Haiti's community-based ART distribution strategy and its role in supporting patient retention

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Abstract

Haiti's community-based ART distribution strategy and its role in supporting patient retention

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Haiti developed a community-based ART distribution strategy (by its French acronym, "DAC") to reduce barriers to active ART participation and adherence. Patients who are stable on ART after the first six months of treatment are eligible for DAC. For patients interested in receiving ART in the community, health care staff distribute medications in the patient's home or at other agreed locations determined by the patient. We sought to evaluate the scale-up of the DAC approach and assess the relationship between DAC participation and active ART participation. In this mixed-methods descriptive study, we used secondary data on medication dispenses from 92 health facilities participating in Haiti's national-level electronic medical record system, iSanté. The data source covered person-level data on ART prescriptions from 92 health facilities, from January 2017 through March 2018. We examined documentation of DAC participation via pharmacy encounter forms, assessed patient, facility, and health network factors associated with

DAC, and described outcomes of active ART participation among DAC and non-DAC patients. We purposively sampled 8 facilities with greater and lesser documented use of DAC from two health networks, interviewing two key informants from each, to identify practices and challenges in implementing DAC and monitoring patient outcomes. Seventy-three facilities (79.3%) documented at least one DAC dispense, and 57 facilities that documented DAC (78.1%) showed reliable DAC documentation from January 2017 to March 2018. 18.0% of patients at the 92 facilities had at least once dispense delivered through DAC from January 2017 to March 2018, compared to 23.8% of patients at the 57 reliable DAC facilities. After adjusting for covariates, patients with a DAC dispense had an odds of being actively retained on ART following a dispense which was 16% lower compared to patients whose ART was dispensed in the clinic. We conclude that the DAC approach has scaled up in a variable way across health facilities. Documentation of the DAC approach within the national electronic medical record system could be improved.

Introduction

Haiti's response to HIV testing and treatment began in the late-1980s, and services were initially provided at a handful of specialized health facilities according to need and availability of resources. Since 2003, Haiti has worked towards scaling up its HIV treatment program to address the various stages of the HIV treatment cascade, including testing and diagnosis, starting and staying on antiretroviral therapy (ART), and achieving viral suppression.

In September 2015, the World Health Organization recommended that ART be initiated in everyone living with HIV at any CD4 cell count. For Haiti to achieve universal ART coverage it required significant expansion of testing and treatment services. Consequently, Haiti adopted differentiated care strategies, including DAC, a home-based ART delivery model, to increase access to ART.

A demographic health survey in 2016 determined that among individuals aged 15-49, the prevalence of HIV was 2.3% for women and 1.6% for men. Among individuals aged 15-24, the prevalence of HIV was 1.1% for women and 0.9% for men. HIV prevalence was higher among widows (14.1%) than among married women (2.6%) and single women (0.7%) ("Haïti Enquête Mortalité, Morbidité et Utilisation des Services (EMMUS-VI 2016-2017)", 2018). These numbers have remained largely unchanged since 2005 (Koenig, et al., 2010).

Auld, et al., examined national retention in Haiti throughout the HIV treatment cascade and determined that the results from 1985-2015 fall short of the 90-90-90 targets for HIV epidemic control. Additionally, retention outcomes varied across the 42 administrative districts in Haiti (ranging between 30% and 88%). The study also identified several factors affecting attrition, including unaffordable transportation costs and overcrowded clinics and long patient wait times (Auld, et al., 2017).

Since 2013, Haiti's national ART program has been working to expand enrollment while reducing loss to follow up. A community-based ART distribution strategy, known by its French acronym, "DAC", was developed to reduce barriers to active ART participation and adherence. Prior to the DAC program, patients were responsible for traveling to their health facility to pick up their ART medications, or entrusting a friend or family member to do so on their behalf. Patients who were at least 6 months stable on ART were eligible for DAC and worked with their facility to have their ART medication delivered by clinic staff to their home or at another fixed point in the community.

DAC was implemented in one facility in January 2015 and spread to a wide array of facilities in 2016. Patient participation was tracked using a DAC variable that was added to the iSanté electronic medical record (EMR) system in January 2017 as a "flag" on pharmacy dispensing forms.

In this study, we used quantitative and qualitative methods to explore documentation of DAC via pharmacy forms within the iSanté EMR system, describe and identify DAC use among patients and facilities, and assess the relationship between DAC and active ART participation (Table 1).

Table 1: Research objectives and methods

	RESEARCH OBJECTIVES	METHODS
1	Explore documentation of DAC, including the frequency and variation of DAC participation, the processes used to document ART dispenses, and participation in ART services within the context of DAC.	Quantitative and qualitative
2	Identify person-level factors associated with DAC use.	Quantitative and qualitative
	Describe the implementation of DAC by comparing its rollout across health facilities in the CMMB and UGP networks.	Quantitative and qualitative
3	Assess the relationship between DAC and the HIV program goal of active ART participation.	Quantitative

Methods

Study Design and Patient Population

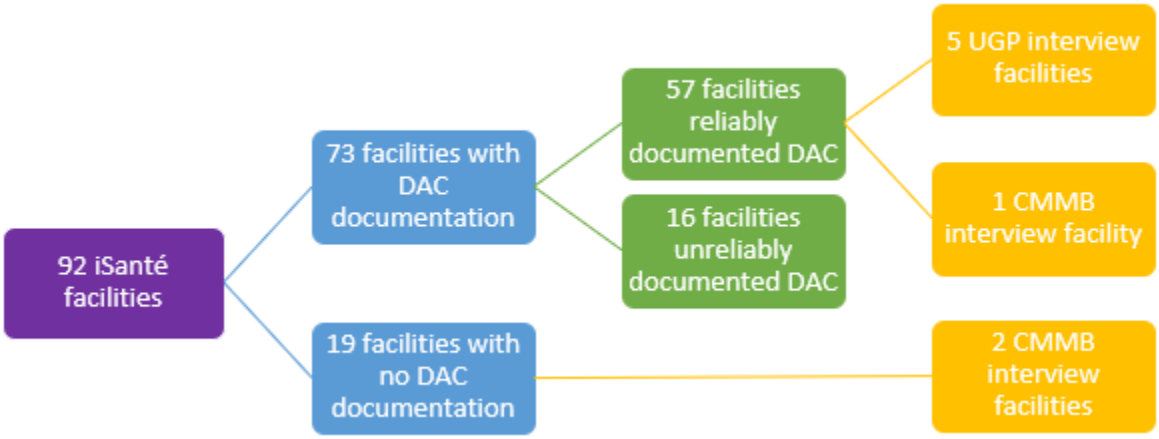
In this mixed-methods descriptive study, we used secondary data on ART medication dispenses from health facilities participating in Haiti's national-level EMR system, iSanté, and collected primary data from semi-structured group interviews with facility healthcare staff.

Secondary data from iSanté covered person-level information on ART prescriptions at 92 health facilities, from January 2017 through March 2018. We examined documentation of DAC participation via pharmacy encounter forms, assessed patient, facility, and health network factors associated with DAC, and described outcomes of active ART participation among DAC and non-DAC patients. We also examined person-level data on ART prescriptions from 34 health facilities in the Catholic Medical Mission Board (CMMB) and Unité de Gestion de Projet (UGP) health networks. These two networks were the first to pioneer the DAC program and advance the approach to other networks in Haiti, making them integral to understanding the implementation process.

We also collected primary data from 8 semi-structured group interviews with facility healthcare staff. Data from semi-structured interviews covered information about DAC implementation, patient participation on DAC, and the effectiveness of DAC for patients, facilities, and communities.

Figure 1 characterizes the scope of iSanté facilities in this study. Seventy-three of the 92 facilities in the dataset documented at least one ART dispense delivered through DAC. Fifty-seven of the 92 facilities reliably documented ART dispenses delivered through DAC. Thirty of the 34 facilities in the CMMB and UGP networks documented at least one ART dispense delivered through DAC, and 21 facilities reliably documented ART dispenses delivered through DAC. Of the 8 facilities that were interviewed, 6 reliably documented ART dispenses delivered through DAC.

Figure 1: The scope of iSanté facilities in this study



Data Source

De-identified secondary data came from iSanté, the largest of Haiti's three EMR systems, which is managed by the Ministry of Public Health and Population (MSPP). Patient participation in DAC was identified using a DAC variable that was added to the iSanté data system as a "flag" on the pharmacy dispensing form. This check box was added to paper forms and to the electronic version of iSanté starting in January 2017. This variable in the dataset tracked whether an ART dispense was distributed to the patient in the community. Observations were collected from the beginning of DAC implementation in January 2017 to March 2018.

Primary data was collected from semi-structured group interviews with key DAC program clinic staff, including Site Coordinators, Community Health Nurses, Community Health Managers, Social Workers, and Nurse Pharmacists at 8 facilities in the CMMB and UGP networks.

Measures

DAC definition

We examined DAC documentation at the dispense, patient, and facility levels. A dispense was considered a DAC dispense if it was marked with the DAC variable flag in iSanté. A patient or facility was considered a DAC participant or DAC facility if it had at least one ART dispense marked with the DAC variable flag.

Since the DAC variable flag was only available in iSanté after January 2017, and facilities began documenting DAC use at different times, we protected against misclassification by focusing our quantitative results on facilities with reliable documentation of DAC. A facility reliably documented DAC if it had at least five consecutive months of DAC documentation at any time between January 2017 and March 2018. Among the facilities with reliable DAC documentation, we inferred that DAC documentation could be interpreted as DAC use.

Active ART participation

Timely ART pickup was used to measure active ART participation. Timely ART pickup was defined as an ART dispense collected within 30 days after the expected pickup date. A patient was considered an active ART participant if they picked up a dispense within 30 days after the expected pickup date. To assess the relationship between DAC participation and the HIV program goal of increased active ART participation, we examined the 57 facilities that reliably documented DAC. We examined the outcome of whether the patient was active or inactive on ART following the dispense of interest.

Person-level covariates

Covariates at the person-level included demographic factors (age at ART initiation, gender, marital status) and clinical factors (WHO stage at ART initiation, year of ART initiation, and BMI at ART initiation).

Sampling

Research Objective 1: Explore documentation of DAC

We included all ART dispenses from all 92 facilities between January 2017 and March 2018. We also examined person-level data from 57 facilities that reliably documented DAC. We defined reliable documentation as a facility having at least five consecutive months of DAC documentation at any time between January 2017 and March 2018. We included all ART dispenses beginning the first month of the 5 consecutive months at each facility (**Table 2**).

Research Objective 2: Identify person-level factors associated with DAC use and describe the implementation of DAC within the CMMB and UGP networks

We examined the 57 facilities that showed reliable DAC documentation (hereafter referred to as "reliable facilities"). For each facility we included all ART dispenses beginning the first month of the 5 consecutive months of DAC documentation.

Furthermore, we purposively sampled 8 facilities in the CMMB and UGP networks to describe DAC implementation processes. To understand how policies and processes may differ between facilities with high and low DAC documentation, we purposively sampled 4 facilities with greater DAC documentation and 4 facilities with lesser DAC documentation. Facilities were chosen given feasibility of conducting interviews and the interest of the leadership of these networks to engage with the study team. In each facility, we held a group interview with 2 to 4 key informants to identify practices in managing patient information in association with their DAC programs. **Table 3** shows the participants who were present in each group interview.

Research Objective 3: Assess the relationship between DAC and active ART participation

We used a single ART dispense from each patient at the 57 facilities that reliably documented DAC. We selected the last ART dispense where it was possible to observe whether the patient remained an active ART participant or became inactive following the dispense, before the closure of the dataset in March 2018.

Table 2: Study sampling

	FACILITIES	PATIENTS	ART DISPENSES
Objective 1: DAC documentation	92	58,242	281,798
Objective 2: DAC participation and implementation	57	40,729	153,507
	8	7,872	38,960
Objective 3: DAC and ART retention	56	30,675	30,675

Table 3: Interview participants across 8 facilities

Group interviews	Site Coordinator	Community Health Nurse	Social Worker	Community Health Manager	Nurse Pharmacist
1, 2, 6					
3					
4					
5, 7					
8					

Quantitative Analysis Methods

We used frequency tables to describe DAC documentation across facilities, patient groups, ART dispenses, and time.

We performed a chi-square test at 5% level of significance to test the null hypothesis of no association between 3 sets of associations: 1) between DAC and active ART participation; 2) between active ART participation and each covariate; and 3) between DAC and each covariate.

We used a logistic regression model at 5% significance to test the association between active ART participation and DAC documentation, adjusting for the person-level covariates mentioned above. We assumed that there was some level of correlation between patients and their ART dispenses within each health facility, so we declared the data to be correlated at the health facility level, and used a population-averaged generalized estimating equations model with a binomial family, logit link, and robust standard errors for appropriate estimation of associations and their confidence intervals.

Qualitative Analysis Methods

Our qualitative analysis sought to explore DAC implementation processes, including similarities and variations, across facilities. Focus group discussions with key informants were conducted in French by a Haitian researcher in Haiti (W.D.). Summary notes were transcribed and typed by W.D. into French, and were translated into English by M.R., using an online translation tool. Interpretation of the notes was verified with the Haitian researcher.

Focus group questions were organized into three themes: describing DAC implementation, describing patient participation in DAC, and describing the effectiveness of DAC for patients, facilities, and the larger community (**Table 4**).

Thematic analysis and inductive coding were used to identify and report patterns and variations within the data. Summary notes were transcribed, read, and initial ideas were noted. Then, initial codes were generated to begin identifying larger patterns. Codes were first turned into higher order themes, which were then reviewed and refined to identify common and distinct procedures and practices in DAC implementation.

Table 4: Focus group guide

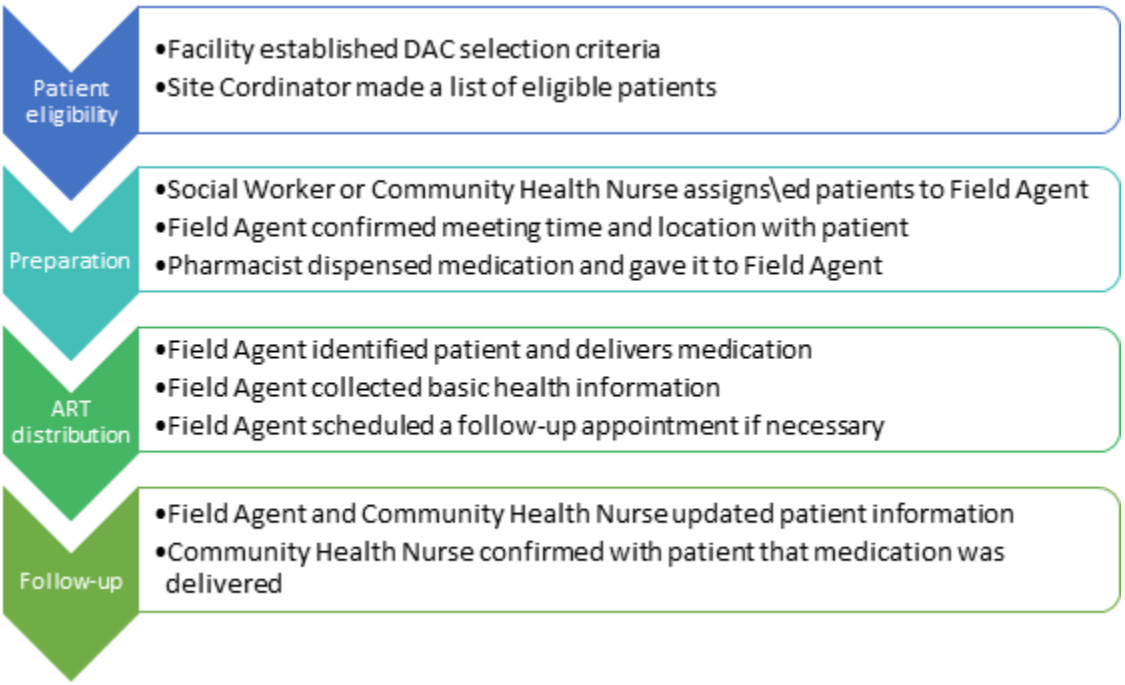
THEME	QUESTIONS
Describing DAC implementation	1. How does the DAC program at this site function from intake to dispensing and distributing medication? 2. What practices have changed in DAC implementation and why? 3. In what ways do you think the DAC program in your site is distinct from DAC in other sites? How are your procedures different? 4. What has been challenging about the implementation process? 5. What is your general perception or impression of the DAC program?
Describing patient participation in DAC	1. How are patients selected for participation in DAC? 2. What are the characteristics of patients who thrive on DAC? What are the characteristics of patients who do not do well (who struggle with ART retention and adherence with DAC)? 3. What are the main barriers to participating in DAC?
Describing the effectiveness of DAC for individual patients, facilities, and communities	1. How is the DAC program monitored and evaluated? 2. What are the benefits to the individual patient? 3. What are the benefits to the facility as a whole? 4. What are the benefits to the facility as a whole? 5. What improvements or changes would you like to see so the DAC program better meets the needs and preferences of the patient?

Results

DAC implementation

Across each of the 8 facilities participating in group interviews, DAC implementation consisted of four steps: determining patient eligibility, preparing for ART delivery, ART distribution and health check-up, and post-delivery follow-up. These steps are illustrated in **Figure 2**.

Figure 2: Steps in DAC implementation



Step I: Determining patient eligibility

The facility identified patients who were eligible for the DAC program based on certain criteria. Health care staff that were interviewed provided the following examples of selection characteristics:

- Patient has consented to the program
- Patient is at least 18 years of age
- Patient is stable on ART for at least 6 months
- Patient has a valid and fixed address
- Patient makes at least one clinic visit every 6 to 12 months

In most cases, the Site Coordinator prepared a list of eligible patients based on the selection criteria. Lists could be identified daily, weekly, or monthly. Once identified, the list was sent to the Social Worker or Community Health Nurse for follow-up.

Step II: Preparing for ART delivery

The Social Worker or Community Health Nurse contacted patients to inform them of their DAC eligibility either in person or over the phone. They explained what the program entailed and asked if the patient would like to participate. Health facility staff noted a number of reasons a patient could refuse to participate in DAC, such as: social stigma, including fear of discrimination and fear of HIV status disclosure; lack of ability to store or manage medication at home; having no permanent address; and not wanting health care staff to know where they live.

Once a patient consented to participate in DAC, the Social Worker or Community Health Nurse arranged the field work delivery schedule and assigned patients to Field Agents. Field Agents contacted their patients to determine a meeting time and location, and a way to visually identify the patient. The patient was responsible for choosing a meeting place, whether their home or another fixed point in the community, like the marketplace, church, school, or place of employment.

The Site Coordinator developed a health questionnaire so the Field Agent could collect basic health information about the patient. This short interview included confirming general demographic information—name, age, phone number and address, next appointment date—and asking questions about the patient's general health—new symptoms, weight gain or loss, and any other complications. Finally, the Physician prepared and sent the prescription to the pharmacy, where the Pharmacist dispensed the medication and gave it to the Field Agent.

Step III: ART delivery and health check-up

Equipped with an electronic tablet and the packaged medication, the Field Agent met the patient at the predetermined location, and after a visual and verbal confirmation of the patient's identity, the Field Agent asked the patient to sign or otherwise verify receipt of the medication. Here, the Field Agent interviewed the patient using the health questionnaire to get a sense of the patient's overall health. If necessary, the Field Agent scheduled a follow-up appointment for the patient, either in the community or at the clinic.

In some facilities, community distribution was individual while in others it was done in a small group. Patients receiving DAC in a group setting had a specific meeting point based on their geographic location. Multiple Field Agents met with the group and collectively distributed medication and collected health information. Patient confidentiality was guaranteed by ensuring only patients in the group were present, and that the patient themselves came to collect their medication.

If patients failed to keep their appointment, the Field Agent returned to the clinic with the medication and rescheduled the appointment. If patients receiving DAC in a group failed to keep their appointment, the Field Agent contacted them to deliver the medication at home or at another fixed location chosen by the patient.

Step IV: Follow-up

The Field Agent and Community Health Nurse updated the patient's health information based on answers to the health questionnaire. The patient's file at the facility is reviewed, as well as their information in the iSanté EMR system. The Community Health Nurse followed up with a phone call to the patient to confirm that they received their medication.

Unique features in DAC implementation across facilities

Although DAC implementation followed a similar pattern across the 8 interviewed facilities, there was variability in how they offered DAC services to their patients. **Table 5** highlights these differences and shows in which step of the implementation process they occured. Key differences included how patients were referred to the DAC program, how Field Agents were assigned patients, the types of co-benefits offered to DAC patients, and the extent to which DAC was monitored and evaluated.

There did not appear to be significant differences in the implementation of DAC between facilities showing strong DAC documentation and facilities showing weak DAC documentation. Both groups acknowledged the importance of DAC in improving patient outcomes and emphasized healthcare staff solidarity when it came to running the DAC program. Interestingly, facilities showing strong DAC documentation observed more challenges to the successful implementation of DAC.

Table 5: Unique features in DAC implementation

STEP	UNIQUE FEATURE
I: Determining patient eligibility	Though some eligibility criteria remained constant across facilities, other criteria varied, such as level of self-awareness about the illness, mandatory clinic visits every 6 to 12 months, and a minimum age requirement. In one facility, DAC patients could refer other patients to the program.
II: Preparing for ART delivery	In some facilities Field Agents were assigned DAC patients at random, while in others Field Agents were assigned to patients living in specific geographic locations.
III: ART delivery and health check-up	One facility used a strategy of distributing ART to groups of patients living in the same geographic area. A team of healthcare workers meets the group at a fixed point in the community, where they deliver medication, collect health information, and offer counseling. Not all facilities provide transportation support to their Field Agents. Facilities differ in the co-benefits they offer to DAC patients, including individual and group education, counseling, and support sessions; and transportation benefits even if patients are not coming into the clinic.
IV: Follow-up	The extent of DAC program monitoring and evaluation is different across facilities. Some facilities monitor DAC activities daily, while others do so less often.

DAC program benefits, challenges, and opportunities to mitigate barriers

Overall, health care staff attested that the DAC program was crucial to efficient service delivery and they identify various benefits to the patient, facility, and the community (**Table 10**). For patients, benefits included reduced self-stigmatization, improved autonomy and ability to go about their daily activities, transportation cost-savings, reduction in stress related to a clinical setting, and increased access to trusted social support networks. Benefits to the facility include reduced workload for health care staff, and benefits to the community include opportunities for patients to spend time with their family and the community.

In addition to acknowledging the DAC program's benefits, health care staff also recognized a number of barriers to the successful implementation of DAC and DAC participation. Challenges were either a product of patient behavior or the larger environment. Person-level barriers included missing appointments, changing addresses or phone numbers without notifying the facility, their own socio-cultural perceptions of HIV and its treatment, fear of disclosure, and "medical shopping", or visiting different facilities to take advantage of patient benefits. Environment-level barriers included political unrest, natural disasters, HIV stigma in the community, certain residential areas being difficult to access, and technical difficulties with field equipment.

Despite these challenges, health care staff also identified ways to circumvent the barriers, including making periodic phone calls to update patient contact information, providing more support group opportunities, increasing the awareness of ART and DAC among patients and the community, providing more health services in the community (e.g., health screenings, general education and care, health campaigns), providing patients with incentives to participate in DAC, and creating a healthier climate of trust (**Table 10**). These were opportunities for facilities who have a low implementation of DAC to solicit increased patient participation.

Table 10: DAC program benefits and challenges

DAC PROGRAM BENEFITS	
Patient-level	• Reduces self-stigmatization in patients living with HIV • Improves patient's ability to go about daily activities • Increases autonomy • Provides transportation and other cost-savings • Makes it easier for patients to adhere, especially in difficult times or situations • Provides access to trusted social support networks • Reduces stress related to a clinical setting
Facility-level	• Decreases workload for health care staff • Gives providers more time to administer other services • Improves ability for facility to manage their budget
Community-level	• Gives patients the opportunity to spend time with their family and community
DAC PROGRAM CHALLENGES	

Patient behavior	• Missing appointments • Not notifying facility of address and phone number changes • Internalized socio-cultural perceptions of HIV and its treatment • Fear of disclosure • Visiting different facilities to take advantage of patient benefits (i.e., medical shopping) • Patient becomes too dependent on the field agent for support
Environment	• Political unrest • Natural disasters • Larger socio-cultural perceptions of HIV, including stigma in the community • Difficult to access residential areas • Technical difficulties with field equipment • Patient does not have space to store medication

CIRCUMVENTING CHALLENGES
• Making periodic phone calls to update patient contact information • Providing more support group opportunities • Increasing the awareness of ART and DAC among patients and the community • Providing more health services in the community (e.g., health screenings, general education and care, health campaigns) • Providing patients with incentives to participate in DAC • Creating a healthier climate of trust between patients, Field Agents, and the facility

DAC documentation

Data completeness in iSanté

There were a total of 281,798 dispenses for 58,242 patients in the 92 facilities, 247,566 dispenses for 51,073 patients in the 73 facilities, 153,507 dispenses for 40,729 patients in the 57 facilities, and 38,960 dispenses for 7,872 patients at the 8 interview facilities.

Nineteen out of 92 iSanté facilities (20.7%) had no documented DAC dispense from January 2017 to March 2018. The remaining 73 facilities (79.3%) documented at least one DAC dispense in that same time period. Fifty-seven out of the 73 facilities that documented DAC (78.1%) showed reliable DAC documentation from January 2017 to March 2018.

18.0% of patients at the 92 facilities had at least once dispense delivered through DAC from January 2017 to March 2018, compared to 23.8% of patients at the 57 reliable DAC facilities and 16.0% of patients at the 8 interview facilities.

Overall, 5.4% of ART dispenses were delivered through DAC at the 92 facilities between January 2017 and March 2018. The number of documented DAC ART dispenses increased steadily in that time period (**Figure 3**) as did the number of DAC dispenses relative to all ART dispenses (**Figure 4**).

Figure 3: Number of DAC ART dispenses from January 2017 to March 2018 (n=281,798 dispenses at 92 health facilities).

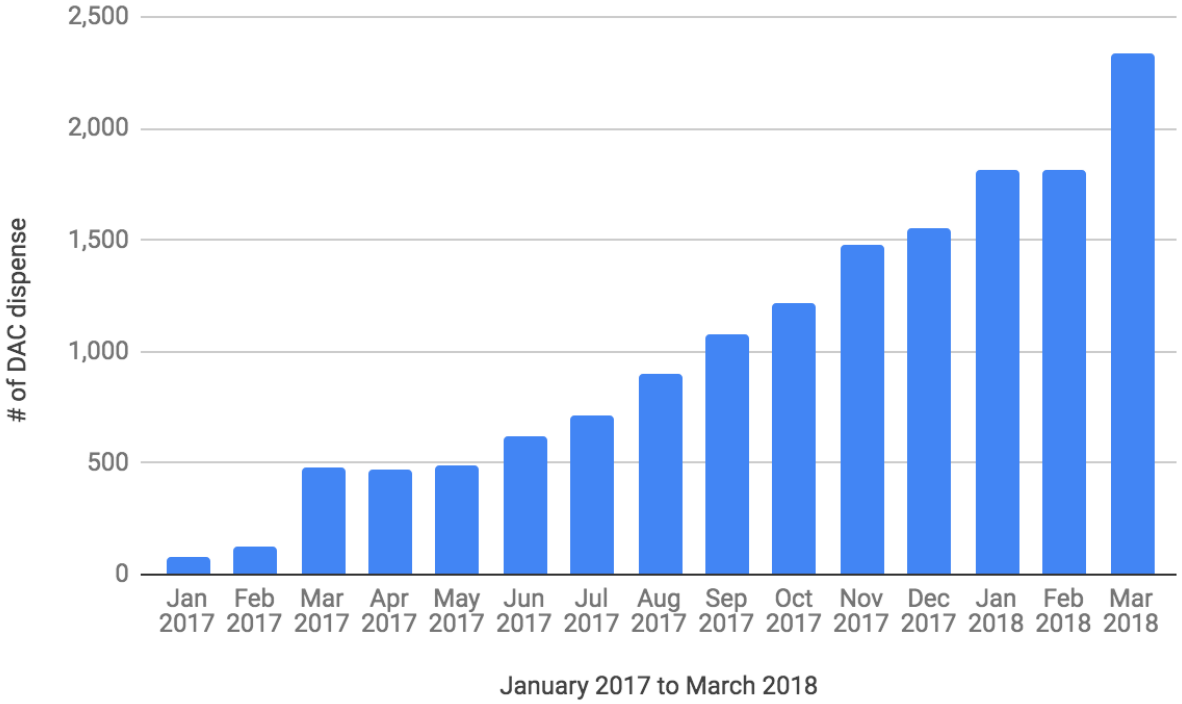
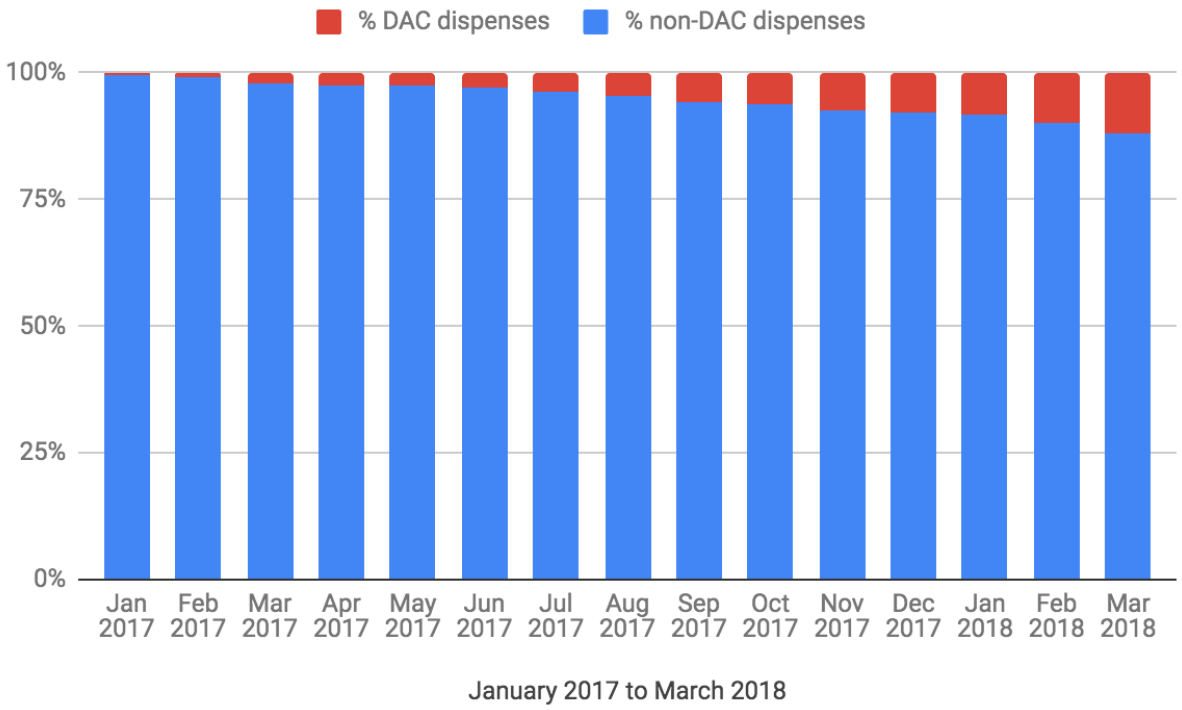


Figure 4: Proportion of DAC ART dispenses relative to all ART dispenses from January 2017 to March 2018



Among all ART patients at the 57 reliable DAC facilities, there were twice as many women as men, married patients constituted approximately half of the patient population, about three-fourths of the patients began ART between the ages of 25 and 54, and half had a normal BMI at ART initiation (**Table 11**).

Table 11: Summary of person-level characteristics across 57 reliable iSanté facilities

Variable	**Category**	**n = 40,729 patients**	
Gender	Female	25,754	63.2%
	Male	14,866	36.5%
	Missing	109	0.3%
Marital status	Married / cohabiting	20,882	51.3%
	Widow / divorced	5,300	13.0%
	Single	7,182	17.6%
	Missing	7,365	18.1%
Age at ART initiation	<15	2,198	5.4%
	15-24	4,459	10.9%
	25-54	30,251	74.3%
	55-89	3,341	8.2%
	Missing	480	1.2%
WHO stage at ART initiation	Stage 1	9,451	23.2%
	Stage 2	8,228	20.2%
	Stage 3	8,132	20.0%
	Stage 4	10,690	26.2%
	Missing	4,228	10.4%
BMI at ART initiation	Normal	20,976	51.5%
	Underweight	6,153	15.1%
	Overweight	4,934	12.1%
	Obese	1,646	4.0%
	Missing	7,020	17.2%

The proportion of DAC dispenses was 9.6% in the 57 facilities with reliable DAC documentation and 4.5% at the 8 interview facilities (**Table 12**).

Patients that were DAC participants made up 18.0% of all patients across the 92 facilities, 24.7% of patients at the 57 facilities with reliable DAC documentation, and 16.0% of patients across the 8 interview facilities.

27.5% of DAC participants received at least half their ART dispenses by DAC across the 92 facilities, compared to 42.4% across the 57 facilities with reliable DAC documentation, and 18.4% across the 8 interview facilities.

Table 12: DAC documentation across facilities

	ART dispenses delivered by DAC		**Patients that are DAC participants**		**DAC participants that received at least half their ART dispenses by DAC**	
All 92 facilities	15,178	5.4%	10,500	18.0%	2,891	27.5%
57 reliable facilities	14,665	9.6%	10,049	24.7%	4,265	42.4%
8 interview facilities	1,753	4.5%	1,256	16.0%	231	18.4%

Person-level factors associated with DAC use

Among both DAC and non-DAC participants at the 57 reliable facilities, there were twice as many women as men, married patients constituted approximately half of the patient population, about three-fourths of the patients began ART between the ages of 25 and 54, and half had a normal BMI at ART initiation. (**Table 13**). There was some difference in WHO category and BMI at ART start among DAC and non-DAC participants at the 8 interview facilities (**Table 14**).

Table 13: Summary of person-level characteristics for DAC and non-DAC participants at 57 reliable facilities

Variable	Category	DAC n = 10,049 patients		DAC n = 30,680 patients	
Gender* **	Female	6,247	62.2%	19,507	63.6%
	Male	3,774	37.6%	11,092	36.2%
	Missing	28	0.3%	81	0.3%
Marital status* **	Married / cohabiting	5,313	52.9%	15,569	50.8%
	Widow / divorced	1,170	11.6%	4,130	13.5%
	Single	1,783	17.7%	5,399	17.6%
	Missing	1,783	17.7%	5,582	18.2%
Age at ART initiation* **	<15	419	4.2%	1,779	5.8%
	15-24	1,309	13.0%	3,150	10.3%
	25-54	7,411	73.7%	22,840	74.5%
	55-89	777	7.7%	2,564	8.4%
	Missing	133	1.3%	347	1.1%
WHO stage at ART initiation* **	Stage 1	2,528	25.2%	6,923	22.6%
	Stage 2	2,004	19.9%	6,224	20.3%
	Stage 3	1,871	18.6%	6,261	20.4%
	Stage 4	2,504	24.9%	8,186	26.7%
	Missing	1,142	11.4%	3,086	10.1%
BMI at ART initiation	Normal	5,208	51.8%	15,768	51.4%
	Underweight	1,517	15.1%	4,636	15.1%
	Overweight	1,228	12.2%	3,706	12.1%
	Obese	414	4.1%	1,232	4.0%
	Missing	1,682	16.7%	5,338	17.4%

*p<0.05 **p<0.01 ***p<0.001 (p-values based on Chi2 test of independence)

Table 14: Summary of person-level characteristics for DAC and non-DAC participants at 8 interview facilities

Variable	Category	DAC n = 1,256 patients		non-DAC n = 6,616 patients	
Gender	Female	833	66.3%	4,202	63.5%
	Male	423	33.7%	2,411	36.4%
	Missing	0	0.0%	3	0.0%
Marital status* **	Married / concubinage	607	48.3%	3,262	49.3%
	Widow / divorce	143	11.4%	934	14.1%
	Celibataire	253	20.1%	1,210	18.3%
	Missing	253	20.1%	1,210	18.3%
Age at ART initiation* **	<15	203	16.2%	312	4.7%
	15-24	268	21.3%	688	10.4%
	25-54	346	27.5%	5,094	77.0%
	55-89	334	26.6%	508	7.7%
	Missing	105	8.4%	14	0.2%
WHO stage at ART initiation* **	1	346	27.5%	1,619	24.5%
	2	203	16.2%	943	14.3%
	3	268	21.3%	1,321	20.0%
	4	334	26.6%	1,950	29.5%
	Missing	105	8.4%	783	11.8%
BMI at ART initiation* **	Normal	676	53.8%	3,704	56.0%
	Underweight	131	10.4%	835	12.6%
	Overweight	214	17.0%	934	14.1%
	Obese	78	6.2%	356	5.4%
	Missing	157	12.5%	787	11.9%

*p<0.05 **p<0.01 ***p<0.001 (p-values based on Chi2 test of independence)

According to health care staff qualitative interviews, certain people did better in the DAC program. For example, patients who were adherent prior to starting DAC; patients who were motivated, open, and confident in the treatment; patients who understood and accepted their prognosis; patients with low stigma; patients who were educated and financially stable; and patients who had disclosed their HIV status to close friends and family tended to do well in the DAC program. There were also some patients who struggled with active ART participation and

adherence with DAC. These patients usually did not keep their appointments, they had not disclosed their HIV status to support networks, they were not educated or financially stable, they cohabitated with others, and visited multiple facilities to take advantage of patient benefits.

Relationship between DAC and active ART participation

In our analysis of the association between DAC participation and ART retention, there were a total of 30,675 dispenses (one for each patient), 2,608 DAC participants, and 28,067 non-DAC participants. Among patients retained on ART, 8.4% were DAC participants; among patients not retained on ART, 10.1% were DAC participants.

In our bivariate models we found that active ART participation was associated with DAC use, gender, marital status, age at ART initiation, year of ART initiation, WHO stage at ART initiation, and BMI at ART initiation.

After adjusting for covariates, patients with a DAC dispense had an odds of being actively retained on ART following a dispense which was 16% lower compared to patients whose ART was dispensed in the clinic (**Table 15**).

Table 15: DAC and ART retention

	OR	**95% CI**	**p-value**
Received ART via DAC*	0.84	[0.73, 0.97]	0.01
Gender			
Female	reference	reference	reference
Male	1.07	[0.98, 1.17]	0.11
Missing	1.27	[0.17, 9.26]	0.82
Marital status			
Married	reference	reference	reference
Widow / divorced	1.32	[1.15, 1.51]	<0.001
Single	1.20	[1.07, 1.34]	<0.001
Missing	0.99	[0.89, 1.11]	0.90
WHO stage			
Stage 1	reference	reference	reference
Stage 2	1.12	[1.00, 1.26]	0.06
Stage 3	1.21	[1.06, 1.37]	0.01

Stage 4	1.02	[0.90, 1.15]	0.73
Missing	1.37	[1.16, 1.61]	<0.001
BMI at ART initiation*			
Normal BMI	reference	reference	reference
Underweight	1.04	[0.92, 1.17]	0.56
Overweight	1.11	[0.98, 1.26]	0.11
Obese	1.32	[1.06, 1.64]	0.02
Missing	0.87	[0.76, 0.98]	0.03
Age at ART initiation			
Age 25-54	reference	reference	reference
Age <15	0.93	[0.76, 1.13]	0.47
Age 15-24	0.58	[0.51, 0.65]	<0.001
Age 55-89	1.10	[0.94, 1.28]	0.25
Missing	2.01	[0.27, 14.76]	0.49
Year of ART initiation**			
2004	reference	reference	reference
2005	0.54	[0.34, 0.85]	0.01
2006	0.88	[0.65, 1.18]	0.38
2007	1.25	[0.97, 1.61]	0.09
2008	1.44	[1.16, 1.77]	<0.001
2009	1.85	[1.48, 2.32]	<0.001
2010	2.52	[1.94, 3.28]	<0.001
2011	2.17	[1.77, 2.66]	<0.001
2012	2.19	[1.83, 2.61]	<0.001
2013	2.42	[2.04, 2.86]	<0.001

2014	2.14	[1.83, 2.51]	<0.001
2015	1.51	[1.31, 1.74]	<0.001
2016	1.86	[1.63, 2.12]	<0.001

*p<0.05 **p<0.01 ***p<0.001 (p-values based on logistic regression)

Recommendations to improve DAC implementation

Healthcare staff made a number of recommendations to improve DAC implementation and use. These can be characterized in three groups: increasing education and awareness, establishing standardized monitoring and evaluation protocols, and improving program staffing and resources (**Table 16**).

Staff perceived the need for increased education around HIV testing and treatment, and making patients aware of the benefits of the DAC program. They also wanted to see improvements made around monitoring and evaluation (M&E) protocols, particularly around standardized operating procedures for DAC implementation and operationalization, providing DAC training for providers, and monitoring of patient ART status on DAC. Finally, healthcare staff wanted more staffing and resources for DAC implementation, including upgraded equipment for Field Agents and an increase in the number of healthcare providers.

Table 16: Recommendations to improve DAC implementation

RECOMMENDATIONS FROM HEALTH CARE STAFF

Increasing education and awareness	• Raise general awareness of HIV in the community • Make patients aware of their status • Improve perceptions of HIV and DAC, and empower patients
Establishing M&E protocols	• Revise DAC eligibility criteria • More closely monitor patient status on DAC • Providing DAC training for providers • Create standardized operating procedures for DAC implementation and operationalization
Improving program staffing and resources	• Provide Field Agents with transportation for field work • Support and motivate health care staff • Emphasize quality of care over quantity of care • Increase the number of healthcare providers • Manage facility electricity and power issues • Maintain and upgrade equipment used by Field Agents • Offer to deliver other medication for patients with comorbidity • Increase the number of fixed points for ART delivery

Discussion

DAC was developed to address issues of low active ART participation and adherence to ART, yet prior to this study there had not been much reported about the program beyond pilot or small-scale implementation in Haiti. This study examined the larger-scale implementation of DAC and contributes to literature about DAC as a differentiated care strategy.

Evidence of DAC documentation across the 92 iSanté facilities was inconsistent and varied. It was unclear from both the iSanté EMR data and the group interviews whether a lack of DAC documentation necessarily correlated with a lack of DAC participation.

Healthcare staff saw DAC as an important program and identified benefits for patients, facilities, and the community. A number of patient benefits including cost and time savings and access to trusted social support networks are consistent with other studies of community-based ART distribution models (Rasschaert, et al., 2014; Decroo, et al., 2013). DAC program benefits for the facility and healthcare staff, such as reduced workloads, are also consistent with other community-based ART retention strategies in Haiti (Faturiyele, et al., 2018).

DAC implementation broadly consisted of the same four steps, but included some unique features across facilities. One challenge to the successful implementation of DAC included socio-cultural perceptions of HIV and ART, as well as the lack of awareness of the DAC program. One community ART group (CAG) program in Haiti mitigated this barrier by involving all stakeholders, including healthcare staff and patients, in the planning and delivery processes. Their study goes on to highlight the importance of early adopters of the program increasing trust by being the face of the implementation process (Naslund et al., 2014). While CAGs typically deliver ART medication in group settings, compared to DAC's home-based delivery model, both strategies aim to ameliorate health system challenges, like shortage of clinical staff and barriers to treatment, by involving community members in the continuum of care.

A second challenge to the successful implementation of DAC was the lack of a monitoring and evaluation plan. Study of CAG models in Mozambique and in South Africa determined that a patient-centered approach and strong accountability measures are required to develop an efficient and sustainable community ART distribution program (Rasschaert, et al., 2014; Grimsrud, et al., 2015).

In our study, there were statistically significant associations between DAC use and person-level covariates including gender, marital status, WHO stage at ART initiation, and BMI at ART initiation, however the magnitude of the differences were marginal and perhaps of limited practical significance.

Patients with a DAC dispense had a lower odds of being actively retained on ART than patients with a clinic dispense, a finding that is counter to the program theory. One explanation may be that patients who were enrolled in DAC were inherently different than patients who picked up their medication at the clinic. Facilities had some discretion over DAC eligibility criteria, i.e., criteria were not the same across all facilities. It is possible that in some facilities patients who could not access or afford transportation and thus struggled to reach the clinic were prioritized for the program. These patients may have also found it difficult to be actively retained on ART due to factors like employment, socio-economic status, comorbidity, disease severity, and deteriorating health status.

Another explanation for the lower retention among DAC patients may be that patients facing higher levels individual and social stigma may have had concerns about regularly seeking

treatment within the clinic and may have therefore preferred DAC. We were not able to measure and adjust for stigma in our analysis, so this could be an additional confounding factor explaining the lower retention among DAC participants. One possible solution for the program is to allow patients to refer other patients to DAC, as was done in one facility we interviewed. A recommendation from a more trusted source may help overcome stigma around DAC and ART treatment.

While we controlled for several patient characteristics in our analysis, we could not control for socio-economic status, employment status, stigma, and other factors which may be associated both with DAC participation and with the retention outcome. In summary, the finding that DAC was associated with worse retention cannot be interpreted as a failure of the program.

Limitations

There are several limitations in our study. First, some patients received ART prescriptions for longer intervals than others, and we did not adjust for this in our analysis. It is likely that patients with fewer ART dispenses had fewer opportunities to engage with DAC. A related limitation is that the iSanté DAC flag may not have fully captured the truth of DAC use. Initial rollout of DAC began as early as January 2015, though facilities did not formally begin documenting DAC use until January 2017. One possibility is that DAC was being used but not documented, in which case our findings may underrepresent the number of true DAC participants and the number of true dispenses delivered by DAC.

Third, the DAC program constituted only one of several differentiated care strategies that impacted ART service delivery in Haiti around the same time. Another strategy was lengthening ART prescribing intervals through multi-month scripting (MMS), which similarly aimed to reduce barriers to active ART participation and adherence. MMS was officially adopted in Haiti in November 2016, only a few months before DAC was first documented in iSanté. Like DAC, MMS also required patients be at least 6 months stable on ART. Thus, it is possible that patients who may have been eligible for the DAC program could have chosen to receive ART medication at the clinic through MMS instead of DAC. The direction and magnitude of this bias is unpredictable.

A fourth limitation is the narrow scope of the qualitative portion of the study. The 8 facilities in the CMMB and UGP networks that we purposively sampled cannot be considered representative of all DAC facilities. As we only spoke with healthcare staff who carried out program implementation, we cannot speak to the attitudes, experiences, and beliefs of patients who did and did not participate in DAC. We also hoped to understand DAC documentation practices with respect to the iSanté EMR system. Specifically we wanted to know whether DAC participation was under-documented, however interviewees spoke more generally about the program and we were unable to understand the DAC documentation processes in detail. The direction and magnitude of this bias is also unpredictable.

Finally, several of the variables we used in our analytic tests included a "Missing/Unknown" category. Only if data were missing completely at random would our results be unbiased. However, this assumption cannot be verified, and here too the direction and magnitude of possible bias in our results is unknown.

Despite these limitations, our mixed-methods approach provides a robust picture of DAC implementation across facilities in the iSanté EMR system. Not only did we restrict our analysis to the 57 facilities that reliably documented DAC, but we also did not look at data before January 2017. Additionally, we did not assume that all facilities began documenting DAC in January

2017 and allowed for the possibility that the version of iSanté with the DAC variable was implemented over time, and only included ART dispenses beginning the first month of successive DAC use at each facility.

Future research

A more robust qualitative study of patient and healthcare worker attitudes, beliefs, and experiences with respect to the DAC program is needed to better understand what factors affect patient and facility participation in DAC.

Similarly, a more detailed comparison of facilities that show strong DAC documentation and facilities that show poor DAC documentation would be useful in generating strategies to improve DAC documentation and participation across the board.

A randomized control trial that adjusts for potential confounders associated with DAC use and ART retention can more accurately determine the effectiveness of the DAC program.

A comparison of differentiated care strategies in Haiti (e.g., DAC, MMS, and fast-track refills), can assess the extent to which patients are actively retained on ART and whether one method is preferred by patients and healthcare providers.

Conclusion

There was variability in the levels of DAC documentation across facilities in the iSanté EMR system. Patients with a DAC dispense had lower odds of being active ART participants than patients with a clinic dispense. There was additional variability in the specific procedures of DAC implementation across 8 facilities in the CMMB and UGP health facility networks, though all described a common approach to distributing ART in the community. Key recommendations to improve DAC implementation include increasing education and awareness of HIV, ART, and DAC; establishing stronger monitoring and evaluation protocols; and improving program staffing and resources for DAC delivery. The DAC program has value in its ability to increase patient access to trusted social networks, reduce transportation costs, decrease staff workloads, and reduce clinic wait times. However, the DAC approach has scaled up in an uneven way across health facilities and networks; and documentation of DAC within the national electronic medical record system could be improved.

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