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## Cost Analysis of the Positive Health Check intervention to suppress HIV viral load and retain patients in HIV clinical care

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### Abstract

**Context:** Digital video-based behavioral interventions are effective tools for improving HIV care and treatment outcomes.

**Objective:** To assess the costs of the Positive Health Check (PHC) intervention delivered in HIV primary care settings.

**Design, Setting, and Intervention:** The PHC study was a randomized trial evaluating the effectiveness of a highly tailored interactive video counseling intervention delivered in four HIV care clinics in the U.S. in improving viral suppression and retention in care. Eligible patients were randomized to either the PHC intervention or control arm. Control arm participants received standard of care (SOC), and intervention arm participants received SOC plus PHC. The intervention was delivered on computer tablets in the clinic waiting rooms. The PHC intervention improved viral suppression among male participants. A microcosting approach was used to assess the program costs, including labor hours, materials and supplies, equipment, and office overhead.

**Participants:** Persons with HIV, receiving care in participating clinics.

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**Disclaimer:** The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

**Main Outcome Measures:** The primary outcome was the number of patients virally suppressed, defined as having <200 copies/mL, by the end of their 12 months of follow-up.

**Results:** A total of 397 (range across sites [r]: 95–102) participants were enrolled in the PHC intervention arm, of whom 368 participants (r: 82–98) had viral load data at baseline and were included in the viral load analyses. Of those, 210 (r: 41–63) patients were virally suppressed at the end of their 12-month follow-up visit. The overall annual program cost was \$402,274 (r: \$65,581–\$124,629). We estimated the average program cost per patient at \$1,013 (r: \$649–\$1,259) and the cost per patient virally suppressed at \$1,916 (r: \$1,041–\$3,040). Recruitment and outreach costs accounted for 30% of PHC program costs.

**Conclusions:** The costs of this interactive video counseling intervention are comparable to other retention in care or re-engagement interventions.

## Keywords

HIV treatment; clinical care; video doctor; retention; viral suppression; randomized trial; costs; cost-effectiveness

## Introduction

An estimated 1.2 million people are living with HIV in the United States (U.S.).<sup>1</sup> Important HIV prevention strategies for persons with HIV (PWH) involves early treatment initiation, adherence to antiretroviral therapy (ART), and retention in HIV care to achieve and maintain viral suppression. Recent studies show that persons in HIV care who adhere to HIV medication and remain virally suppressed can live long and healthy lives with effectively no risk of sexually transmitting the virus to their partners.<sup>2,3</sup> Moreover, a key pillar of Ending the HIV Epidemic in the U.S. (EHE) initiative calls for initiating PWH rapidly on ART, and maintaining a high level of adherence to achieve sustained viral suppression.<sup>4</sup> However, the most recent Centers for Disease Control and Prevention data show that for every 100 persons with HIV in 2019, 66% received some HIV care, 50% were retained in care, and 57% were virally suppressed.<sup>5</sup>

The recommendation is that persons with HIV are seen by their HIV medical provider and have their HIV viral load and CD4 counts monitored every 6 months if they have been virally suppressed for more than 2 years, and more frequently if they are newly diagnosed, have not achieved viral suppression, or need closer medical supervision.<sup>6</sup> Providers aim to address patients' co-morbidities and psychosocial issues along with providing HIV medical care in order to promote their medication adherence and retention in care.<sup>7</sup> However, provider visits are typically time-limited due to heavy patient workloads.<sup>8,9</sup> In busy primary care settings, digital health interventions can increase the amount and type of support PWH receive as part of their clinical care and reinforce providers' messaging with minimal impact on staff time. Prior research has demonstrated that digital video-based behavioral interventions can increase medication adherence<sup>10</sup>, reduce drug and sexual risk behaviors<sup>11</sup>, and improve virologic suppression.<sup>12</sup>

Positive Health Check (PHC) is a brief, highly-tailored, interactive video counseling intervention developed for PWH in clinical care that can be used on laptops, tablets,

and desktop computers.<sup>13,14</sup> Expanding the scope of previous video-based interventions, PHC aims to improve ART adherence, virologic suppression, and retention in care by providing tailored patient education on early ART initiation and sexual risk reduction. To assess the effectiveness of the PHC intervention, we conducted a type 1 hybrid effectiveness-implementation randomized trial among patients who were receiving care in HIV primary care clinics in the United States.<sup>15</sup> The trial outcome analyses showed no statistically significant differences between PHC+SOC and SOC when analyzing all participants for either the primary or secondary endpoints.<sup>16</sup> However, males in the PHC intervention improved on viral suppression more so than males assigned to control. Furthermore, retention in care improved more among the youngest and oldest age groups of participants enrolled in the PHC intervention arm compared with those in the control arm. In order to facilitate HIV clinics' adoption of effective video and other digital interventions, more information is needed on the costs and cost-effectiveness of implementation in clinic environments.<sup>17</sup> We assess the costs of the PHC intervention using primary data on program costs and outcomes across the four U.S. HIV clinics.

## Methods

### PHC Study design, participants, and health outcomes

The PHC trial enrolled study participants from 2/28/2018 to 3/1/2019 from four regionally—and demographically—diverse HIV primary care clinics in the Southeast, South-Central, and Northeast regions of the U.S.<sup>15</sup>; specifically:

- Site A (Southeast Region)—is a primary care and infectious diseases/HIV medical specialty practice within a Veterans Affairs (VA) medical center, Atlanta, GA
- Site B (South-Central Region)—is an ambulatory clinic, a community health center, a primary care practice, and a nonprofit clinic, New Orleans, LA
- Site C (Northeast Region)—is an ambulatory care and academic medical center, Newark, NJ
- Site D (Southeast Region)—is a primary care and specialty care practice that is part of a health department and supported by an academic medical institution, Tampa, FL

Eligibility criteria included: (1) 18 years of age or older; (2) HIV diagnosis; (3) English-speaking; (4) Receiving care at one of the four participating clinics; (5) Meeting at least one of the following sub-criteria: most recent VL lab result of  $\leq 200$  copies/mL, new to care within the past 12 months (i.e., either new to the clinic or new to HIV medical care), or out of care (i.e., last attended appointment at the clinic was more than 12 months ago); and (6) No other research study participation that could confound the current trial results.<sup>15</sup>

Clinic staff used Electronic Medical Records (EMR) systems to identify patients who had scheduled appointments, missed appointments, or who were out of care and did not have an upcoming appointment scheduled. After clinic project coordinators made initial contact with prospective trial participants, once onsite, all patients were screened for eligibility,

consented, enrolled, and randomized into the study. Control arm participants received clinic's standard of care (SOC) and treatment arm participants received SOC plus the PHC intervention. The intervention was delivered in the HIV clinic waiting room or other clinic space before the scheduled provider appointment.

PHC trial data were abstracted from participants' EMRs, and PHC effectiveness was measured by comparing health outcomes of participants enrolled in the intervention arm with the control arm. The primary outcome was the number of participants virally suppressed at baseline versus post-intervention, defined as having <200 copies/mL by the end of their 12 months of follow-up (with a window from the start of 10 months through the end of 16 months post-randomization to accommodate the timing of clinic visits). The viral load reported at baseline was collected during a window ranging from 90 days before, up to 14 days after the first PHC use. Additionally, retention in care, the secondary outcome, was defined using three retention measures: (1) participants having at least one visit in each 6-month period within 12-months post-randomization separated by at least 2 months (RIC-A), (2) participants having 2 kept visits separated by at least 90 days as defined in the Health Resources and Services Administration HIV/AIDS Bureau (HRSA-HAB) retention measure (RIC-B), and (3) participants with 6-month visit gap, i.e., having at least 189 days between two sequentially kept visits, which indicated participants were not retained in care (RIC-C).<sup>18</sup> For RIC-C, we took the inverse of the measure to arrive at those that had visit gap less than 189 days and thus, were retained in care to conduct cost analysis.

The trial received Institutional Review Board (IRB) approvals from RTI International and the institutional IRB affiliated with each clinical site participating in the study.

### Cost data collection and analysis

We used a microcosting approach to collect the economic costs of the overall PHC program implemented, as well as intervention-specific cost.<sup>19–23</sup> The PHC intervention cost included staff training and preparation for intervention, delivery of intervention activities, mobile device management, report generation, and project administration and oversight. The PHC program included intervention cost along with participant recruitment and outreach. Although the PHC intervention was designed primarily to be used with the patients currently in care, outreach was conducted to re-engage and recruit patients who were out of HIV care. PHC outreach was based on an adapted version of the Patients Unable to Follow-up Found (PUFF) re-engagement strategy<sup>24</sup>, and served as an additional component in the trial. We collected information on overall ongoing program costs, including labor hours and wages and fringe benefits, materials and supply costs, office overhead, and equipment costs, and the opportunity cost of any donated labor and in-kind services. We did not collect SOC services costs.

We collected the data using a cost form designed in collaboration with clinic staff and trial coordinators. The labor costs included personnel time spent on each of the PHC program activities, including the personnel time spent on PHC intervention, patient identification and recruitment, and outreach for patients who were out of care. The patients recruitment/identification and outreach activities were conducted prior to randomization.

The PHC nonlabor cost included costs associated with materials, supplies, travel, equipment, and indirect or overhead cost charged to PHC. The overhead cost reflected office rent, repair and maintenance, network connection and maintenance, telephone service, and shared office equipment. In addition, the intervention used computer tablets, printers, WiFi hotspots, and internet services that were particularly important for the PHC intervention.

The cost data were collected at three time points: at 1 month, 6 months, and 12 months into the intervention. The clinic staff reported the hours spent over a typical week of the month when the data were collected, and the trial coordinator reported the monthly costs of materials, supplies, and other resources used during the data collection month. The research study staff maintained the data on the cost of electronic equipment, printers, WiFi hotspots, and internet services used during the trial period. All costs were annuitized for cost analysis.

We estimated the annual total cost of the PHC program for each clinic separately by extrapolating their estimated monthly cost and analyzed the distribution of costs across program activities, labor versus non-labor costs, and fixed versus variable costs. Variable costs were those which varied with the number of participants served, whereas the fixed costs remained the same regardless of the number of participants.<sup>19,21,25</sup> The labor costs were estimated by multiplying the number of hours spent on each intervention activity by the hourly wage rate (including fringe benefits) of the staff person contributing the time. The costs of durable equipment were amortized over the useful duration of the equipment using straight-line depreciation.<sup>26</sup> The office space and utility cost of the program was estimated based on the indirect overhead amount charged by each clinic to the PHC, subtracting the cost of administrative oversight and office supplies. All program costs, regardless of the funding source, were included in the analysis; the research and evaluation costs were excluded.

The main outcomes of this analysis were total program cost and the average program cost per patient receiving the intervention, retained in care, and remained virally suppressed. Our calculation of the average cost per virally suppressed patient included all participants receiving PHC and SOC services (PHC+SOC). We did not assess cost per additional patient virally suppressed (i.e., incremental cost) relative to SOC alone because the trial results showed no statistically significant differences between PHC+SOC and SOC on overall outcomes.<sup>16</sup> We conducted sensitivity analysis excluding recruitment and outreach costs to generate average PHC intervention costs per patients receiving the intervention, retained in care, and remained virally suppressed. The sensitivity analysis also included the results by independently varying fixed costs, patient recruitment costs, and outreach costs. The analysis was conducted from the health care service provider's perspective. All costs were reported in 2019 U.S. dollars.

## Results

A total of 397 (range across sites (r): 95–102) participants were enrolled in the PHC intervention study arm, and of these, 368 participants (r: 82–98) had viral load data at baseline and were included in the viral load analyses. Of those, 210 (r: 41–63) patients were virally suppressed at the end of their 12-month follow-up visit. The number of patients

retained in care was 257 (r: 54–73), 267 (r: 60–72), and 253 (r: 53–72) based on RIC-A, RIC-B, and RIC-C measures, respectively.

The overall annual program cost across all sites was \$402,274 (r: \$65,581–\$124,629). We estimated the average program cost per patient enrolled at \$1,013 (r: \$649–\$1,259) and the cost per patient virally suppressed at \$1,916 (r: \$1,041–\$3,040) (Table 1). The average cost per patient retained in care was \$1,565 (r: \$979–\$2,308) under RIC-A, based on the PHC measure of retention in care, \$1,507 (r: \$937–\$2,077) under RIC-B, based on the HRSA-HAB measure, and \$1,590 (r: \$950–\$2,351) under RIC-C, based on the 6-month visit gap measure.

The program cost included all fixed and variable costs, including participant recruitment and PHC outreach costs. The fixed cost was a major portion of the total cost, ranging from 49% in site B to 71% in site C (Table 2, Figure 1). The two highest fixed cost items involving labor costs were staff training (r: 94–379 hours spent) and administrative oversight (r: 148–275 hours spent). The cost of office space and utilities was another major fixed cost item. Variable cost, exclusive of PHC outreach, contributed between 21% and 31% to the total program costs, and PHC outreach cost contributed from 8% to 27%. Among variable costs, the cost of patient recruitment was higher than the cost of intervention activities across all sites, except site B (Table 2). The two highest PHC outreach activity cost items were reaching patients lost to care (r: 87–373 hours spent) and conducting community outreach (r: 52–225 hours spent) across all sites, except site A. The average weekly labor cost of the PHC intervention related activities ranged from \$507 (11.4 hours) in site B to \$1,170 (23.2 hours) in site D (Appendix Table 1, 2). The weekly cost of PHC outreach activities ranged from \$175 (4.1 hours) in site C to \$351 (15.5 hours) in site A.

The average program cost per patient generally decreased as the number of participants virally suppressed increased across the intervention sites, suggesting potential economies of scale in the PHC intervention (Figure 2).

The sensitivity analysis showed how the results change when some program activities are excluded or costs are reduced (Table 3, Appendix Figure 1.a–1.d). When we excluded the participant recruitment and outreach to estimate the PHC intervention costs, the cost per patient enrolled was \$708 (r: \$398–\$896) and cost per patient with viral suppression was \$1,338 (r: \$638–\$2,156, Table 3).

When we assumed relatively moderate and low fixed costs (25% and 50% reduction from base case) and no change in the number of participants virally suppressed from the base case, the average program cost decreased to \$1,631 (r: \$915–\$2,569) and \$1,346 (r: \$788–\$2,098) (Table 3, Appendix Figure 1.a–1.d). Similarly, when we reduced the PHC outreach cost by 50%, the average program cost decreased to \$1,773 (r: \$899–\$2,863), and when we eliminated the PHC outreach cost altogether, the average program cost decreased to \$1,631 (r: 758–\$2,685) (Table 3, Appendix Figure 2.a–2.d). The impact of a reduction or elimination of patient recruitment costs on average program cost per patient virally suppressed was similar to that of a reduction or elimination of PHC outreach costs (Table 3).



## Discussion

PHC is a highly-tailored, interactive video counseling intervention that was delivered in the patient waiting room of HIV primary care clinics. The average annual cost of the program, including patient recruitment and outreach costs, was estimated to be \$1,013 (r: \$649–\$1,259) per patient enrolled, \$1,916 (r: \$1,041–\$3,040) per patient virally suppressed, and \$1,565 (r: \$979–\$2,308) per patient retained in care. The program cost was reduced by 30% (r: 21%–39%) when we excluded the recruitment and outreach costs, to reflect the PHC intervention cost. In particular, the outreach was used with patients who were out of HIV care and re-engage them in care, whereas the PHC intervention was designed primarily to be used with patients currently in care, thus the recruitment and outreach components may be optional for future implementations.

A substantial portion of the program cost was fixed in each intervention site, ranging from 49–71% of the total cost. Clinic Site C (71%) and Site D (62%), both affiliated with academic institutions, had the highest fixed cost, due in part to higher facility overhead, including administrative oversight, staff training, and office space and utility costs. Academic institutions have higher indirect costs than non-academic clinics to cover their research operations. Thus, the PHC program cost in those sites may have been overestimated compared with costs incurred by primary care clinics. When the intervention is scaled up and replicated in HIV primary care clinics as part of their standard of care, some of the fixed costs can be reduced and some can be distributed across a larger number of patients, substantially reducing the average cost per patient.

The literature on costs analyses of video counseling interventions for persons with HIV is limited. Sweat et al. 2001 reported cost and cost-effectiveness of a brief single-session video-based group counseling intervention in sexually transmitted disease clinics, and the intervention tracked HIV risk-related knowledge and condom use, and STD incidence.<sup>27</sup> The authors estimated the cost per participant at \$45 (1999 US\$) and the intervention was cost saving. Another video-based intervention, Safe in the City, delivered a 23-minute video in STD clinic waiting rooms on negotiating proper condom use<sup>28</sup>, and the study showed that the intervention can be cost-effective when implemented at scale.

However, PHC is different from those video-based interventions in that it is a highly-tailored, interactive video counseling intervention delivered directly to the patient on a personal computer or tablet. PHC includes tailored content delivered in multiple domains: treatment readiness, medication adherence, retention in care, sexual risk reduction, mother-to-child transmission, and injection drug use. Although the PHC study found no main effect on viral suppression overall, the intervention was found to be effective among males. As such, the unit costs estimated for these intervention activities and average program cost per patient reported in our analysis can inform other similar HIV care interventions and the program planning and budgeting. In future applications, patients may have unlimited, on-demand access to PHC from any location and device with access to the internet. This increases the utility and reach of PHC, as it can be accessed as part of clinic care (onsite or remote, in conjunction with telemedicine), or could serve as a stand-alone support tool for PWH.

Additionally, the PHC study utilized patient outreach which was adapted from the Patients Unable to Follow-up Found (PUFF) re-engagement strategy<sup>24</sup> to re-engage the patients who were out of care. This contributed to a relatively higher program cost, more in line with re-engagement and retention in care interventions. While outreach can be used to reengage patients in care, this is not the focus of PHC (which was designed to be used with patients currently in care), and thus, this component is optional for future implementing clinics. For example, a cost analysis of a clinic-based retention in care intervention that provided basic HIV education, in-person contact with clinic staff, and follow-up appointment reminders reported the average cost per participant at \$393 (2010 US\$) and per person retained in care at \$704.<sup>25</sup> Another study conducted a cost analysis of various programs that aimed at finding, linking, and retaining hard-to-reach persons with HIV infection to medical care<sup>29</sup>, and the average cost per person virally suppressed ranged from \$2,272–\$11,633 (2013 US\$).

We used microcosting to estimate the cost of each component of the labor and non-labor resources used in the PHC program, incorporating all fixed and variable costs. Sensitivity analyses showed that the average annual cost can be lower if the program could streamline some of the activities involving high costs. For example, with a moderate reduction in fixed costs (by 25% from the base case), the overall cost per patient virally suppressed was estimated to be \$1,631, a 15% reduction from the base case, \$1,916. A further reduction in fixed costs by 50% reduced the overall average cost by 30% (\$1,346). These results are similar to the elimination of both patient recruitment/identification and PHC outreach costs altogether. While the PHC study attempted to re-engage patients who were out of care and clinic staff actively recruited and engaged patients to encourage enrollment into the PHC study prior to randomization, future implementers can cut the intervention costs to \$1,338 per patient virally suppressed, by utilizing PHC only with patients that are already in care, referred to the intervention by their provider or care team. The goal of integrating PHC into a clinic in this manner would be to provide additional support to patients to help them remain in care and maintain or improve medication adherence, to ultimately achieve and maintain viral suppression.

The PHC measures of retention in care may be useful to improve our understanding of how different factors may contribute to retention of patients in HIV care. We calculated average cost of retention in care using all three measures, and the results were similar.

Our analysis has some limitations. We estimated the average program costs in terms of the cost per patient enrolled in the intervention, per patient virally suppressed, and per patient retained in care. Because the costs represented a majority of PHC intervention costs, while health outcomes represented the effects of PHC intervention plus SOC (i.e., the SOC outcomes were not subtracted), we may have underestimated our average program costs compared with other alternative measures (e.g., incremental cost-effectiveness ratios). Analysts conducting incremental cost-effectiveness evaluation and modeling using this methodology should be aware of this limitation when interpreting results.

Because the participant recruitment and PHC outreach activities took place before randomization, and we did not subtract the common costs partially attributable to the SOC participants, we may have potentially overstated our estimate of the program cost. We



conducted sensitivity analyses to evaluate the scenarios with lower or exclusion of these costs to estimate the PHC intervention costs and to show where there could be favorable results.

Our analysis was focused on the health care providers' perspective in assessing costs, and the estimates do not account for patients' time and associated costs. Although we included different geographic locations and practice settings, this analysis describes a small number of sites (four), limiting generalizability of our results. Furthermore, all data were collected prior to the service disruptions associated with the beginning of the COVID-19 pandemic in March 2020. The context of clinical services may have changed in ways that could affect service delivery costs going forward.

## Conclusions

PHC is a tailored, interactive video counseling intervention delivered in HIV primary care clinics to improve health outcomes, including retention in HIV care and viral suppression. While the PHC study did not show overall effectiveness in the primary outcomes, a priori subgroup analyses found that segments of the intervention arm were significantly impacted by the intervention; specifically, more men achieved viral suppression, and younger and older patients were retained in care more than those in the SOC arm alone. The EHE initiative calls for comprehensive strategies to enhance linkage, retention, and engagement in HIV medical care to improve viral suppression.<sup>4</sup> Following the COVID-19 related disruptions in patient care, there is increased interest in patient support strategies that can be delivered via digital strategies.<sup>30</sup> Our cost analysis showed that the program cost is comparable to other retention in care or re-engagement interventions, and even further reduced when focusing on retention and medication adherence to achieve viral suppression of those patients already in HIV care. By providing detailed microcosting information of the cost of each intervention activity and resources involved, our results provide useful information for clinics planning to implement PHC to strengthen their adherence and retention services.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

## Funding:

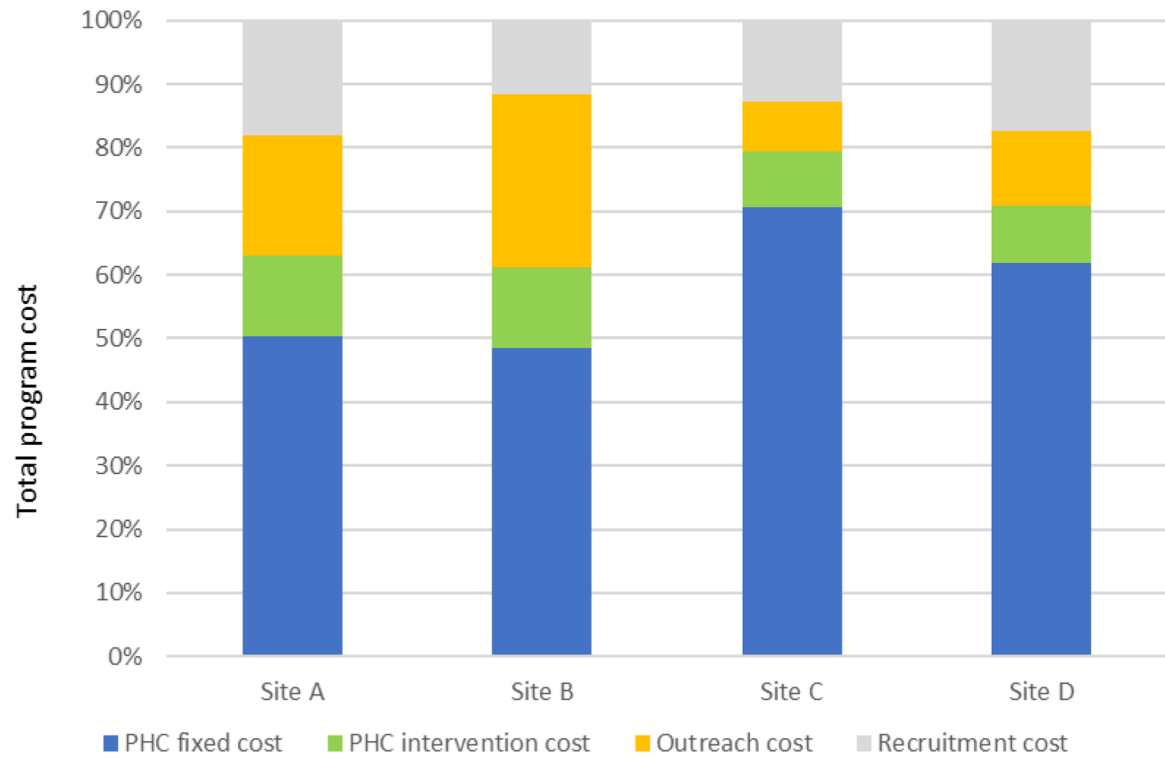
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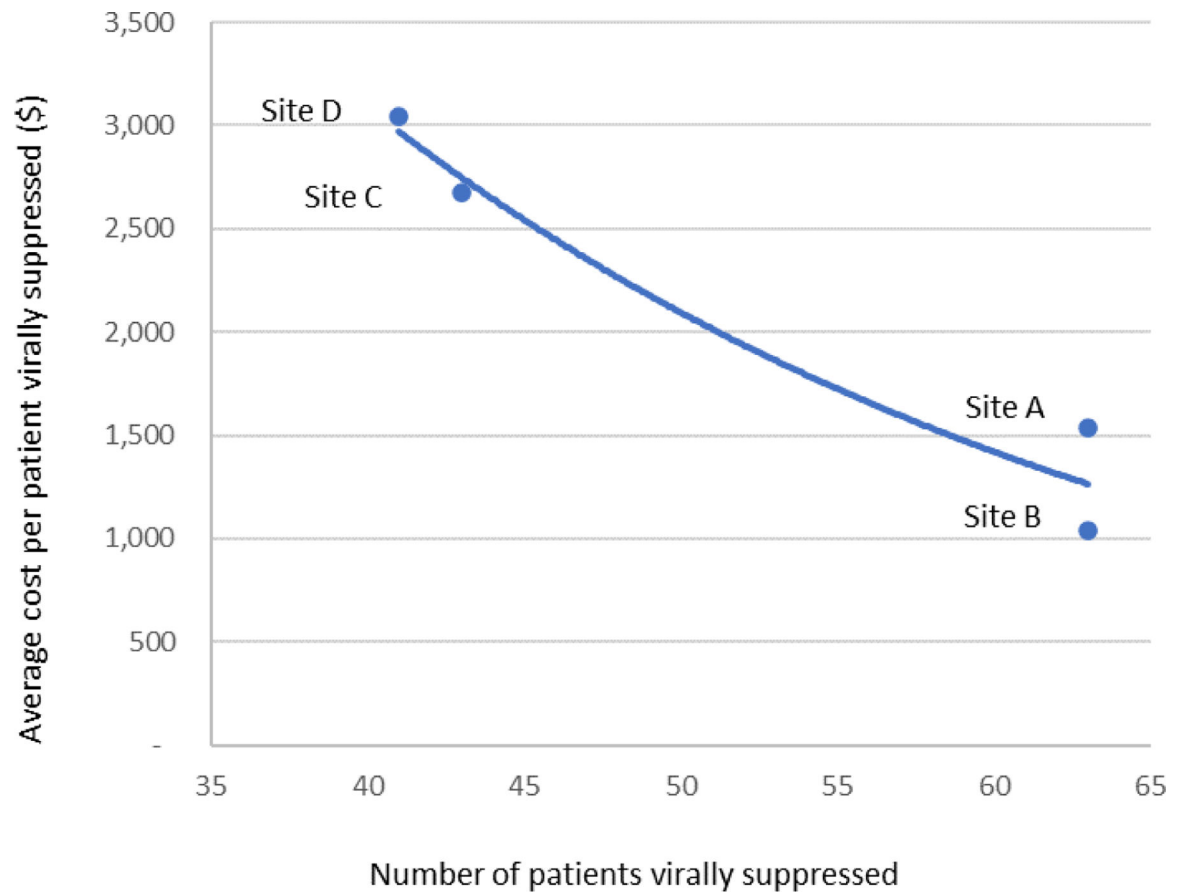
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**FIGURE 1.**

Distribution of the Positive Health Check (PHC) program costs for patient with HIV in multi-site clinical care settings, enrolled from February 2018–March 2019



**FIGURE 2.**

Average per-patient program cost and number of patients virally suppressed in the Positive Health Check intervention for patients with HIV in multi-site clinical care settings, enrolled from February 2018–March 2019

**TABLE 1.**

Program costs and outcomes of the Positive Health Check intervention for persons with HIV in multi-site clinical care settings, enrolled from February 2018–March 2019

	Site A	Site B	Site C	Site D	Overall
Patients enrolled in the intervention arm (no.)	95	101	102	99	397
Viral load suppression, primary outcome (no.) <sup>a</sup>					
Patients followed up, with VL data	82	98	91	97	368
Patients virally suppressed, n (%)	63 (77)	63 (64)	43 (47)	41 (42)	210 (57)
Retention in care, secondary outcome [n (%)] <sup>a,b</sup>					
Positive Health Check (RIC-A)	63 (66)	67 (66)	73 (72)	54 (55)	257 (65)
HRSA-HAB (RIC-B)	65 (68)	70 (69)	72 (71)	60 (61)	267 (67)
6-month visit gap (RIC-C)	59 (62)	69 (68)	72 (71)	53 (54)	253 (64)
Total annual program cost, \$	96,924	65,581	115,140	124,629	402,274
Average cost per patient, \$					
Enrolled	1,020	649	1,129	1,259	1,013
Virally suppressed	1,538	1,041	2,678	3,040	1,916
Retained in care (RIC-A)	1,538	979	1,577	2,308	1,565
Retained in care (RIC-B)	1,491	937	1,599	2,077	1,507
Retained in care (RIC-C)	1,643	950	1,599	2,351	1,590

<sup>a</sup>Outcomes represent the patients receiving Positive Health Check intervention in addition to their clinics' standard-of-care (PHC+SOC), i.e., those receiving the clinics' SOC alone were not subtracted. There were no statistically significant differences between PHC+SOC and SOC when analyzing all participants for both the primary and secondary endpoints.

<sup>b</sup>RIC-A: Positive Health Check measure of retention in care; RIC-B: Health Resources and Services Administration HIV/AIDS Bureau (HRSA-HAB) measure of retention in care; RIC-C: 6-month visit gap measure of retention in care.



TABLE 2.

Annual variable and fixed program costs of the Positive Health Check intervention for persons with HIV in multi-site clinical care settings, enrolled from February 2018–March 2019

	Site A		Site B		Site C		Site D	
	Mean (h)	Mean (\$)	Mean (h)	Mean (\$)	Mean (h)	Mean (\$)	Mean (h)	Mean (\$)
<b>Variable costs (labor)<sup>a</sup>:</b>								
Patient recruitment/identification	588	17,559	250	7,560	378	14,668	483	21,702
Intervention activities	385	12,292	276	8,348	251	9,999	297	11,202
<b>Variable costs (PHC outreach, labor)<sup>a</sup>:</b>								
Reaching patients lost to care	373	8,446	147	4,463	87	3,725	176	4,931
Contacting patients	295	6,678	130	3,938	35	1,490	111	2,588
Conducting community outreach	87	1,964	225	6,825	52	2,034	163	4,667
Updating patient contact information	52	1,179	87	2,625	39	1,835	91	2,339
<b>Fixed costs (labor):</b>								
Staff training and preparation	120	10,735	94	7,339	267	16,410	379	21,662
Mobile device management	86	2,457	44	1,339	84	3,149	78	2,999
Report generation	52	1,179	31	945	81	4,146	178	6,502
Administration/general oversight	255	14,427	148	8,383	175	14,381	275	18,480
<b>Fixed costs (non-labor):</b>								
Computers and printers	---	863	---	448	---	375	---	464
Durable supplies	---	213	---	230	---	214	---	143
WiFi Hotspot unit and monthly charges	---	401	---	122	---	219	---	195
Office supplies	---	72	---	310	---	110	---	61
Travel/Gas	---	-	---	92	---	-	---	-
Office space and utilities	---	18,460	---	12,615	---	42,385	---	26,695
Total	2,291	96,924	1,432	65,581	1,447	115,140	2,230	124,629

<sup>a</sup>The costs related to patient recruitment/identification as well as PHC outreach activities were conducted prior to the randomization and were not part of the PHC intervention or SOC practice. These were additional study costs and were attributable to the patients on both PHC and SOC arms.

**TABLE 3.**

Sensitivity of the results with changes in program costs in the Positive Health Check intervention for persons with HIV in multisite, clinical care settings, enrolled from February 2018–March 2019

	Site A	Site B	Site C	Site D	Overall
Base case, program cost per person with viral suppression	1,538	1,041	2,678	3,040	1,916
PHC intervention cost per patient, excluding recruitment and outreach costs: <sup>a</sup>					
Enrolled <sup>b</sup> (reduction, %)	\$643 (29.1%)	\$398 (20.6%)	\$896 (37.0%)	\$893 (38.7%)	\$708 (30.1%)
Virally suppressed	970	638	2,125	2,156	1,338
Retained in care (RIC-A)	970	600	1,252	1,637	1,094
Retained in care (RIC-B)	940	574	1,269	1,473	1,053
Retained in care (RIC-C)	1,036	582	1,269	1,668	1,111
Program cost per patient with viral suppression:					
Reduction in fixed costs:					
Moderate cost (25% reduction)	1,345	915	2,204	2,569	1,631
Low cost (50% reduction)	1,151	788	1,731	2,098	1,346
Reduction in recruitment costs:					
Low cost (50% reduction)	1,399	981	2,507	2,775	1,769
No cost	1,260	921	2,337	2,510	1,623
Reduction in outreach costs:					
Low cost (50% reduction)	1,393	899	2,572	2,863	1,773
No cost	1,249	758	2,466	2,685	1,631

<sup>a</sup>Because the costs related to patient recruitment/identification as well as PHC outreach activities were conducted prior to the randomization and were additional program costs attributable to the patients on both PHC and SOC arms, we excluded those costs to estimate the PHC intervention cost.

<sup>b</sup>Numbers in parentheses are percent reduction in cost per participant enrolled from the base case.