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The role of organizational characteristics in intervention sustainment: findings from a quantitative analysis in 42 HIV testing clinics in Vietnam

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Abstract

Background Evidence-based intervention (EBI) sustainment is one of public health's largest translational research problems. Fewer than half of public health EBIs are sustained long-term, and sustainment challenges are even more pressing in low and middle-income countries (LMICs). Organizational characteristics, including organizations' inner structures, culture, and climate, may play a key role in EBI sustainment. However, little quantitative research has examined these relationships, particularly in LMICs.

Methods In this observational study, we assessed the association between baseline organizational characteristics and EBI sustainment within a cluster randomized implementation trial in Vietnam testing strategies to scale-up Systems Navigation and Psychosocial Counseling (SNaP) for people who inject drugs (PWID) living with HIV across 42 HIV testing clinics. From the Exploration, Preparation, Implementation, and Sustainment (EPIS) Framework, five baseline organizational characteristics were selected for investigation: 1) organizational readiness for implementing change; 2) implementation leadership; 3) implementation climate; 4) percent PWID; and 5) staff workload. Six to ten months post-study completion, clinic staff and leadership completed a survey that included the Provider Report of Sustainment Scale (PRESS), a measure of EBI sustainment across a clinic. We conducted clinic-level simple and multiple linear regression analyses to evaluate the association between organizational characteristics and sustainment.

Results 218 participants (94% completion rate) completed the PRESS survey. All implementation scales had good individual-level internal consistency reliability. Clinics with high organizational readiness to change at baseline had significantly greater SNaP sustainment than clinics with low organizational readiness to change (ß = 1.91, $p = 0.015$). None of the other organizational characteristics were associated with sustainment, controlling for study arm.

Conclusions We identified the importance of organizational readiness for SNaP sustainment in Vietnam. This study adds to the evidence base around the relationship between organizational characteristics and HIV intervention sustainment and could inform the development of future sustainment strategies. We also identified several areas for organizational characteristic and sustainment measure advancement, including the need for pragmatic

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sustainment measures that also capture EBI adaptation. This research demonstrates that assessing clinics' organizational readiness pre-implementation and providing tailored support to those with low readiness scores could improve HIV intervention sustainment for key populations.

Keywords Sustainment, Organizational characteristics, HIV intervention, Vietnam

Contributions to the literature

- Intervention sustainment continues to be a significant challenge. This study is among the first to examine the association between organizational characteristics and sustainment of an HIV intervention for people who inject drugs (PWID) living with HIV.
- We evaluated sustainment of an HIV intervention across 42 HIV testing clinics in Vietnam and examined the association between five important organizational characteristics and sustainment.
- We found that organizational readiness to change was significantly associated with sustainment of our HIV intervention.
- Findings can inform the prioritization and development of organizational readiness-focused sustainment strategies to improve HIV outcomes for PWID.

Background

Intervention sustainment is one of the largest translational research problems in public health, as fewer than half of public health interventions are sustained long-term [1–4]. Sustainment is the extent to which a practice or intervention that has been newly implemented is continued as part of an organization's regular operations [5]. We know that sustainment is impeded by many factors, such as lack of planning, challenges with obtaining long-term funding, and staff turnover [6]. However, less is known about the most effective approaches for sustaining evidence-based interventions (EBIs) (7).

One set of factors that may be important for intervention sustainment are organizational characteristics [8]. Organizational characteristics are organizations' inner structures, culture, and climate. Organizational characteristics compose the contexts that are needed for effective implementation and can inform the selection of implementation strategies [8, 9]. For example, organizations with weak implementation leadership (meaning that leaders do not engage in behaviors to encourage EBI implementation) will likely experience challenges with implementing new interventions and may need to undertake strategies to improve implementation leadership to achieve EBI scale-up [10].

While conceptual frameworks suggest a wide range of organizational characteristics, four key characteristics that have been hypothesized to be critical for successful EBI implementation include: 1) implementation leadership, 2) implementation climate, 3) organizational readiness, and 4) clinic demographic variables (e.g., size) (defined below) [8, 11, 12]. Qualitative research suggests that these organizational characteristics may also be important for sustainment [13]. But their relationships with sustainment have been infrequently examined in quantitative research, largely due to sample size challenges, and the few studies that have been conducted have inconsistent findings around the associations between these characteristics and sustainment [7, 14, 15]. It is also unknown which of these organizational characteristics are most important for EBI sustainment; thus, it is unclear how to intervene most effectively. Even fewer studies have quantitatively examined sustainment determinants within low- and middle-income country (LMIC) settings [13, 16, 17].

Sustained, effective interventions are particularly needed for people who inject drugs (PWID) living with HIV. While significant advances have been made in addressing the HIV epidemic globally, PWID are at greater risk for HIV infection and have poorer HIV outcomes compared with the general population [18]. There are EBIs, most of which are clinic-based, that are effective in improving HIV outcomes among PWID [19]. However, given low rates of intervention sustainment and significant sustainment barriers, more work is needed to identify factors within clinics that may facilitate EBI sustainment for PWID.

To address these gaps, we conducted a quantitative study, as an extension of a larger cluster randomized implementation trial, to assess the association between organizational characteristics and sustainment (after the removal of external study support) of an EBI for PWID living with HIV across 42 HIV testing clinics in Vietnam. We hypothesized that clinics with stronger organizational characteristics (i.e., higher implementation leadership, implementation climate, organizational readiness, and percent PWID and smaller workloads) would also have higher sustainment.

Methods

Parent study and setting

In Vietnam, despite the government's concerted efforts to address the HIV epidemic among PWID, this population

has continued to have worse HIV prevention and care outcomes than the general population [20]. In 2023, PWID in Vietnam experienced an HIV prevalence of 9.1%, compared to a prevalence of 0.3% among adults ages 15–49 in the general population. PWID also had an HIV testing and status awareness of 63% and an antiretroviral therapy (ART) coverage of 62% compared to 94% and 78%, receptively, among the general population [21]. These disparities underscore the need for the sustainment of effective EBIs for this population in Vietnam.

This quantitative study is an extension of a hybrid type III implementation-effectiveness trial (referred to as "the parent study"; NCT03952520, multiple PIs: Go and Miller) [22]. The trial assessed the scale up of an EBI, Systems Navigation and Psychosocial Counseling (SNaP), designed to improve ART uptake and adherence among PWID. We tested two implementation strategies to scale up SNaP across HIV testing clinics in Vietnam. SNaP includes two sessions of systems navigation (over the phone or in-person) and at least one session of psychosocial counseling (with the option for additional booster sessions, as needed). SNaP was proven to be effective in HIV Prevention Trials Network (HPTN) 074, a randomized control trial conducted from 2015–2018 in Ukraine, Vietnam, and Indonesia [23]. HPTN 074 showed that SNaP was effective in reducing HIV mortality and transmission. It also improved ART use as well as use of medications for opioid use disorder and increased rates of viral suppression among PWID who were newly diagnosed with HIV or re-engaging in care [23, 24].

The parent study took place from 2020–2023 in 42 HIV testing clinics across ten provinces in Vietnam. Clinics were selected due to their high concentration of PWID and high concentrations of PWID within the larger catchment area. The goal of the trial was to compare the effectiveness of a standard package of implementation strategies (SA arm) to a package of strategies tailored to address each site's barriers to implementation (TA arm) in scaling up SNaP. The SA and TA arm strategies were developed through intervention mapping, a systematic approach for designing and tailoring implementation strategies in collaboration with implementation partners [25]. The implementation mapping process resulted in 15 "discrete" implementation strategies in the SA arm (e.g., booster training sessions) and a menu of 10 additional strategies (e.g., audit and feedback) that sites in the TA arm could tailor to their needs. Clinics were randomized 1:1 to the SA or TA arm, and both arms received the SNaP intervention. The study activities included surveys with clinic staff at study baseline, 12, and 24 months. Inclusion criteria in the parent study for clinic staff were being a clinic director or staff member, including systems navigators and psychosocial counselors, involved with delivering SNaP at the selected HIV testing clinics, and willingness to participate [22]. See Nguyen et al. (2020) for further details on the parent study, including the list of implementation strategies, study design, and outcomes measurement [22].

Recruitment and data collection

Between April and December 2023, research staff recontacted all clinic staff ($n = 232$) (clinic directors, navigators/counselors, and phlebotomists) who had been involved with the parent study across all 42 SNaP study clinics and invited them by email to participate in a SNaP sustainment survey. This survey included a reminder summary of the core components of the SNaP intervention and the Provider Report of Sustainment Scale (PRESS) [26]. Participants were invited to take the survey six to ten months after the SNaP study had ended at their clinic, which was staggered based on their clinic's SNaP initiation date. A member of the study team, who is fluent in English and Vietnamese and has extensive experience with translations, translated the survey to Vietnamese. The survey was self-administered in Qualtrics, and participants were compensated (50,000 VND, ~2 USD) for their participation. Within each clinic, we stopped participant recruitment after reaching six surveys, which was the maximum number of staff participating in SNaP at each clinic. All participants provided informed consent before completing the survey, and the study was approved by the University of North Carolina at Chapel Hill, Hanoi Medical University, and Viet Nam Ministry of Health Institutional Review Boards. This study adheres to the STROBE checklist.

Conceptual frameworks and measures

Conceptual frameworks

The widely-used Exploration, Preparation, Implementation, Sustainment (EPIS) Framework informed our selection of the five organizational characteristics that we assessed in this paper for their association with sustainment: 1) organizational readiness for change; 2) implementation leadership; 3) implementation climate; 4) target population percentage; and 5) staff workload (definitions are listed below) [8, 12, 27]. These organizational characteristics are all represented within the EPIS and were chosen because of their importance for EBI implementation [8, 11, 12].

PRESS scale

We used the PRESS, a 3-item scale designed as a pragmatic assessment of providers' perceptions of an intervention's sustainment within their clinic [26]. The questions ask participants to rate how much they agree with the following items: 1) Staff use SNaP as much as

possible when appropriate; 2) Staff continue to use SNaP throughout changing circumstances; and 3) SNaP is a routine part of our practice. PRESS uses five-point Likert scale response options with responses ranging from 0 = "not at all" to 4 = "a great extent" (scale score range: 0–12). In a study in the US, the PRESS had a high Cronbach's alpha (0.947) and face and content validity [26]. From the PRESS, we constructed an average sustainment score for each clinic.

Organizational characteristics

The five organizational characteristic measures, which correspond to our five organizational characteristics, came from the parent study's baseline survey, which was conducted with all participating clinic staff (n = 247) at the study clinics. These measures included: 1) Organizational Readiness for Implementing Change (ORIC) [28]; 2) the Implementation Leadership Scale (ILS) [29]; and 3) the Implementation Climate Scale (ICS) [30], in addition to two clinic demographic variables: 4) PWID size and 5) staff workload.

ORIC assesses how prepared "psychologically and behaviorally" members of an organization are to implement a new change [28]. It is a 12-item measure with Likert scale response options ranging from 0 to 5 and two sub-scales that include "change commitment" and "change efficacy." In the initial psychometric assessment of the ORIC in the US, it had high reliability (Alpha: 0.89–0.91) and strong validity [28]. We calculated an average ORIC score for each participant (scale range = 0–5, with higher scores indicating higher organizational readiness to change) and then averaged scores within clinics to create a clinic score. The ORIC was heavily skewed, so we dichotomized it at its median to create "high" and "low" values to improve interpretation. We selected the median because it is a widely-used cutoff for creating binary variables [31].

The Implementation Leadership Scale (ILS) assesses actions that leaders have taken to facilitate implementation efforts in their organizations. It includes two scale versions: one for leadership that asks about their own implementation leadership and a second for clinic staff that asks about leaders' implementation leadership. We used both versions of the scale. The ILS contains 12 items across four sub-scales: 1) proactive leadership; 2) knowledgeable leadership; 3) supportive leadership; and 4) perseverant leadership. It has 5-point Likert scale response options ranging from 0 = "not at all" to 4 = "a very great extent" and has demonstrated good validity and reliability [29]. We averaged across the sub-scales to create a score for each participant and then averaged across participants within a clinic (total score range = 0–4, with higher scores indicating higher implementation leadership).

The Implementation Climate Scale (ICS) is an 18-item scale that assesses "the shared meaning organizational members attach to the events, policies, practices, and procedures they experience and the behaviors they see being rewarded, supported, and expected" [30]. The ICS contains six sub-scales: 1) Focus on evidence-based practice (EBP); 2) Educational support for EBP; 3) Recognition for EBP; 4) Rewards for EBP; 5) Selection for EBP; and 6) Selection for openness. We created a total score for each participant by averaging across sub-scales and then calculated an average score for each site (total score range = 0–4, with higher scores indicating stronger implementation climates). The ICS has the same response options as the ILS and also has demonstrated good validity and reliability [30].

We also assessed two clinic demographic variables, PWID size and staff workload. As part of the baseline survey, clinic leaders at each of the sites were asked to input this data for their site. PWID size was assessed as percentage of PWID HIV tests/total HIV tests in the past year. Staff workload was assessed as total number of HIV tests in the past year/number of clinic staff. Four clinic leaders did not complete data for these variables. After conducting an analysis to confirm that there was not a significant difference between clinics' baseline and 12-month scores on these variables, we replaced the missing values with the four clinics' respective 12-month survey responses. Both variables were highly skewed, so we dichotomized them at their median to create "high" and "low" values to facilitate interpretation.

Data analysis

Using StataBE version 17 [32], we prepared and cleaned the data, including reviewing item distributions, checking for outliers, assessing correlations and Cronbach's alphas for the scales, and generating basic descriptive statistics. We first conducted a bivariate linear regression analysis to assess the associations between each of the organizational characteristics and the PRESS score (assessed with $\alpha = 0.05$). After checking for collinearity, we ran a multiple linear regression to assess the association between all organizational characteristics and sustainment score, controlling for study arm (assessed with $\alpha = 0.05$). Results are presented as regression coefficients, standard errors, 95% confidence intervals, and p-values.

Results

Two hundred forty-seven participants completed the baseline clinic demographics survey (i.e., implementation climate, implementation leadership, and organizational readiness scales). Most baseline survey participants were clinic staff (63%), while 37% were site directors or vice directors. In addition to HIV counseling and testing, half

of the sites also offered HIV confirmation testing and 61% offered HIV treatment. The median number of tests conducted in the last year across sites was 1,657, while the median number of positive tests was 17. The median percentage of PWID at the sites in the past year was 23% (Inter-quartile range (IQR) =11–40%), while the median percent positive HIV tests among PWID was 36% (IQR =10–70%). The median total number of staff members per site was 4 (IQR =2–5) (Table 1).

In total, 218 participants completed the PRESS (out of 232 possible participants) at 6–10 months post-study completion, which represented a 94% completion rate. This number of potential participants is smaller than the number at baseline, given that some clinic staff/leadership retired or changed positions. The average number of surveys completed per site was five (range =2–6). The average PRESS score across sites was 8.54 (Standard Deviation (SD) =1.71) (scale score range =0–12, with higher scores indicating higher sustainment). See Table 2 for predictor descriptive statistics. All the scales had high Cronbach's alphas: ORIC alpha =0.96; ICS alpha =0.95; ILS alpha =0.95. The PRESS Cronbach's alpha was slightly lower but still good (alpha =0.88).

In the simple linear regression, implementation climate (ß =−0.10, p= 0.896), implementation leadership (ß =−0.06, p= 0.950), percent PWID (ß =0.02, p= 0.965), staff workload (ß =0.11, p= 0.843), and study arm (TA vs. SA) (ß =0.40, p= 0.456) were not associated with sustainment. Organizational readiness was borderline significantly associated with the PRESS sustainment score (ß =0.93, p= 0.078) (Table 2).

In the multiple linear regression, we found that clinics with high organizational readiness to change had significantly greater sustainment (ß =1.91, p= 0.015) than clinics with low organizational readiness to change, controlling for study arm. Implementation climate (ß =−0.79, p= 0.564), implementation leadership (ß =−1.68, p= 0.350), percent PWID (ß =−0.12, p= 0.825), staff workload (ß =−0.15, p= 0.802), and study arm (ß =0.30, p= 0.580) were not significantly associated with PRESS sustainment score (Table 3).

Table 1 Clinic demographic characteristics (n =42)

Characteristic	n (%) or median (IQR)
Province (%)	
Dien Bien	6 (14)
Ha Noi	6 (14)
Ho Chi Minh city	2 (5)
Khanh Hoa	2 (5)
Long An	2 (5)
Nghe An	5 (12)
Phu Tho	5 (12)
Quang Ninh	2 (5)
Son La	6 (14)
Thai Nguyen	6 (14)
Services offered[†] (%)	
HIV counseling and testing	38 (100)
HIV confirmation testing	19 (50)
HIV treatment	23 (61)
Number of HIV tests last year[†] (median)	1,656.50 (971–2,978)
Number of HIV positive tests last year[†] (median)	17 (8–35)
% PWID with a positive HIV test[†] (median)	36.2 (10.2–70)
Number of Voluntary Counseling and Testing staff[†] (median)	4 (2–5)

[†] Missing 4 observations

Discussion

As far as we know, this is one of the first studies to examine the association between organizational characteristics and sustainment of an HIV intervention for PWID. In our analysis of the relationship between organizational characteristics and sustainment of the SNaP intervention in HIV testing clinics in Vietnam, we found that organizational readiness to change was associated with reported sustainment. In contrast, we found that implementation climate, implementation leadership, percent PWID, staff workload, and study arm were not significantly associated with sustainment. These findings were somewhat contrary to our hypothesis that all the organizational characteristic variables would be significantly associated with sustainment of SNaP post-study completion.

This was also one of the first studies to quantitatively examine the association between organizational readiness to change and intervention sustainment within an LMIC setting. The few studies that have assessed this relationship were all conducted in the US and had inconsistent findings related to the association between these two variables [14, 33–36]. These studies had different settings, interventions, and measures of readiness and sustainment than ours. They used the Organizational Readiness for Change and Organizational Readiness for Change Assessment to measure readiness, whereas we used the ORIC [37, 38]. To measure sustainment, they used claims data or unvalidated survey questions that asked participants to what extent they had continued delivering the intervention. They then dichotomized responses into "sustained" versus "not sustained" [14, 33–36]. Given the wide range of methods for measuring sustainment, including the use of unvalidated study-specific measures, greater standardization of how sustainment is measured globally would be helpful to improve confidence in sustainment outcomes and facilitate cross-study comparisons [39].

One possible explanation for our findings that organizational readiness was associated with sustainment while

Table 2 Organizational characteristics descriptive statistics and simple linear regression of the association between organizational characteristics and sustainment score

Predictor	Scale range[a]	Median	IQR	Regression Coefficient	SE	95% CI	*P*-value
Readiness to change	0–5	4.68	4.50–4.86	0.93	0.51	−0.11, 1.97	0.078
Implementation climate	0–5	3.30	3.03–3.58	−0.10	0.76	−1.64, 1.44	0.896
Implementation leadership	0–4	3.65	3.39–3.83	−0.06	0.91	−1.89, 1.77	0.950
% PWID		23%	11–40%	0.02	0.53	−1.05, 1.10	0.965
Staff workload (# of HIV tests conducted in past year/# of clinic staff)		487	234.5–1231.5	0.11	0.53	−0.97, 1.18	0.843
Study Arm (SA vs. TA)				0.40	0.53	−0.67, 1.47	0.456

[a] Greater scores for all scales indicate higher scores (e.g., higher readiness to change)

the other organizational characteristics were not is that some researchers have hypothesized that organizational readiness may be closer on the causal pathway to EBI implementation success (and potentially sustainment) than some of our other organizational characteristics, like implementation leadership and climate [8]. While organizational characteristics are viewed as being interrelated, if organizational readiness is more proximal to sustainment, this may have led us to see a significant relationship between these variables, while we may have been unable to see relationships with our organizational characteristics that were further away from sustainment on the causal pathway (particularly with our relatively small sample size).

Additionally, given that organizational readiness was more significant in the multivariate analysis than the bivariate analysis and there was a somewhat strong correlation between organizational readiness, implementation climate, and implementation leadership, it is likely that a suppressor effect (when adding a predictor augments the predictive power of another independent variable) was occurring in this relationship [40]. This is one of the reasons why it is important to not solely rely on bivariate relationships for determining which variables should be included in multivariate analyses [41].

Table 3 Multiple linear regression of the association between organizational characteristics and sustainment score

	Regression Coefficient	SE	95% CI	*P*-value
Readiness to change	1.91	0.75	0.39, 3.44	0.015*
Implementation climate	−0.79	1.35	−3.52, 1.95	0.564
Implementation leadership	−1.68	1.78	−5.30, 1.93	0.350
% PWID	−0.12	0.55	−1.23, 0.99	0.825
Staff workload	−0.15	0.58	−1.32, 1.02	0.802
Study Arm (SA vs. TA)	0.30	0.54	−0.79, 1.39	0.580

* Indicates statistical significance at the $p < 0.05$ level

In terms of the broader implications of this research, our findings indicate that in future scale-up of SNaP in Vietnam (and elsewhere), clinic leadership and policymakers may want to assess clinics' readiness for implementation and provide tailored support to clinics with low readiness to change scores to increase the likelihood of long-term sustainment of SNaP. There are several approaches that may be effective for increasing organizational readiness, but they have yet to be widely tested. These include organizations using Implementation Mapping and the Readiness Building System to prioritize readiness goals and select strategies to improve readiness, and use of strategies identified from the Organizational Readiness Typology (e.g., conduct local consensus discussions, conduct educational meetings) to increase organizational readiness [42, 43]. Testing these systematic strategy selection approaches and assessing their effect on readiness will be an important next step.

Another factor that could have contributed to our null findings is that there may be other external factors that are relatively more important for SNaP sustainment than some of the organizational-level factors. In a qualitative study of factors related to SNaP sustainment, we identified external factors, like lack of funding, barriers to getting PWID into care, and government mandates, as being particularly influential in the long-term sustainment of SNaP [44]. It is possible that these external factors may have been driving differences in SNaP sustainment across clinics more than some of our organizational-level factors. In the literature, while one mixed methods review found that inner setting barriers/facilitators were the most commonly identified type of sustainment determinants across studies [13], a predictive study of factors influencing EBI sustainment identified that external factors, including funding stability, political support, and partnerships, appeared to be more important for sustainment than inner setting factors [14]. If these external factors have a greater influence on sustainment than some of our clinic-level factors, this could have important

implications in terms of the selection of sustainment strategies in future studies.

Additionally, there are challenges with the measurement of organizational characteristics within LMIC settings. All of the organizational characteristic measures that we used in this study were developed in high-income countries (HICs). While these measures have been previously used within LMICs [45–47], researchers have questioned their applicability outside of HICs [45], given differences in structures and financing of healthcare globally and differing cultural values [48]. For example, research has found that leadership may look differently in countries that are influenced by Confucianism (like Vietnam) than in Western countries [49]. These countries may put greater value on collectivism and paternalism than Western countries, which could have implications for the adaptation of organizational measures (e.g., the addition of a "directive leadership" dimension to the ILS that focuses on leadership mandates or vocal support around EBI implementation). In response, they have called for the development of more context-specific measurements as part of a broader movement towards decolonization of global implementation science [50]. We also identified several translation challenges with these measures into Vietnamese (e.g., some items direct translated to the exact same sentence) and had to further modify them as a result. In response to these challenges, recently a few implementation science measures, like the Mental Health Implementation Science Tools [45], have been developed to be more applicable to LMIC settings. More work is needed to adapt implementation measures to advance the study of implementation and sustainment within LMICs.

In addition to challenges with measuring organizational characteristics, there is also a dearth of sustainment measures that are both pragmatic and have strong psychometric properties, and even fewer that measure sustainment as an outcome rather than measuring sustainment determinants [39, 51–54]. In a systematic review of 28 sustainment measures (all that were developed in HICs), the PRESS had the best psychometric and pragmatic properties across sustainment measures [39]. However, the PRESS does not allow for a nuanced assessment of adaptations or of partial sustainment of some, but not other, components of an EBI. This is an issue given that intervention adaptations are common and may be helpful to ensure continued EBI fit within clinics over time [13, 55]. This demonstrates the challenge in the use of a highly general sustainment measure, like the 3-item PRESS, that is pragmatic and easy for busy providers to answer but may not fully capture whether an EBI has been sustained or not. There is a need for more work around sustainment measurement to develop psychometrically strong measures that can capture EBI adaptation while maintaining pragmatism. One possibility could be to develop a scale that asks implementors about the degree to which they continued to implement each of an EBI's core components, with open-ended questions to list adaptations that were made [7].

There are some limitations to this research. First, some of the self-reported organizational characteristics (particularly implementation leadership) and sustainment may have been subject to social desirability bias. This could have been a challenge in Vietnam where there is cultural respect for hierarchy and people in authority [56]. While participants were reminded at the start of the surveys that their responses were anonymous, these factors still might have encouraged clinic staff to score leaders and the organizations more highly on the implementation and sustainment measures, leading to skew in the data. Use of innovative observational methods could help to get a more objective measure of sustainment. For example, standardized patients, who are trained to present with a certain condition, could be used to assess if providers in a clinic have continued to implement an intervention and to what degree they have adapted it [57].

Additionally, while 42 clinics is a relatively large number for implementation research, it is possible that with this number of clinics and the skew in the data, we were unable to see small to medium-small effect sizes in the relationships between organizational characteristics and SNaP sustainment. There was also variability in the number of surveys conducted at each site, given that the number of staff members varied across sites. As a result, extreme responses would have had a greater effect on scores in clinics with fewer staff than in clinics with more staff involved in SNaP. Finally, while there is no standard amount of time when an intervention can be assessed for sustainment, in the literature, measuring sustainment two or more years after study end is viewed as ideal [7]. This study allowed us to see what happened to SNaP in the early sustainment phase, and even at 6–10 months, we already saw variation in sustainment across the sites. An area for future research would be to repeat the sustainment measure at a later point to determine both if SNaP had been sustained long-term in the clinics and if organizational readiness remained significantly associated with sustainment at this later time point.

Conclusions

From our analysis of the association between theoretically important organizational characteristics and SNaP sustainment, we identified that organizational

readiness to change was significantly associated with sustainment, while other organizational characteristics (implementation climate, implementation leadership, percent PWID, and staff workload) were not. We also identified several factors that might have contributed to these null findings, including potential measurement challenges. This study adds to the limited quantitative research on the association between organizational characteristics and sustainment, particularly within LMIC settings, and could inform future selection of strategies for HIV intervention sustainment.

Abbreviations

ART	Anti-retroviral Therapy
EBI	Evidence-based Intervention
EBP	Evidence-based Practice
EPIS	Exploration, Preparation, Implementation, Sustainment
HIC	High-income Country
HPTN	HIV Prevention Trials Network
ICS	Implementation Climate Scale
ILS	Implementation Leadership Scale
IQR	Inter-quartile Range
LMIC	Low and Middle-income Country
ORIC	Organizational Readiness for Implementing Change
PRESS	Provider Report of Sustainment Scale
PWID	People Who Inject Drugs
SA	Standard Arm
SD	Standard Deviation
SNaP	Systems Navigation and Psychosocial Counseling
TA	Tailored Arm

Authors' contributions

SMB conceived the study and obtained the funding with support from VG, WCM, CB, LMR, LMG, and BJP who also helped with protocol development. WCM and VG conceived the parent study and obtained the parent study funding. HVT, NTKN, MXN, TTN, VATC, and VATT facilitated or contributed to data collection and results interpretation. LMR also supported data analysis. SMB drafted the manuscript, and VG, WCM, CB, LMR, TS, and HTTP revised it critically with important intellectual contents. All authors read and approved the final manuscript.

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Data availability

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

The study was approved by the University of North Carolina at Chapel Hill, Hanoi Medical University, and Viet Nam Ministry of Health Institutional Review Boards. All participants provided written informed consent before participating in the study interviews.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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