Effectiveness and Efficiency of Improving HIV Service Provision for Key Populations in Nicaragua

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Objective: HIV in Nicaragua is concentrated among key populations (KPs) – men who have sex with men, female sex workers, and female transgender – in whom prevalence is 600–4,000 times higher than the general population. The United States Agency for International Development PrevenSida project is aimed at increasing healthy behavior among KPs and people with HIV and improving testing, counseling, and continuity of prevention and treatment by building capacity and improving performance of non-governmental organizations (NGOs) providing services to KPs. We evaluated the cost-effectiveness of PrevenSida’s activities.

Methods: This retrospective observational evaluation used individuals in KPs covered by NGOs receiving assistance from PrevenSida from 2012 to 2014. Cost-effectiveness analysis compared PrevenSida’s intervention with business-as-usual. Model inputs were generated from epidemiological modeling and PrevenSida’s records.

Results: By 2014, 24 NGOs received grants and technical assistance from PrevenSida with 72,955 people in KPs served at $11.32/person ($9.39–$16.55/person, depending on region). The estimated incremental cost-effectiveness ratio was $50,700/HIV case averted or $2,600/Disability-adjusted Life Year (DALY) averted (95% CI: $1,000–$99,000 and $50–$5,100, respectively).

Conclusion: PrevenSida distributed about $600,000 in grants and used $230,000 to support 24 NGOs in 2014. Cost-effectiveness from the program perspective compared to no program was slightly over half of GDP per capita per DALY averted, considered highly cost-effective by WHO criteria. Cost and efficiency varied by region, reflecting the number of people in KPs receiving services. Cost-sharing by NGOs improved cost-effectiveness from the program perspective and likely promotes sustainability. Focused interventions for KP service provision organizations can be acceptably efficient in this setting.

Keywords: vulnerable populations, HIV infections, Nicaragua, cost efficiency analysis
INTRODUCTION

Cases of HIV in Nicaragua are concentrated among groups of individuals referred to as key populations (KPs), such as men who have sex with men (MSM), female sex workers (FSW), and female transgender people (FT). In 2013, HIV prevalence among MSM was 7.5%, among FSW was 1.9%, and among FT was 13.8% (1), whereas in the general population it was 0.003% (2).

To control the country’s epidemic, the United States Agency for International Development (USAID) Nicaragua has funded the PrevenSida Project to reach KPs through building capacity and improving performance of Nicaraguan non-governmental organizations (NGOs) that provide services to KPs. PrevenSida is a 6-year project aimed at increasing healthy behavior among those most at risk of HIV/AIDS transmission. Its goals are to strengthen institutional capacities of NGOs working with KPs, improve access to and quality of HIV/AIDS preventive services, reduce stigma and discrimination among KPs, and improve coverage of KPs by NGOs. The project grants funds to KP NGOs and works to improve data quality and continuity of care for those with HIV. To encourage sustainability, PrevenSida requires participating NGOs to use material support from sources outside the project, including in-kind donations of HIV test kits, condoms and lubricants, administrative resources use such as buildings and capital equipment, and in-kind donations of labor.

It is important for the Nicaraguan Ministry of Health, USAID, and the United States President’s Emergency Plan for AIDS Relief (PEPFAR) to know the efficiency and effectiveness of the activities implemented by PrevenSida, especially as PEPFAR pivots toward service providers in geographic areas with high burden and focuses on transparency, accountability for impact, and accelerating core interventions for epidemic control (3).

An external evaluation of bilateral USAID programing, which included assessment of the PrevenSida Project, was commissioned by USAID and conducted in 2014 (1). It showed success in capacity-building for key organizations involved with the response to HIV and good communication and coordination between them. However, there was no examination of the cost of the combination prevention model for KPs and no evaluation of efficiency of capacity development for NGOs. The current study evaluates the cost-effectiveness of the PrevenSida activities in terms of expenditure per additional KP individual receiving services from a supported NGO, per case of HIV averted, and per disability-adjusted Life Year (DALY) averted. It estimates the cost and efficiency of nationwide expansion and consolidation of this prevention approach.

Research Questions

The questions for this evaluation are:

1. What is the cost and efficiency of the prevention program implemented by PrevenSida in terms of the projected proportion of HIV infections averted?
2. What is the cost-effectiveness, in terms of DALYs averted, of the PrevenSida intervention?

Intervention

PrevenSida provided technical assistance using principles of quality improvement to develop human resources competencies in preventive service provision, community outreach, and general management. It worked to address accessibility gaps in KPs and developed a combined prevention model based on working with the civil society organization networks in their own social spaces and complementing public services (4).

Following project start-up in 2011, the intervention was fully underway by 2012 when 12 NGOs were receiving technical support. Capacity development for NGO management included organizing boards of directors, defining overall strategic and annual plans, developing internal accountability and budget formulation and management, and formulating overall monitoring systems. For service provision activities, a computer-based monitoring and epidemiological system (Unique Recording System) was instituted across all participating NGOs to facilitate referral of KPs to specific target services, to maximize access and coverage, and to track performance in terms of risk behavior changes (condom and lubricant use, HIV/STI testing, counseling and referral) among the targeted KPs. In 2013, the number of NGOs participating in the grants program increased to 17, and in 2014, the number increased to 24. Technical and administrative experts based in Managua traveled to all participating NGOs to provide one-on-one training, coaching, and mentorship on three to five occasions through the intervention period. The NGOs were required to report data through the Unique Recording System, comply with administrative reporting, and remain in frequent communication throughout their involvement.

MATERIALS AND METHODS

Study Design

This retrospective observational evaluation considered KPs covered by participating NGOs who received technical assistance from PrevenSida between 2012 and 2014. Variables of interest include the grants to each NGO for institutional strengthening and prevention activities between 2012 and 2014, the population reached with prevention services by the NGOs, the proportion of KPs reported to have changed their risk behavior, and estimated incidence of HIV in the population of interest from 2010 to 2014.

Sampling

The study population is all of the KPs receiving services from participating NGOs in each fiscal year (FY). NGOs were included if they received grants from PEPFAR and the Key Population Challenge Fund (a financing mechanism established to expand coverage of preventive services to hidden or hard-to-reach KPs) specifically for HIV prevention activities for KPs. Data on 100% of the universe is available from those NGOs: 12 NGOs in FY 2012, 17 in FY 2013, and 24 in FY 2014.

Data Collection

PrevenSida has an extensive database recording the preventive services delivered by NGOs that uses an anonymous and
unique code for each service recipient to protect privacy. No additional information was required for this study – it was done entirely with the routine data collected through the Unique Recording System, including information by age, gender, population type, service received, number of contacts, geographical site where the service was delivered, and HIV test results. Other sources of information were PrevenSida’s financial records, which tracked grant payments to NGOs and staff costs for activities directly related to providing support to the NGOs. We used the project funder’s perspective for the analysis and therefore did not include the cost-sharing that was mandated for the NGOs.

Because of the anonymous nature of the data recording system and because no additional primary data were collected from clients or health-care providers, the evaluation presented no risks to participants. The study was approved by the Centro de Investigaciones y Estudios de la Salud (CIES) of the Universidad Nacional Autónoma de Nicaragua (UNAN Managua).

Analysis
To determine the efficiency of coverage of KPs, cost-effectiveness evaluation was conducted using decision-tree analysis comparing the PrevenSida intervention with business-as-usual (Figure 1). Inputs into the model in terms of the change in the risk of HIV were generated from the “Transmission Model” from UNAIDS (5), which used data from the PrevenSida records as inputs to estimate the number of individuals expected to develop HIV infection. Results were expressed in cost per additional person tested for HIV, cost per case of HIV infection averted, and cost per KP receiving services.

RESULTS
By 2014, 24 NGOs were receiving grants and technical assistance as part of their involvement in PrevenSida with a total of 74,080 people receiving their services (72,955 KPs plus 1,125 confirmed HIV cases served by them). The total cost per person in the key population reached was $11.32 with a range of $9.39–$16.55 per person depending on the region in which the NGO operated (Table 1).

We compared the cost of grants and administrative costs for technical assistance provided by PrevenSida between NGOs that had been working with the project for 3 years to those working for only 1 year. For comparability, they were chosen from the same regions. There was a difference in the number of people the NGOs were providing services to in the two categories, with the more experienced NGOs serving four or more times as many people in KPs. Therefore, the costs per capita for inexperienced
TABLE 1 | Costs and coverage of NGOs by PrevenSida by region, 2014.

| Region   | NGOs | PrevenSida costs | Grant total ($) | Number reached | Cost per person reached |
|----------|------|------------------|-----------------|---------------|------------------------|
|          |      |                  | Grant | Number reached | Total | KP (at risk) | PHIV |                   |
| Caribbean| 5    | 70,363           | 133,673| 12,280       | 16.55   |
| Pacific  | 14   | 121,962          | 349,205| 44,049        | 10.44   |
| Central  | 4    | 23,454           | 93,979 | 12,510        | 9.29    |
| RSJ      | 1    | 18,763           | 26,918 | 4,116         | 11.10   |
| Total    | 24   | 234,542          | 603,775| 72,965        | 11.32   |

TABLE 2 | Grants and administrative costs for selected NGOs by region.

| NGO   | Region | Grants | Admin Costs | People reached | Admin cost per capita | Per capita total cost |
|-------|--------|--------|-------------|----------------|-----------------------|----------------------|
| A     | Central| 33,902 | 5,864       | 6,766          | 0.87                  | 5.88                 |
| B     | Pacific| 33,502 | 8,712       | 4,695          | 1.86                  | 8.99                 |
| C     | Pacific| 33,098 | 8,712       | 4,076          | 2.14                  | 10.26                |
| F     | Central| 16,634 | 5,864       | 1,318          | 4.45                  | 17.07                |
| D     | Pacific| 15,452 | 8,712       | 2,001          | 4.35                  | 12.08                |
| E     | Pacific| 11,074 | 8,712       | 784            | 11.11                 | 25.24                |

DISCUSSION

The PrevenSida Project distributed about $600,000 in grants and spent about $230,000 to provide technical and administrative assistance to 24 HIV/AIDS NGOs throughout Nicaragua in 2014. In the same year, the number of individuals considered in KPs served by NGOs involved in the project was just over 72,955, for a total cost per individual served of less than $12, which is 0.26% of the Gross Domestic Product per capita (GDPPC).

In terms of efficiency, the intervention cost approximately $2,600 per DALY averted, which is a little over half the GDPPC and is considered highly cost-effective according to WHO criteria for an efficient health intervention (12). The NGOs themselves organized and managed cost-sharing outside the PrevenSida mechanism, and these costs were not included in this cost-effectiveness analysis because the perspective was of the PrevenSida funder, USAID, and not the NGOs or society at large. The amount of cost-sharing was approximately $233,000 per year; more than half of this amount was the utilization of volunteer labor and the share of office expenses in situations where the NGO had negotiated shared office space in which to operate along with other organizations. This model was promoted by PrevenSida to develop a greater degree of engagement among the NGOs and to help develop a model for sustainability of the activities beyond the involvement of PrevenSida (personal communication; April 10, 2015).

Comparing the costs and efficiency in terms of spending per recipient of services, more experienced sites received a higher amount of absolute funding, but because they were providing services to substantially more individuals, they were a third to three times less costly per capita. The PrevenSida administrative costs were approximately the same per NGO receiving the technical assistance; therefore, the number of KPs the NGO provided
services to was the main driver of the efficiency of their program. Given that the larger NGOs were the first to be included in the project, they look more efficient. Some of the technical assistance provided by PrevenSida was to improve management capacity in the NGO, and it was seen that fewer inputs were required over time for this type of assistance. It can be expected that if other NGOs providing services to KPs are added to the program in the future, they will appear less efficient because they will likely be serving fewer individuals in KPs and require more capacity-building inputs than NGOs already part of the project. However, both equity and efficiency issues must be addressed when making decisions in light of these data.

This study had limitations, some common to economic and epidemiological modeling and some due to data deficiencies. Several assumptions were made with the cost-effectiveness model. The discount rate of 3% per year is standard in this type of analysis. It could be argued that age weighting should have been used to account for the fact that the highest incidence of HIV occurs in those who are generally the most productive and therefore have the highest DALY age weighting. Doing so would have improved the cost-effectiveness of the project; instead, we produced a more conservative estimate. We assumed that those members of KPs who received services from the NGOs cost approximately the same regardless of their age, although this may not have been the case in reality. We also assumed that the new cases averted due to the intervention would have occurred at the same average age of those who have so far contracted HIV in Nicaragua. However, it is unlikely this input would have much of a difference in the overall result. Many figures used in the cost-effective model were based on epidemiological estimates using

### TABLE 3 | Key epidemiological inputs for cost-effectiveness model.

| Variable descriptions                                      | Value       | Source                                      |
|------------------------------------------------------------|-------------|---------------------------------------------|
| Probability of becoming HIV+ if risk behavior reduced, 2014| N 2,765     | Comision Nicaraguense del SIDA (6)          |
|                                                           | D 3,265,000 |                                             |
| Probability that KP gets NGO services, 2014               | N 42,271    | Comision Nicaraguense del SIDA (6)          |
|                                                           | D 80,280    |                                             |
| Probability of risk behavior reduction when exposed to NGO, 2014 | 57%         | Instituto Nacional de informacion de desarrollo (7) |
| Probability of HIV infection if no change in risk behavior in KP | N 3,387     | Comision Nicaraguense del SIDA (6) and PrevenSIDA (8) |
|                                                           | D 3,265,000 |                                             |
| Probability of risk behavior reduction if KP not exposed to NGO, 2014 | 38%         | Comision Nicaraguense del SIDA (6); PrevenSIDA (8), and UNAIDS (5) |
| Probability that KP gets NGO services, 2010               | N 3,065     | Comision Nicaraguense del SIDA (6) and UNAIDS (5) |
|                                                           | D 74,280    | Comision Nicaraguense del SIDA (6)          |
| Probability of reduced risk behavior with NGO, 2010       | 38%         | UNAIDS (5)                                 |

N, numerator; D, denominator.

### TABLE 4 | Sources and results for DALY calculations.

| Description | HIV with ART | HIV with no ART | AIDS with no ART | Reference                                      |
|-------------|--------------|-----------------|------------------|------------------------------------------------|
| Discount rate | 0.03         | 0.03            | 0.03             | Assumed                                       |
| Disability weight (1 for death) | 0.053        | 0.221           | 0.547            | Mather et al. (10), Salomon et al. (11), Comision Nicaraguense del SIDA (6), and USAID Nicaragua (4) |
| Age at death (YLL) | 60           | 36              | 36               | Comision Nicaraguense del SIDA (6) and USAID Nicaragua (4) |
| Life expectancy at age of death | 21           | 42              | 42               | Comision Nicaraguense del SIDA (6) and USAID Nicaragua (4) |
| Years between onset and death | 30           | 10              | 2                | Comision Nicaraguense del SIDA (6) and USAID Nicaragua (4) |
| Age at onset | 26           | 26              | 26               | Comision Nicaraguense del SIDA (6) and USAID Nicaragua (4) |
| Years with disability | 30           | 8               | 2                | Mather et al. (10) and Salomon et al. (11) |
| Years of life lost | 4.56         | 16.88           | 24.00            | Calculated                                    |
| Years of life lost to disability | 1.41         | 2.35            | 1.61             | Calculated                                    |
| DALYs lost | 5.96         | 21.23           | 25.61            | Calculated                                    |
| Percent of people with HIV in group | 67           | 33              | 33               | Calculated                                    |
| DALYs lost overall illness | 4.01         | 7.01            | 8.45             | Calculated                                    |
| Total estimated DALY burden per case of HIV in Nicaragua | 19.46        |                 |                  | Calculated                                    |
conclusions given by UNAIDS. While these are widely used in such projections, it would have been preferable to have enough follow-up time to collect actual outcome data.

CONCLUSION

The technical support given by PrevenSida appears to be cost-effective by WHO standards compared to the status quo, and therefore we recommend that implementation of this form of capacity development be continued. While it appears to be less efficient for new NGOs that provide services to fewer people in KPs, it is still likely to be cost-effective by international standards. These findings show that such targeted capacity development interventions aimed at organizations that provide services to KPs where the HIV epidemic has the greatest effect can be acceptably efficient, at least in this setting.

AUTHOR CONTRIBUTIONS

EB conducted the analysis and was primarily responsible for producing the first draft. RA, AO, and ON oversaw the intervention and led all data collection, entry, and cleaning; All authors reviewed, edited and approved the final draft.

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Conflict of Interest Statement: ON, RA, and AO are employed by URC Nicaragua, which implemented the program. EB is employed by a separate project by URC Headquarters in the United States. No authors received financial benefit based on the result of the evaluation.

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