HHS Public Access

Author manuscript

AIDS Behav. Author manuscript; available in PMC 2018 November 01.

Published in final edited form as:

AIDS Behav. 2018 November ; 22(11): 3734–3741. doi:10.1007/s10461-017-2015-z.

Cost–Utility of Access to Care, a National HIV Linkage, Re-engagement and Retention in Care Program

Catherine Maulsby[1], **Kriti M. Jain**[1], **Brian W. Weir**[1], **Blessing Enobun**[1], **Melissa Werner**[2], **Morey Riordan**[2], **David R. Holtgrave**[1], and **A2C Intervention Team**

[1]Department of Health Behavior and Society, Johns Hopkins Bloomberg School of Public Health, 624 N. Broadway, Room 904C, Baltimore, MD 21205, USA

[2]AIDS United, 1424 K Street, N.W., Washington, DC 20005, USA

Abstract

Linkage to HIV medical care and on-going engagement in HIV medical care are vital for ending the HIV epidemic. However, little is known about the cost–utility of HIV linkage, re-engagement and retention (LRC) in care programs. This paper presents the cost–utility analysis of Access to Care, a national HIV LRC program. Using standard methods from the US Panel on Cost-Effectiveness in Health and Medicine, we calculated the cost–utility ratio. Seven Access to Care programs were cost-effective and two were cost-saving. This study adds to a small but growing body of evidence to support the cost-effectiveness of LRC programs.

Keywords

Retention in HIV care; Cost–utility; HIV; Access to Care

Background

Linking or re-engaging and retaining people living with HIV (PLWH) in ongoing, primary care is vital for ending the HIV epidemic and ensuring a full, healthy lifespan for the greater than one million PLWH in the US. Additionally, linking PLWH to care is a policy priority described in both the 2010 and 2015 national HIV/AIDS strategies [1–3]. However, 41–44%

The A2C Intervention Team is comprised of the co-authors of this paper and representatives from each study site.

Compliance with Ethical Standards

Conflict of interest Catherine Maulsby, Kriti Jain, Brian Weir, Blessing Enobun, Melissa Werner, Morey Riordan, The Access to Care Intervention Team, and David Holtgrave have no conflicts of interest to disclose.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the Institutional and/or National Research Committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed Consent Program sites underwent IRB approval locally. Program evaluation activities by Action Wellness, The Damien Center, and Amida Care were found to be non-human subjects research and consent was not obtained. Activities conducted by AIDS Action Committee were found to be minimal risk and all participants provided signed informed consent. Activities by AIDS Foundation of Chicago, AIDS Project Los Angeles, Christies Place, Louisiana Public Health Institute, Medical Advocacy and Outreach, and St. Louis Effort for AIDS were found to be participating in human subjects research which required IRB oversight. At all these sites written informed consent was obtained, except for St. Louis Effort for AIDS were informed consent was waved because all data were de-identified. JHU's IRB found the cost evaluation to be non-human subjects research and informed consent was not obtained.

of individuals living with HIV are not accessing regular, ongoing HIV care, and the epidemic disproportionately affects some demographic subgroups [4, 5].

The evidence base describing recent effective HIV linkage and retention in care programs is small but continues to grow [6, 7]. To explore the cost associated with such programs, several studies have modeled costs of providing HIV care [8–11]. The results of these analyses pointed towards various interventions, particularly those focused on retention in care, as being cost-effective interventions on a large scale. Alongside these modeling studies, there is a small number of economic analyses examining ongoing, real-world HIV linkage and retention in care programs. For example, in the US, Shrestha et al. examined the cost of a retention in care intervention compared to standard of care at six clinics. The researchers found that the intervention was more effective than standard of care and cost $3834 for each additional patient retained in care. In Zambia, Marseille et al. examined the cost-effectiveness of an ART program at 45 sites and assessed these to be in the mid-range of cost-effectiveness when compared to other interventions in the region [12].

Other economic analysis of HIV linkage and retention in care programs quantified the cost per quality-adjusted life year (QALY), which allows a comparison across health areas. Across the US, Kim et al. found that five ongoing, community-based HIV linkage and retention in care programs had highly achievable cost-saving and cost-effective-ness thresholds [13]. Two were found to be cost-effective, and the third was highly cost-effective with a cost per QALY of $4439 [14]. Another study, a nine-site linkage to care intervention for PLWH following incarceration, estimated the cost per QALY to be $72,285. This quantity was considered to be cost-effective [15]. An earlier study from Burundi found the cost per DALY to be $250 in the context of integrated care for HIV; this quantity was considered to be cost-effective in this context [16].

A recent review noted that few such studies exist and called for further evidence describing HIV linkage and retention in care programs [9]. In particular, cost–utility analyses are needed for comparisons across health areas. The analysis presented in this paper builds off of a cost and cost-threshold analysis of Access to Care (A2C). A2C included 12 US programs designed to help PLWH stay linked and retained in HIV care [17]. From 2011 to 2015, the program sites shared the goal of finding, linking, and retaining PLWH to HIV care, but tailored their approaches to the needs of their population, which included women affected by trauma, incarcerated or recently released individuals, and residents of medically underserved rural areas. Each program was evidence-informed but was tailored to the local epidemic of the lead agency in order meet the specific needs of individuals being served at each location. Program models included peer navigation, medical case management, care teams for care co-ordination, and intensive non-medical case management to eliminate barriers to HIV care. In this paper, we estimate the cost–utility ratio for the A2C programs.

Methods

A2C was a national HIV linkage, re-engagement and retention in care program funded by AIDS United with support from the Social Innovations Fund (SIF) and the Corporation for National and Community Service (details on the A2C initiative and the programs

implemented by the A2C grantees can be found elsewhere) [17]. This study presents the results of cost–utility analyses for seven of the A2C grantees. Two programs were not included because of incomplete data and two were excluded because significant difference were not seen over time in viral suppression. The fifth was excluded because it included a randomized control trial to assess program effectiveness, and we were not able to separate out the costs of program implementation from the costs associated with the study.

The A2C programs shared common elements such as being evidence-informed, including a focus on addressing clients' barriers to care, and working with multiple implementation partners. The majority of participants (52%) were recruited through in-reach which is the process of using data on medical visit history to identify and contact eligible individuals. The remaining participants were recruited through referrals from partner programs, self-referrals, and fliers/advertisements. To be eligible for the program, participants had to be living with HIV, over the age of 18 and either out-of-care or at risk for falling out of care. Individuals who were out-of-care failed to meet the Health Resources Services Administration HIV/AIDS Bureau definition of retention (two visits per year at least 60 days apart) [18, 19]. Participants who were at risk for falling out of care met the definition of retention in care but were characterized as being at risk for falling out-of-care for one or more of the following reasons: active severe substance use, active severe mental health issues, a crisis in basic need, history of missed visits/gap in care, living in a remote area, or a transition from a structured environment to the community (such as re-entry).

The cost–utility analysis of the A2C programs used standard methods as recommended by the United States Panel on Cost Effectiveness in Health and Medicine [20, 21]. To assess cost-effectiveness, we calculated "R" the cost–utility ratio (or net cost per QALY) using the following formula: $R = (C - AT)/AQ$. In this formula, "C" is the total person-year cost for all participants enrolled, "A" is the estimated number of HIV infections averted by the program, "T" is the lifetime cost of HIV care and treatment, and "Q" is the number of QALYs saved. All analyses were conducted in 2013 dollars.

"C" (the person-year costs of the program) was calculated from the payer perspective and the societal perspective. To estimate costs from the payer perspective, we used the total cost of program delivery, the total number of enrolled participants, and the total program duration for each site to calculate the cost per participant per year. The total cost of each program was provided by AIDS United, the funder for the project. The total number of participants enrolled and the program duration were gathered from program implementation forms and records. Societal costs were estimated by the A2C grantees using a standardized excel spreadsheet tool [13]. The spreadsheet tool captured costs per participant per year for participants' time, travel to and from program services, and dependent care. The societal costs and payer costs per participant per year were summed together and multiplied by the total number of participants to estimate the societal perspective. This approach estimated one person-year of costs for all participants enrolled. We used this approach to ensure that our data on costs aligned with our health outcome data, as described below.

"A", the number of HIV infections averted by each program, was calculated using data on the proportion of participants who became virally suppressed while enrolled in the A2C

program. Data on the proportion of participants who were not virally suppressed at enrollment but were virally suppressed at 12 months was used to estimate the net number of participants who became virally suppressed during A2C. We used McNemar's test to assess statistical significance at the p = 0.05 level. We multiplied the proportion of individual who became virally suppressed by the number of participants who were enrolled in A2C at least 12 months prior to the end of the program (and were therefore able to contribute 12 month follow-up data) (Table 2: (((column g − column f)/column e) * column b). We assumed that each participant who became virally suppressed contributed six person-months of viral suppression to the project. This estimate takes into consideration the duration of time it would have taken participants to become engaged in care and virally suppressed, and it is reasonable to assume that participants who were virally suppressed at their 12 month follow-up remained virally suppressed for a duration of time following their 12 month follow-up visits. Unfortunately, follow-up data on viral suppression beyond 12 months were not available to test this assumption. To estimate the number of HIV infections averted, we multiplied the net number of participants who became virally suppressed during A2C by the change in the estimated annual transmission rate (0.0472) for someone who is not virally suppressed. This latter was a weighted average of the transmission rate for individuals who are living with HIV but undiagnosed, HIV diagnosed but not retained in medical care, retained in care but not prescribed ART, and prescribed ART but not virally suppressed [22]. In addition, we conducted two sensitivity analyses. For the first sensitivity analysis, we assumed that individuals who became virally suppressed during the A2C program contributed one-person year of viral suppression. For the second sensitivity analysis, we used an alternative literature-based transmission rate for someone who is not virally suppressed (0.046) [23].

"T", the discounted lifetime cost of care and treatment was estimated to be $330,000 (in 2011 USD) [24]. We adjusted "T" to 2013 dollars (US Department of Labor's consumer price index http://data.bls.gov/pdq/SurveyOutputServlet) (price index for all urban consumers, not seasonally adjusted, US city average, medical care) ((425.134/400.25 8) * 330,000 = $350,509). To estimate the total number of QALYs saved, we first assessed QALYs saved through the improved health of program participants (Q1) by multiplying the estimated number of person-years of viral suppression by 0.039, an estimate of the number of QALYs saved from improvements in quality of life [25]. To estimate the number of QALYs saved through averted HIV infections (Q2), we multiplied the estimate of HIV infections averted by the program (A) by 5.83, the estimate from the literature of the number of QALYs saved by an averted HIV infection [24]. We summed the total number of QALYs saved by adding Q1 to Q2. We considered programs with a cost per QALY of less than $163,889 to be cost-effective. This threshold was calculated by multiplying the US gross domestic product per capita ($54,629.50) by 3 [26]. (US GDP per capita accessed from http://data.worldbank.org/indicator/NY.GDP.PCAP.CD, 19 June 2016.) This standard method for deriving thresholds scales the value of a life year to income and was defined in the World Health Organization's Choosing Interventions that are Cost-Effective program because of its global applications [27].

Results

The duration of the A2C programs ranged from 3 to 5 years depending on their funding cycle (Table 1) and served from 149 to 833 participants (Table 2). Absolute increase in the percent of participants who were virally suppressed at enrollment compared to follow-up (6 or 12 months) ranged from 7 to 54% and significant increases in the proportion of participants who were virally suppressed at enrollment and 12 months were seen at all seven sites (Table 2). The estimated number of person-years of viral suppression achieved during the implementation of A2C ranged from 14 to 96 while the number of HIV infections averted ranged from 0.64 to 4.54. The total QALYs saved ranged from 4.26 to 30.20. The cost–utility ratio estimates the net cost per QALY. The cost–utility ratio ranged from $–41,439.51 to $115,467.92. All seven SIF programs were cost-effective, as the cost–utility ratios were less than the threshold of $163,889, or the amount society is willing to pay per QALY. Two programs were cost-saving as demonstrated by a negative cost–utility ratio (Table 3).

When we ran our first sensitivity analysis (Table 4), we assumed that participants contributed 12 months rather than 6 months of viral suppression, six programs were cost-saving (AIDS Action Committee, AIDS Foundation Chicago, Amida Care, The Damien Center, St. Louis Effort for AIDS, and Medical Advocacy and Outreach) and all programs were cost-effective.

When we conducted sensitivity analyses and used 0.046 as the transmission rate for someone who is not virally suppressed, all programs remained cost-effective and two programs were cost-saving (The Damien Center and St. Louis Effort for AIDS) (data not shown).

Conclusion

Across A2C programs we saw a wide range in costs, number of infections averted and subsequent QALYs saved. Seven of the A2C programs were cost-effective and two were cost-saving. In interpreting the results from this study, it is important to consider that the A2C programs employed a diverse range of program models, served a variety of vulnerable populations and were implemented across the nation in varying geographical locations. As such, it is not appropriate to make direct comparisons between A2C programs.

This study faces several limitations. First, this paper uses a cost-effective threshold of $163,889 or the US gross domestic product per capita multiplied by three. Other research has used more conservative thresholds of $100,000–$150,000 per QALY [28, 29]. When we apply the threshold of $100,000 to our study, six of the programs remain cost-effective. In addition, in using the total costs of the programs to estimate “C,” we included intervention start-up costs which are typically inflated as well as costs associated with program evaluation. As a result, our estimate of “C” could be an overestimate. To estimate “A” we used aggregate data on the net number of participants who became virally suppressed from enrollment to 6 months follow-up as a proxy measure for person-years of viral suppression and then conducted sensitivity analysis. A more precise approach would have been to have

participant-level clinic data on the person-years of viral suppression contributed by each participant but this was beyond the scope of this evaluation.

Despite these limitations, our findings have important public health implications. The cost per QALY for the A2C programs ranged from $– 41,439.51 to $115,467.92. This adds to a growing body of literature which has found HIV linkage and retention in care programs to be cost-effective [14, 15]. The cost per QALY for the A2C programs also compares favorably with other public health interventions [30–32]. In conclusion, linkage, re-engagement and retention in care programs such as A2C appear to a cost-effective use of public health funds, worthy of further investment.

Acknowledgments

The authors would like to express their gratitude to the A2C intervention staff for their dedication and for the individuals who participated in the A2C intervention. This document is based upon work under Grant No. 10SIHDC001 and supported by the Social Innovation Fund (SIF), a Program of the Corporation for National and Community Service (CNCS). Opinions or points of view expressed in this document are those of the authors and do not necessarily reflect the official position of, or a position that is endorsed by, CNCS or the Social Innovation Fund Program. The Social Innovation Fund is a Program of the Corporation for National and Community Service, a federal agency that engages millions of Americans in service through its AmeriCorps, Senior Corps, Social Innovation Fund, and Volunteer Generation Fund programs, and leads the President's national call to service initiative, United We Serve. For more information, visit http://NationalService.gov.

References

1. Mugavero MJ, Amico KR, Horn T, Thompson MA. The state of engagement in HIV care in the United States: from cascade to continuum to control. Clin Infect Dis. 2013; 57(8):1164–71. DOI: 10.1093/cid/cit420 [PubMed: 23797289]
2. White House Office of National AIDS Policy. National HIV/AIDS strategy for the United States. Washington, DC: The White House; 2010. http://www.whitehouse.gov/administration/eop/onap/nhas [Accessed 27 Feb 2016]
3. White House Office of National AIDS Policy. National HIV/AIDS strategy for the United States: updated to 2020. Washington, DC: The White House; 2015. https://www.aids.gov/federal-resources/national-hiv-aids-strategy/nhas-update.pdf [Accessed 27 Feb 2016]
4. Gardner EM, McLees MP, Steiner JF, Del Rio C, Burman WJ. The spectrum of engagement in HIV care and its relevance to test-and-treat strategies for prevention of HIV infection. Clin Infect Dis. 2011; 52(6):793–800. DOI: 10.1093/cid/ciq243 [PubMed: 21367734]
5. Hall HI, Frazier EL, Rhodes P, Holtgrave DR, Furlow-Parmley C, Tang T, et al. Differences in human immunodeficiency virus care and treatment among subpopulations in the United States. JAMA Intern Med. 2013; 173(14):1337–44. DOI: 10.1001/jamainternmed.2013.6841 [PubMed: 23780395]
6. Higa DH, Crepaz N, Mullins MM. Prevention Research Synthesis Project. Identifying best practices for increasing linkage to, retention, and re-engagement in HIV medical care: findings from a systematic review, 1996–2014. AIDS Behav. 2016; 20(5):951–66. DOI: 10.1007/s10461-015-1204-x [PubMed: 26404014]
7. Liau A, Crepaz N, Lyles CM, Higa DH, Mullins MM, DeLuca J, et al. Interventions to promote linkage to and utilization of HIV medical care among HIV-diagnosed persons: a qualitative systematic review, 1996–2011. AIDS Behav. 2013; 17(6):1941–62. DOI: 10.1007/s10461-013-0435-y [PubMed: 23456593]
8. Gopalappa C, Farnham PG, Hutchinson AB, Sansom SL. Cost effectiveness of the National HIV/AIDS Strategy goal of increasing linkage to care for HIV-infected persons. J Acquir Immune Defic Syndr. 2012; 61(1):99–105. DOI: 10.1097/qai.0b013e31825bd862 [PubMed: 22580563]
9. Nosyk B, Min JE, Lima VD, Hogg RS, Montaner JS. Group SHAs. Cost-effectiveness of population-level expansion of highly active antiretroviral treatment for HIV in British Columbia,

Canada: a modelling study. Lancet HIV. 2015; 2(9):e393–400. DOI: 10.1016/s2352-3018(15)00127-7 [PubMed: 26423553]

10. Shah M, Risher K, Berry SA, Dowdy DW. The epidemiologic and economic impact of improving HIV testing, linkage, and retention in care in the United States. Clin Infect Dis. 2016; 62(2):220–9. DOI: 10.1093/cid/civ801 [PubMed: 26362321]
11. Zhang L, Phanuphak N, Henderson K, Nonenoy S, Srikaew S, Shattock AJ, et al. Scaling up of HIV treatment for men who have sex with men in Bangkok: a modelling and costing study. Lancet HIV. 2015; 2(5):e200–7. DOI: 10.1016/s2352-3018(15)00020-x [PubMed: 26423002]
12. Marseille E, Giganti MJ, Mwango A, Chisembele-Taylor A, Mulenga L, Over M, et al. Taking ART to scale: determinants of the cost and cost-effectiveness of antiretroviral therapy in 45 clinical sites in Zambia. PLoS ONE. 2012; 7(12):e51993.doi: 10.1371/journal.pone.0051993 [PubMed: 23284843]
13. Kim JJ, Maulsby C, Zulliger R, Jain K, Charles V, et al. Positive Charge Intervention Team. Cost and threshold analysis of positive charge, a multi-site linkage to HIV care program in the United States. AIDS Behav. 2015; 19(10):1735–41. DOI: 10.1007/s10461-015-1124-9 [PubMed: 26139421]
14. Jain KM, Zulliger R, Maulsby C, Kim JJ, Charles V, et al. PCI Team. Cost–utility analysis of three U.S. HIV linkage and re-engagement in care programs from positive charge. AIDS Behav. 2016; 20(5):973–6. DOI: 10.1007/s10461-015-1243-3 [PubMed: 26563760]
15. Spaulding AC, Pinkerton SD, Superak H, Cunningham MJ, Resch S, Jordan AO, et al. Cost analysis of enhancing linkages to HIV care following jail: a cost-effective intervention. AIDS Behav. 2013; 17(Suppl 2):S220–6. DOI: 10.1007/s10461-012-0353-4 [PubMed: 23138877]
16. Renaud A, Basenya O, de Borman N, Greindl I, Meyer-Rath G. The cost effectiveness of integrated care for people living with HIV including antiretroviral treatment in a primary health care centre in Bujumbura, Burundi. AIDS Care. 2009; 21(11):1388–94. DOI: 10.1080/09540120902884042 [PubMed: 20024715]
17. Jain KM, Maulsby C, Brantley M, Kim JJ, Zulliger R, et al. Team SIFi. Cost and cost threshold analyses for 12 innovative US HIV linkage and retention in care programs. AIDS Care. 2016; 28(9):1199–204. DOI: 10.1080/09540121.2016.1164294 [PubMed: 27017972]
18. Health Resources and Services Administration. [Accessed 10 Oct 2017] HIV/AIDS Bureau performance measures. http://hab.hrsa.gov/deliverhivaidscare/coremeasures.pdf
19. Horberg MA, Aberg JA, Cheever LW, Renner P, O'Brien Kaleba E, Asch SM. Development of national and multiagency HIV care quality measures. Clin Infect Dis. 2010; 51(6):732–8. (Epub 19 Aug 2010). DOI: 10.1086/655893 [PubMed: 20715924]
20. Sanders GD, Neumann PJ, Basu A, Brock DW, Feeny D, Krahn M, et al. Recommendations for conduct, methodological practices, and reporting of cost-effectiveness analyses: Second Panel on Cost-Effectiveness in Health and Medicine. JAMA. 2016; 316(10):1093–103. DOI: 10.1001/jama.2016.12195 [PubMed: 27623463]
21. Weinstein MC, Siegel JE, Gold MR, Kamlet MS, Russell LB. Recommendations of the Panel on Cost-effectiveness in Health and Medicine. JAMA. 1996; 276(15):1253–8. [PubMed: 8849754]
22. Skarbinski J, Rosenberg E, Paz-Bailey G, Hall HI, Rose CE, Viall AH, et al. Human immunodeficiency virus transmission at each step of the care continuum in the United States. JAMA Intern Med. 2015; 175(4):588–96. DOI: 10.1001/jamainternmed.2014.8180 [PubMed: 25706928]
23. Hall HI, Holtgrave DR, Tang T, Rhodes P. HIV transmission in the United States: considerations of viral load, risk behavior, and health disparities. AIDS Behav. 2013; 17(5):1632–6. DOI: 10.1007/s10461-013-0426-z [PubMed: 23456577]
24. Farnham PG, Holtgrave DR, Gopalappa C, Hutchinson AB, Sansom SL. Lifetime costs and quality-adjusted life years saved from HIV prevention in the test and treat era. J Acquir Immune Defic Syndr. 2013; 64(2):e15–8. DOI: 10.1097/qai.0b013e3182a5c8d4 [PubMed: 24047975]
25. Holtgrave DR, Hall HI, Wehrmeyer L, Maulsby C. Costs, consequences and feasibility of strategies for achieving the goals of the national HIV/AIDS strategy in the United States: a closing window for success? AIDS Behav. 2012; 16(6):1365–72. DOI: 10.1007/s10461-012-0207-0 [PubMed: 22610372]

26. World Health Organization. [Accessed 10 Oct 2017] Choosing interventions that are cost-effective. 2014. http://www.who.int/choice/en/
27. Robinson LA, Hammitt JK, Chang AY, Resch S. Understanding and improving the one and three times GDP per capita cost-effectiveness thresholds. Health Policy Plan. 2017; 32(1):141–5. DOI: 10.1093/heapol/czw096 [PubMed: 27452949]
28. World Bank. GDP per capita (current US$). 2013. http://data.worldbank.org/indicator/NY.GDP.PCAP.CD
29. Ubel PA, Hirth RA, Chernew ME, Fendrick AM. What is the price of life and why doesn't it increase at the rate of inflation? Arch Intern Med. 2003; 163(14):1637–41. DOI: 10.1001/archinte.163.14.1637 [PubMed: 12885677]
30. Salzmann P, Kerlikowske K, Phillips K. Cost-effectiveness of extending screening mammography guidelines to include women 40 to 49 years of age. Ann Intern Med. 1997; 127(11):955–65. [PubMed: 9412300]
31. Walensky RP. Cost-effectiveness of HIV interventions: from cohort studies and clinical trials to policy. Top HIV Med. 2009; 17(4):130–4. [PubMed: 19890185]
32. Winkelmayer WC, Weinstein MC, Mittleman MA, Glynn RJ, Pliskin JS. Health economic evaluations: the special case of end-stage renal disease treatment. Med Decis Making. 2002; 22(5):417–30. [PubMed: 12365484]

Table 1

Description of A2C programs

A2C grantees	Location and start date	Populations served	Program description	Program duration (years)
AIDS Action Committee	Boston, MA 2011	Individuals who are out-of-care or at risk of falling out of care	Advocacy teams comprised of HIV peer advocate, medical case manager and other staff provide HIV care co-ordination with a focus on economic stability	5
AIDS Foundation Chicago	Chicago, IL 2011	Individuals who are out-of-care	Systems and individual level intervention, were peer navigators and case managers work through a network of AIDS Service Organizations to support continuous HIV medical and social supportive services	5
Amida Care	New York City, NY 2011	Individuals who are dually or triply diagnosed with mental health or substance use issues	Mobile engagement teams conduct intensive outreach, care navigation, case management and re-engagement services	5
Christie's Place	San Diego, CA 2011	Women of color	Mobile- and home-based peer navigation services use a trauma- and gender-informed program model to provide care co-ordination, health system and social service navigation, social support, and individualized health care plans	5
The Damien Center	Indianapolis, IN 2013	Black MSM, Latino/a, women of color, and individuals 18–24	Linkage to Care Specialist work with participants to create customized care plans that address and eliminate barriers to HIV care and provide engagement in care services	3
St. Louis Effort for AIDS	St. Louis, MO 2011	Individuals who are out-of-care	Care team (peer advocate, nurse, and case manager) to eliminate barriers to care and support engagement in HIV care	5
Medical Advocacy and Outreach	Montgomery, AL 2011	Individuals living in rural areas	Telemedicine program that provided HIV care to individuals living in remote areas	5

Table 2

Participant enrollment and viral suppression at follow-up

A2C grantees	(a) Total participants served n	(b) Participants enrolled at least 1 year prior to the end of A2C n	All enrolled participants		Participants with data at both enrollment and 12 months			
			(c) Virally suppressed at enrollment n (prop., 95% CI)	(d) Virally suppressed at 6 or 12 months n (prop., 95% CI)	(e) n	(f) Virally suppressed at enrollment n (prop., 95% CI)	(g) Virally suppressed at 12 months n (prop., 95% CI)	X^2, *p* values
AIDS Action Committee	342	294	138 (0.40, 0.35–0.46)	237 (0.69, 0.64–0.74)	108	66 (0.61, 0.52–0.70)	90 (0.83, 0.75–0.89)	16.94, < 0.0001
AIDS Foundation Chicago	639	537	231 (0.36, 0.33–0.40)	333 (0.52, 0.48–0.56)	166	88 (0.53, 0.45–0.60)	113 (0.68, 0.60–0.75)	36.44, < 0.0010
Amida Care	833	797	438 (0.53, 0.49–0.56)	536 (0.64, 0.61–0.68)	441	291 (0.66, 0.61–0.70)	334 (0.76, 0.72–0.80)	17.61, < 0.0001
Christie's Place	226	224	122 (0.54, 0.47–0.60)	137 (0.61, 0.54–0.67)	91	66 (0.73, 0.63–0.81)	77 (0.85, 0.76–0.91)	4.21, 0.0430
The Damien Center	149	134	16 (0.11, 0.07–0.17)	73 (0.49, 0.41–0.57)	51	10 (0.20, 0.11–0.32)	38 (0.75, 0.61–0.84)	4.26, < 0.0001
St. Louis Effort for AIDS	322	295	34 (0.11, 0.08–0.14)	210 (0.65, 0.60–0.70)	169	18 (0.11, 0.07–0.16)	128 (0.76, 0.69–0.82)	108.04, < 0.0001
Medical Advocacy and Outreach	244	244	189 (0.77, 0.72–0.82)	235 (0.96, 0.93–0.98)	185	148 (0.80, 0.74–0.85)	176 (0.95, 0.91–0.97)	15.26, < 0.0001

prop. proportion, *95% CI* 95% confidence interval of the proportion

HIV infection averted or "A" = ((g − f)/e) * b/2

Table 3

Cost–utility analysis results: base case

A2C grantees	AIDS Action Committee	AIDS Foundation Chicago	Amida Care	Christie's Place	The Damien Center	St. Louis Effort for AIDS	Medical Advocacy and Outreach
C							
Estimated cost for all participants for 1 year of program exposure (societal perspective, $)	828,069	684,363	1,162,468	716,127	442,035	339,155	399,956
T							
Treatment cost of one HIV infection from the literature (2013 dollars, $)	350,509	350,509	350,509	350,509	350,509	350,509	350,509
A							
Estimated number of person-years of viral suppression (A1)	33	40	39	14	37	96	18
Estimated number of HIV infections averted (A2)	1.54	1.91	1.84	0.64	1.74	4.54	0.87
Q * A							
QALYs saved through improved individual health (Q1 = A1 * 0.039)	1.27	1.58	1.52	0.53	1.43	3.74	0.72
QALYs saved through averted HIV infections (Q2 = A2 * 5.83)	9.00	11.14	10.71	3.73	10.14	26.46	5.09
Total QALYs saved (Q1 + Q2)	10.27	12.72	12.23	4.26	11.57	30.20	5.81
Cost–utility ratio [R = (C − AT)/AQ] ($)	27,906.99	1127.70	42,427.91	115,467.92	(14,470.95)	(41,439.51)	16,181.94
Interpretation of cost– utility ratio	Cost-effective	Cost-effective	Cost-effective	Cost-effective	Cost-saving	Cost-saving	Cost-effective

Table 4

Cost–utility analysis results: sensitivity analysis (sensitivity analysis 1: 12 months of viral suppression)

A2C grantees	AIDS Action Committee	AIDS Foundation Chicago	Amida Care	Christie's Place	The Damien Center	St. Louis Effort for AIDS	Medical Advocacy and Outreach
C							
Estimated cost for all participants for 1 year of program exposure (societal perspective, $)	828,069	684,363	1,162,468	716,127	442,035	339,155	399,956
T							
Treatment cost of one HIV infection from the literature (2013 dollars, $)	350,509	350,509	350,509	350,509	350,509	350,509	350,509
A							
Estimated number of person-years of viral suppression (A1)	65	81	78	27	74	192	37
Estimated number of HIV infections averted (A2)	3.09	3.82	3.67	1.28	3.48	9.08	1.75
Q * A							
QALYs saved through improved individual health (Q1 = A1 * 0.039)	2.55	3.15	3.03	1.06	2.87	7.49	1.44
QALYs saved through averted HIV infections (Q2 = A2 * 5.83)	18.01	22.29	21.42	7.46	20.28	52.92	10.18
Total QALYs saved (Q1 + Q2)	20.56	25.44	24.45	8.52	23.15	60.41	11.62
Cost–utility ratio [R = (C − AT)/AQ] ($)	(12,380.84)	(25,770.48)	(5120.37)	31,399.63	(33,569.81)	(47,054.09)	(18,243.36)
Interpretation of cost–utility ratio	Cost-saving	Cost-saving	Cost-saving	Cost-effective	Cost-saving	Cost-saving	Cost-saving