HIV-uninfected children particularly among HEU-children (58%). This observation reinforces those reported by Sidze et al (22) in a previous study conducted in the same cohort which showed that the proportion of lost to follow up children was significantly lower in HIV-infected and HEU-children compare to HUU-children, and only 35% of the latter could be joined by phone calls. The high proportion of NC among HIV-uninfected children might be related to parent decision. As a longitudinal study, PEDIACAM has consisted of regular clinical visits. The parents whose child is not sick, or shows no signs of illness, may not perceive the importance of regular clinical visits and will even try to stop follow-up as was observed in 90.6%(29/32) of those who show interest to stop. On the other hand, a high proportion of mothers (42%) of HEU-children were unaware of their HIV status before prenatal HIV screening. The Woman who had not disclosed her own HIV infection status to the family (especially her partner) had difficulties justifying frequent visits with the child to the health facility. Fear of violence and stigma from their families prevented them from utilizing HIV care services (23).

In this study, phone calls reminder had considered as a search tool on returning to care. The influence of this intervention in improving patient adherence in health facilities had been shown in a similar context (16, 17, 24). Only 35.2% of the total phone calls made resulted in a phone interview. The reasons for NC to missed visits were mainly related to geographic mobility of population (relocation, travels), lack of time, and forgetfulness. These reasons are similar to those presented in other study (25). However, in our study, others important reasons like stigma, lack of money, and the cost of transport were not mentioned as indicated in some studies conducted in the resource's limited countries (22, 25–28). In fact, in PEDIACAM study, to avoid missing scheduled visits, free medical support and reimbursement of transport fares were brought to the children. This is curious when we find that it's the uninfected children who miss the most visits, and that is why we can think that this stigma reason could have been masked among the answer we collected.

The predominance of relocation (30.4%) among reasons given in our study could be explained by people dynamic related to study duration. Some of the parents were transferred for professional purpose, others relocated because of economic reasons or modification of the composition of the family with the death of one of the parents. Most of the parents who change the place of residence had children always NC indicating that specific measures should be implemented to tackle such a problem.

Phone call reminders (CR) allowed to reduce significantly adjusted relative risk to miss one scheduled visit to two third. This result shows that CR are an effective intervention to improve the retention in care. Our results are in line with those recently published in a systematic review of current clinical evidence of CR on retention to care among HIV patients (29). The later used the results from nine studies carried out in four sub-Saharan African countries (Cameroon, Kenya, South Africa, Eswatini), Switzerland, United Kingdom and United States of America. However, this intervention shows weaknesses for children non-compliant. Indeed, a large number of calls performed among non-compliant children remained unreachable throughout the study period.

Multivariate analysis identified others economically and individual's factors associated with a missing visit or non-compliant: HIV infection, low family incomes, mother's occupation. In addition, low-income family live in a precarious situation, which leads to frequent relocation to find a better situation or for seasonal work. This may result in an increase in the distance from the site of care, an increase in the cost of transport and therefore pre-financing difficulties. On the other hand, most of the mothers (40%) of HEU-children were housewives or unemployed at the inclusion of their child in the study. However, it can be noted that mothers who were housewives or unemployed were not financially independent and therefore needed financial support from a partner or their families to come frequently to clinical visits.

This study has some limitations: the phone calls were the only research tool used in this study for reminders and collection of informations about the reasons for missing visits. More than half of calls performed were unreachable. As a result, reasons for missing visits were not always available, and could only be collected from those who were reachable. The time intervals between clinical visits were irregular throughout the follow-up. In multivariate analysis, we only considered covariables measured at inclusion

in our study. Indeed, the model was the concern with missing visits, and at these visits, the dynamic data were missing. In this context, the modeling requires a step of the imputation of the missing data beforehand. In a recent paper, Lee and al (21) used a most recent observed value for imputing missing data, however this strategy to deal with missing data is not always appropriate. In future work, comparing this method with other imputation strategies may determine the best way to consider dynamic data in this framework.

Conclusion

Our findings suggest that maternal HIV infection and socioeconomic status could influence the attendance of children in HIV care. Strengthening counselling of mothers of HIV-uninfected children to better explain the objectives of the study and the reasons of their participation can help to improve the attendance of HEU-children as well as HUU-children. On the other hand, the phone call reminder is an effective intervention to improve attendance to care. However, this intervention is limited among non-compliant children, due to the high proportion of unreachable calls, what indicates that this strategy cannot be used alone and should always be associated to be more effective like community monitoring.

Declarations

Ethics approval and consent to participate

The ANRS-Pediacam study was granted ethical approval in Cameroon by the National Ethics Committee and in France by the Biomedical Research Committee of the Pasteur Institute of Paris. The Cameroon Ministry of Public Health gave administrative authorization to start the study. We obtained free and informed consent from all study participants.

Consent for publication

We give our consent to the publication of this work.

Availability of data and material

The data and tools of this study remain available and are maintained by our teams.

Competing interests

We declare that this study is not subject to any conflict of interest.

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Authors' contributions

Conceived and designed the experiments: TMC AF JW PIC. Analyzed the data: YSF TJB SCL TMC. Wrote the paper: YSF TJB TMC. Coordination of the study: TMC AF PIC JW. Recruitment and infants follow up: PIC GG ANF TS GD BA MA.

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Tables

Table 1
Proportion of NC children at the start of evaluation (31 March 2014)

	Compliant		Non-compliant		Total		P-value
	N	%	N	%	N	%	
	386	70.7	160	29.3	546	100	
Sites (n = 546)							< 0.001
MCC-CBF	176	66.4	89	33.6	265	48.5	
LHD	82	63.6	47	36.4	129	23.6	
EHC	128	84.2	24	15.8	152	27.8	
Groups of children (n = 546)							< 0.001
HIV-infected children	138	90.2	15	9.8	153	28.0	
HEU-children	121	60.5	79	39.5	200	36.6	
HUU-children	127	65.8	66	34.2	193	35.3	
Marital status of mother (n = 468)							0.121
Single/Divorced/Widowed	86	76.8	26	23.2	112	23.9	
Married/Cohabitation	244	68.5	112	31.5	356	76.1	
Mother's education level (n = 538)							0.574
None/Primary	66	75	22	25	88	16.4	
Secondary	218	69.2	97	30.8	315	58.6	
Higher	95	70.4	40	29.6	135	25.1	
Mother's occupation (n = 536)							0.229
At Home/Unemployment	157	74.4	54	25.6	211	39.4	
Training/education	70	69.3	31	30.7	101	18.8	
Paid activity	150	67	74	33	224	41.8	
Change of residence place (n = 446)							0.597
Yes	46	63	27	37	73	16.4	
No	250	67	132	33	373	83.6	
Mother vital status (n = 544)							0.264
Died	10	90.9	1	9.1	11	2.0	

	Compliant		Non-compliant		Total	
Alive	373	70.1	159	29.9	532	97.8
Not know	1	100.0	0	0.0	1	0.2
Father vital status (n = 542)						0.23
Died	7	70.0	3	30.0	10	1.8
Alive	361	70	155	30	516	95.2
Not know	15	93.7	1	6.3	16	3.0
Familly composition (n = 540)						0.049
Mother	149	75.6	48	24.4	197	36.5
Mother & father	217	66.8	108	33.2	325	60.2
Mother & grandmother/grandmother	7	63.6	4	36.4	11	2.0
Uncle/aunt/cousin/nephew/institution	7	100.0	0	0.0	7	1.3

Table 2

Not returning reasons among children NC at least once and children NC who didn't come back to visit during April 2014 – April 2017

Reasons	Children NC at least one N = 246(%)	Children NC who didn't return to visit N = 109(%)
Change of residence place city	84 (30.4)	60 (39.5)
Lack of time	65 (23.6)	27 (17.8)
Wish to stop follow-up	32 (11.6)	28 (18.4)
Parents and/or child trip	27 (9.8)	12 (7.9)
School attendance	26 (9.4)	10 (6.6)
Forgetfulness	20 (7.2)	6 (3.9)
Illness or death of a close relative	13 (4.7)	6 (3.9)
Lack of motivation	4 (1.4)	1 (0.7)
Others	5 (1.4)	2 (1.3)
Total	276 (100)	152 (100)

Table 3

State transition matrix over follow-up period before call reminder enhancement. Missed visit, and Non-compliant represent respectively the missing visit for short and long term.

State at tj				
State at tj-1	Seen	Missed visit	Non-compliant	Deceased
Seen	0.84	0.15	0	0.11
Missed-visit	0.5	0	0.47	0.036
Non-Compliant	0.13	0	0.86	0.008
Deceased	0	0	0	0

Table 4

State transition matrix over follow-up period during call reminder enhancement period. Missed visit, and Non-compliant represent respectively the missing visit for short and long term.

State at tj				
State at tj-1	Seen	Missed visit	Non-compliant	Deceased
Seen	0.89	0.11	0	0.001
Missed-visit	0.46	0	0.54	0.006
Non-compliant	0.08	0	0.92	0
Deceased	0	0	0	0

Table 5

Relative risk ratios for effect of covariates on transition from seen to missed visit or deceased, relative to remaining seen, ANRS-Pediacam cohort 2014–2017, Cameroon

State tj-1	Seen	
State tj	Missing-visit	Deceased
Call reminder enhancement	0.35[0.24–0.52]***	0.37[0.02–5.66]
Group		
HIV-infected	0.65[0.53–0.82]***	12.32[3.54–42.85]***
HEU	REF	REF
HUU	1.02[0.85–1.24]	0.99[0.20–5.00]
Year of inclusion		
2008	REF	
2009	0.83[0.66–1.07]	0.38[0.15–0.93]*
2010	0.83[0.63–1.08]	0.83[0.36–1.94]
2011	1.7[1.11–2.61]*	0.93[0.31–2.83]
Mother Education levels		
None/Primary	0.89[0.70–1.12]	0.95[0.44–2.03]
Secondary or Higher	REF	REF
Mother's occupation		
At Home/Unemployment	0.90[0.75–1.08]	1.08[0.52–2.24]
Training/education	1.12[0.90–1.40]	1.46[0.57–3.78]
Paid activity	REF	REF
***: pvalue < 0.001; **: pvalue < 0.01; *: pvalue < 0.05		

Table 6
Relative risk ratios for effect of covariates on transition from Missed visit to Non-compliant or deceased, relative to remaining seen

State tj-1	Missed visit	
State tj	Non-compliant	Deceased
Call reminder enhancement	0.72[0.36–1.44]	1.74[0.02–111]
Groupe		
HIV-infected	0.14[0.08–0.23]***	8.76[1.60–47.9]*
HEU	REF	REF
HUU	0.65[0.44–0.94]*	0.17[-]
Site		
MCC-CBF	REF	REF
EHC	1.74[1.66–2.60]**	2.53[0.54–11.8]
LHD	0.55[0.37–0.82]**	3.05[0.83–11.8]
Year of inclusion		
2008	REF	REF
2009	0.60[0.33–0.95]*	1.79[0.32–9.96]
2010	0.60[0.35–1.04]	1.57[0.26–9.40]
2011	1.59[0.67–3.76]	2.73[0.33–22.71]
Mother Education levels		
None/Primary	1.14[0.69–1.89]	1.06[0.31–3.56]
Secondary/Higher	REF	REF
Mother's occupation		
At Home/Unemployment		3.24[1.8–13.0]*
Training/education		0.99[0.09–11.21]
Paid activity		REF
***: pvalue < 0.001; **: pvalue < 0.01; *: pvalue < 0.05		

Table 7
 Relative risk ratios for effect of covariates on transition
 from Non-compliant to non-compliant relative to
 remaining seen

State at Tj-1	Non-Compliant
State at tj	Non-Compliant
Call reminder enhancement & Group	0.57[0.26–1.23]
HIV-infected	1.05[0.52–2.14]
HEU	REF
HUU	0.61[0.38–1.00]
Family income's (XCFA)	
<50000	2.81[1.34–5.92]*
50000–150000	1.53[0.85–2.75]
>150000	REF
***: pvalue < 0.001; **: pvalue < 0.01; *: pvalue < 0.05	

Figures

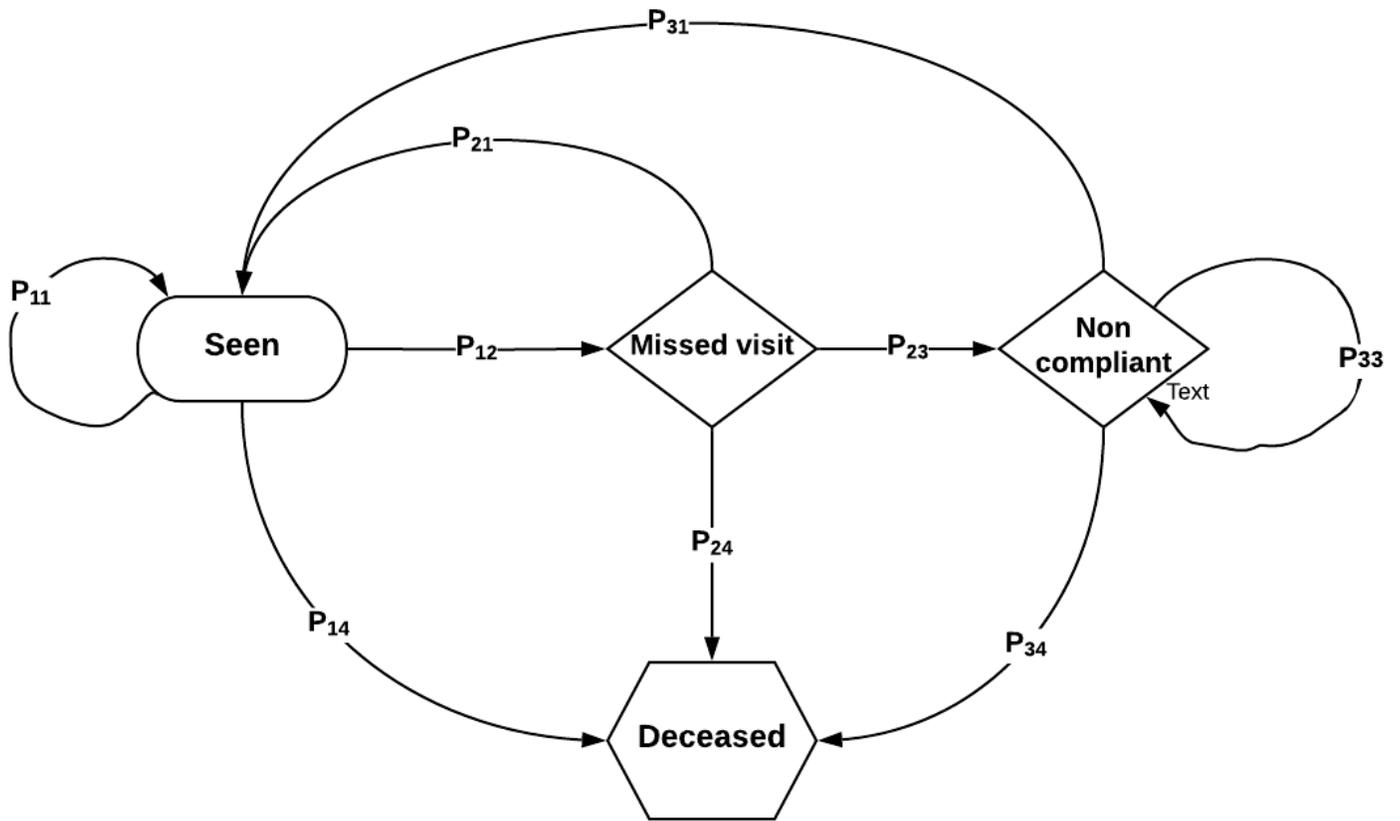


Figure 1

Cascade of state transition (Seen, missed visit, Non-compliant, deceased) during follow-up of HIV-infected children followed in Peditcam cohort. P_{ij} represent the transition probability from state i to state j during the follow-up period, where, $i, j=1, \dots, 4$ are the recoded state: 1= Seen; 2= missed visit; 3= Non-compliant; 4=Deceased.

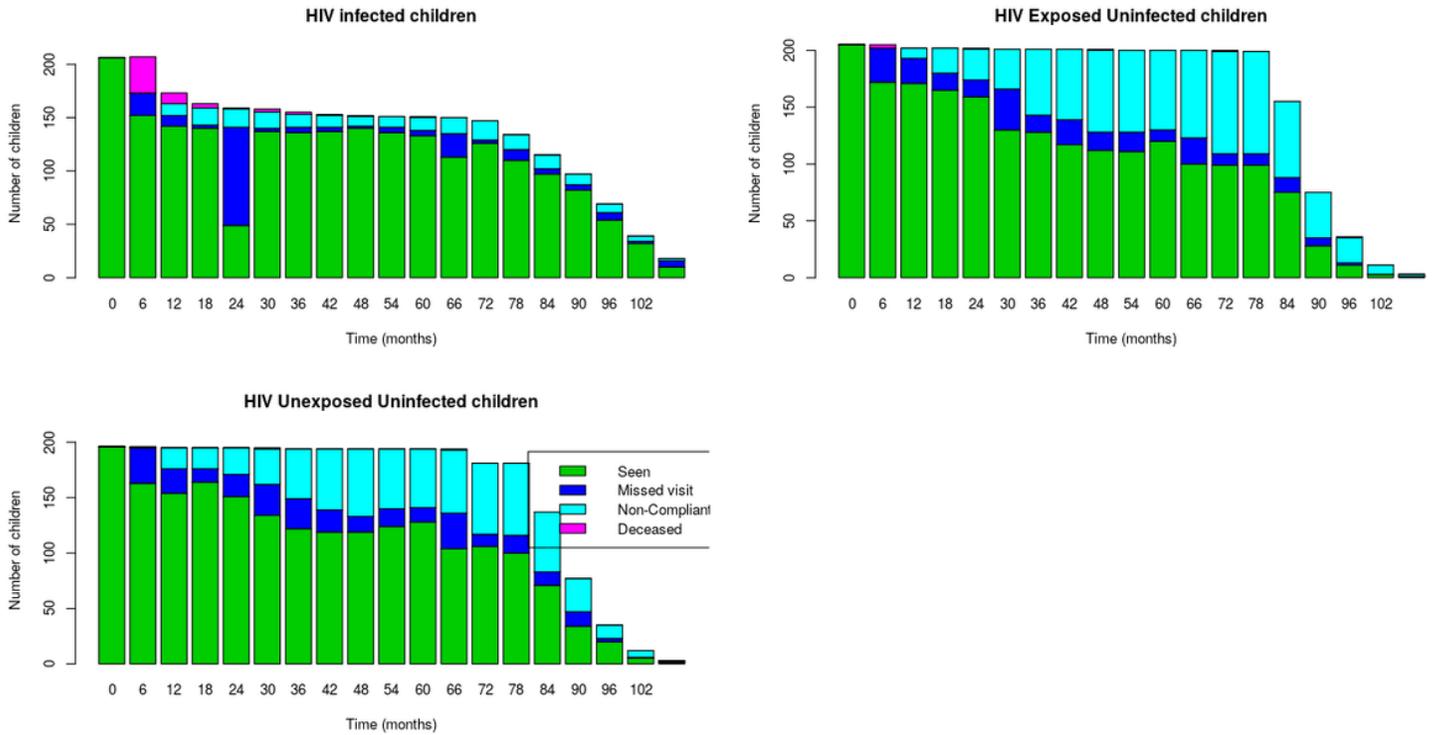


Figure 2

Number of children in each state over time.

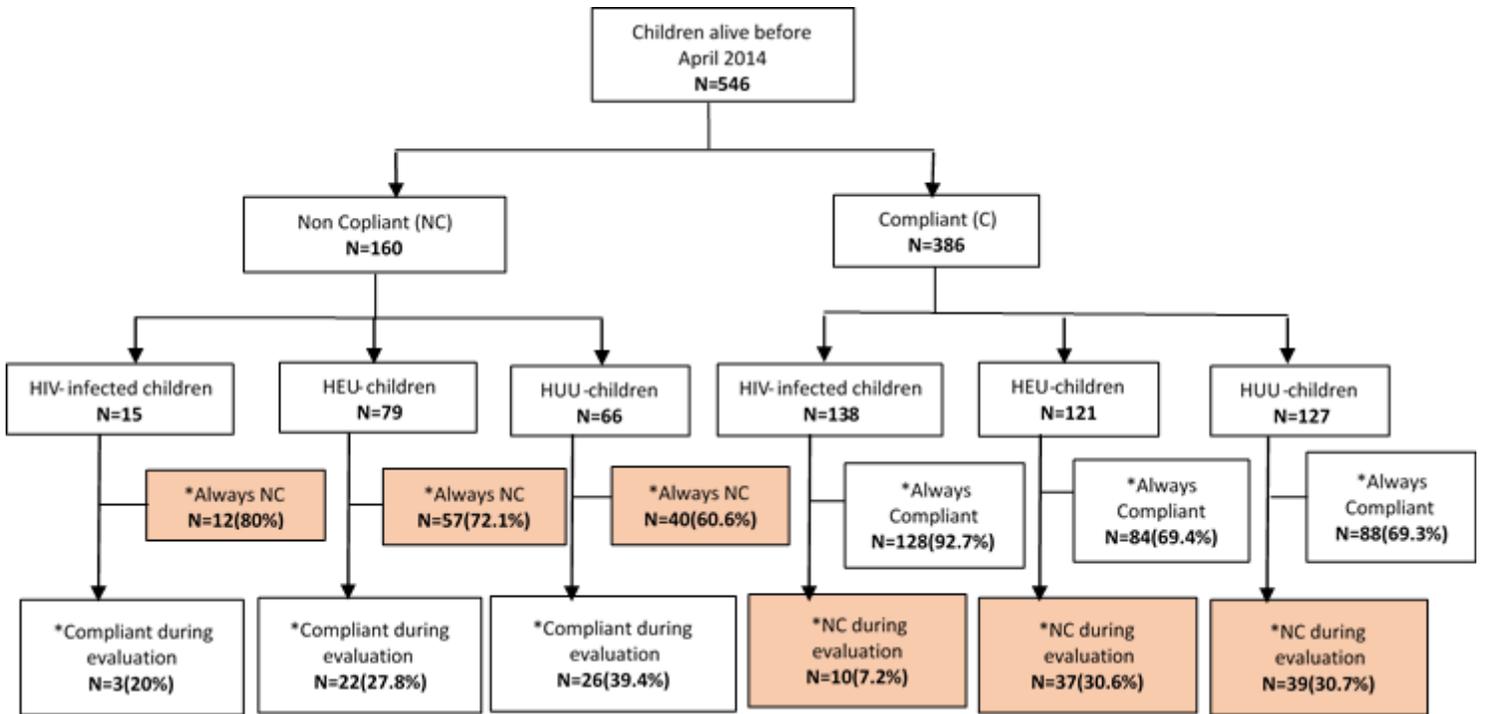


Figure 3

NC trajectory (flow) for children between April 2014 and April 2017, ANRS-Pediacam, Cameroon * Always NC: Designates among those who missed their last visit at the start, those who have never returned

throughout the evaluation period. *Always Compliant: Designates among the Compliant at the start, those who have always kept compliant status throughout the evaluation period. *Compliant during evaluation: Designates among those who missed their last visit at the start, those who have returned to at least one visit in the evaluation period.

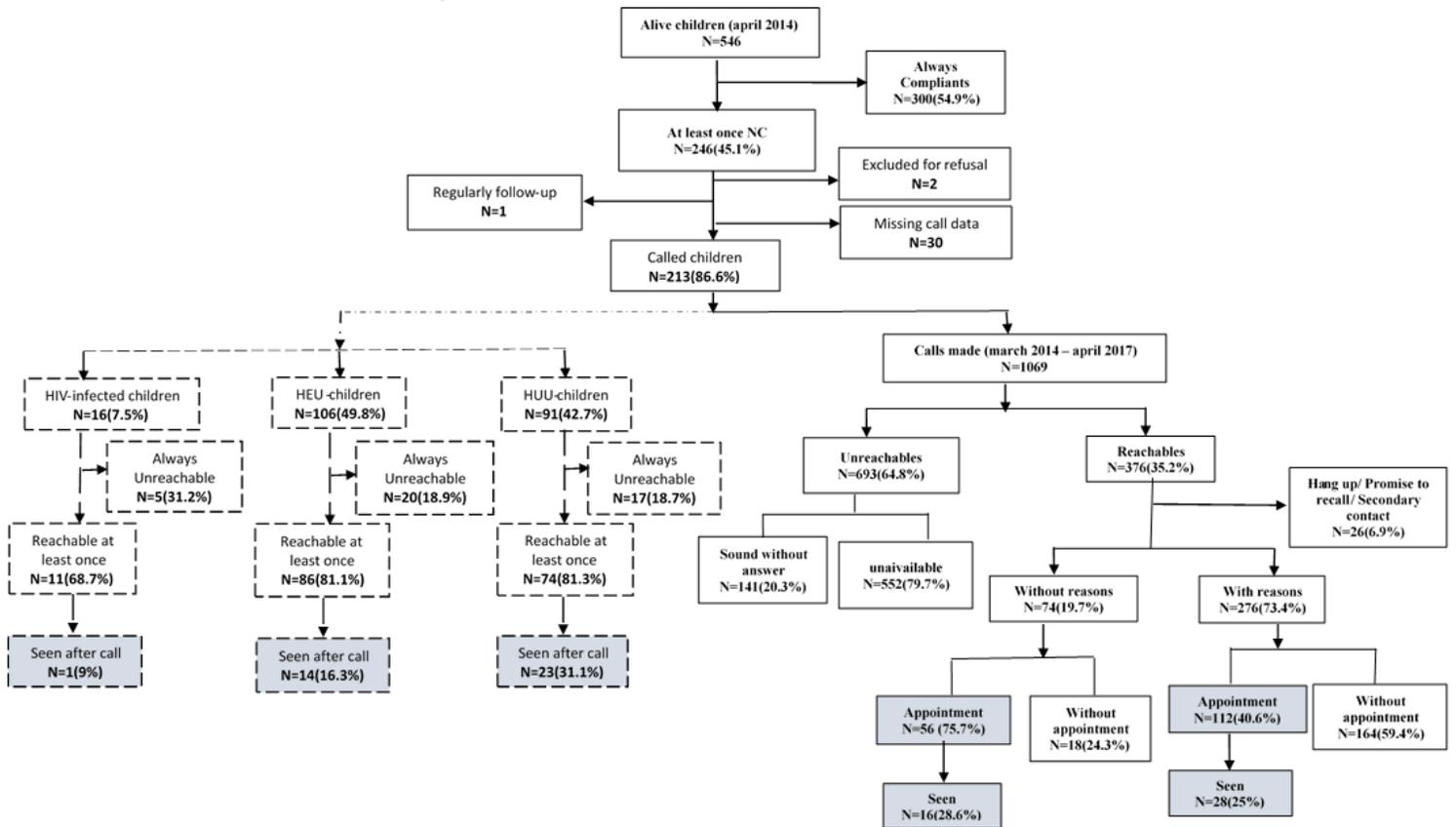


Figure 4

calls distribution by group and status