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## Scale-Up and Case-Finding Effectiveness of an HIV Partner Services Program in Cameroon: An Innovative HIV Prevention Intervention for Developing Countries

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### Abstract

**Background**—Partner services (PSs) are a long-standing component of HIV control programs in the United States and some parts of Europe. Small randomized trials suggest that HIV PS can be effective in identifying persons with undiagnosed HIV infection. However, the scalability and effectiveness of HIV PS in low-income countries are unknown.

**Methods**—We used data collected from 2009 to 2010 through a large HIV PS program in Cameroon to evaluate HIV PS in a developing country. HIV-positive index cases diagnosed in antenatal care, voluntary counseling and testing, and inpatient facilities were interviewed to collect information on their sexual partners. Partners were contacted via telephone or home visit to notify, test, and enroll those found to be HIV positive in medical care.

**Results**—Health advisors interviewed 1462 persons with HIV infection during the evaluation period; these persons provided information about 1607 sexual partners. Health advisors notified 1347 (83.8%) of these partners, of whom 900 (66.8%) were HIV tested. Of partners tested, 451 (50.1%) were HIV positive, of whom 386 (85.6%) enrolled into HIV medical care. An average 3.2 index cases needed to be interviewed to identify 1 HIV case.

**Conclusions**—HIV PS can be successfully implemented in a developing country and is highly effective in identifying persons with HIV infection and linking them to care.

Public health partner services (PS) are a long-standing component of HIV control programs in parts of the United States and Europe.<sup>1–3</sup> These services typically involve trained staff interviewing persons with recently diagnosed HIV infection (index cases) about their sexual and needle-sharing partners and then making an effort to ensure that reported partners are notified, tested, and, if HIV infected, successfully referred for medical care. HIV PSs are designed both to ensure that infected persons receive life-saving treatment and to prevent ongoing HIV transmission.

Small randomized trials undertaken in the United States and in Malawi suggest that HIV PS programs can identify persons with undiagnosed HIV infections, and such programs have been brought to scale in some areas of the United States and Europe.<sup>4–7</sup> However, at present, HIV PSs are not commonly provided in low-income nations, and we are not aware of published reports describing large-scale HIV PS programs in Africa. We used data collected as part of a large, ongoing HIV PS program in Cameroon to describe and evaluate an HIV PS program in a developing country.

## MATERIALS AND METHODS

We analyzed data collected from index cases and their sex partners who received HIV PS between August 2009 and June 2010 in Cameroon, West Africa. The University of Washington Human Subjects Division and the Cameroon Baptist Convention Health Services (CBCHS) Institutional Review Board determined the study to be exempt from institutional review board approval.

### Study Background and Setting

The CBCHS initiated an HIV PS program in August 2007 in the North West and South West Regions of Cameroon (NWR and SWR). An estimated 5.1% of Cameroonian adults aged 15 to 49 years are HIV infected, and HIV prevalence is highest in the NWR and SWR (>6.9%).<sup>8</sup> The CBCHS is a nonprofit, faith-based health care organization. The AIDS Care and Prevention program of CBCHS includes community voluntary counseling and HIV testing (VCT), support of services to prevent mother-to-child HIV transmission in 434 facilities, HIV care and treatment, and the HIV PS program. Since its inception, this program has trained 80 health advisers in the provision of HIV PS and provided PS services to more than 9100 index cases. Health advisers include HIV educators, laboratory technicians, nurses, social workers, chaplains, and support group coordinators who provide PS in addition to their main jobs.

Beginning in 2009, CBCHS staff initiated a structured program evaluation of its HIV PS program in collaboration with investigators at the University of Washington, USA. This evaluation involved development and use of revised data collection forms. After a period of staff training, PS health advisers began using these new forms in August 2009.

### Study Population

The study population included persons testing positive for HIV infection who accepted HIV PS (index cases). All index cases were diagnosed as having HIV infection in CBCHS-supported VCT centers, antenatal care clinics, or inpatient facilities in Cameroon's NWR

and SWR between August 2009 and June 2010. After an HIV-positive result, health advisors asked all HIV-positive persons whether they were interested in receiving HIV PS. Those who verbally accepted were interviewed as index cases using structured interview forms. The program did not collect data on the number of persons testing HIV positive who were offered HIV PS. As a result, we cannot assess the proportion of persons who accepted PS, or ways in which those who accepted PS services differed from those who declined. Partners included individuals who were reported as sexual contacts by the index cases.

### Partner Notification Procedures and Data Collection

Before initiating PS interviews, health advisors explained that all information collected through the PS process would be kept confidential and that staff would not reveal index cases' identities when contacting their partners. Health advisors first asked each index case a series of questions regarding their demographic characteristics, sexual behavior, and HIV testing history. Next, they asked cases how many partners they had in the prior 3 years. If the index case reported no sex partners in the last 3 years, then the health advisors asked them about their most recent sex partner. Health advisors then attempted to collect information about each of the case's acknowledged sex partners, including the partner's demographic characteristics, contact information, the case's relationship to the partner, the case's sexual behavior with the partner, the case's knowledge of the partner's HIV status, and whether the partner had already been notified of the case's HIV result. All data were collected using structured interview forms; responses to most questions were recorded as numerical or categorical outcomes. Although all health advisors were trained in proper data collection procedures, staff's lack of familiarity with the forms resulted in substantial missing data during the first few months of data collection. Index cases were given unique ID numbers, and their partners were assigned with corresponding IDs that had an additional sequential number allowing partners to be linked to index cases.

After collecting data on all of the index case's reported partners, health advisors asked cases how they wanted to notify each partner, offering them the options of provider, contract, or patient referral.<sup>9</sup> Staff members explained each of these options to cases before they asked the case to decide on a partner notification plan. If cases chose provider referral, health advisors attempted to directly notify their partners. If cases chose contract or patient referral, the health advisor counseled the case on how to notify their partner(s) and gave them a letter to give to each of their partners; the letter explained why it is important for the partner to test for HIV and included information on where to test. The letter also indicated that the HIV test would be free if they came to a CBCHS clinic. If an index case chose contract referral, the health advisor and the case established a period of time during which the case would attempt to notify their partner(s) themselves. If an identified partner did not come to a CBCHS site by the end of that period, the health advisor attempted to notify the partner directly.

Health advisors contacted index cases who chose patient referral several days after the initial interview to verify whether each of their partners had been notified. If 1 or more partners had not yet been notified, the health advisor further counseled the index case and again offered them the 3 partner notification methods, allowing the case to revise their notification

plan, if desired. This process continued until all of the case's partners had been notified or the index case chose to no longer receive PS.

Health advisors first attempted to contact partners via telephone. If this was unsuccessful, they attempted to visit the partner's home. Health advisors made a minimum of 3 attempts to notify each partner. The program classified partners as lost to follow-up if all attempts to notify a partner were unsuccessful or if partners refused to meet with the health advisor. When notifying partners, health advisors counseled the partner about HIV and encouraged them to undergo HIV testing. Partners notified through a home visit were offered on-site HIV testing and posttest counseling. Partners notified via telephone were referred to the nearest CBCHS VCT site and encouraged to undergo testing as soon as possible. Partner service program staff indicated that most partners chose to be tested outside medical facilities, although the place of HIV testing was not specifically recorded. If a partner stated that they were already aware of being HIV positive, then the health advisor referred them for medical care and treatment.

Partners who came to CBCHS health facilities for testing as a result of any notification method were linked to the index case's unique ID number and recorded as notified. This was done using the partner's invitation letter, which included the index case's ID number, or by manually searching the program's records to find the index case's name and ID number. Health advisors referred HIV-positive partners to the nearest HIV care and treatment center, where they could enroll into care and be clinically evaluated for treatment. We defined partners to be enrolled in care if a health advisor (1) brought them to an HIV care clinic, (2) saw them in the clinic for care, (3) verified their enrollment in the care and treatment facilities' register books, or (4) verified their enrollment in their medical record.

Health advisors completed abuse case-report forms on a weekly basis to monitor and follow up any index cases who indicated during their initial interview that they feared domestic violence and/or abuse from partners. The form included instructions to describe in detail any situation that was reported by index cases and the plan developed by both the health advisor and index case for resolving the current problem and preventing any future abuse. The CBCHS developed a written protocol and presentations to use when training health advisors in how to provide HIV PS.

## Data Management and Statistical Analysis

Data from the structured interview forms were entered into an EpiInfo database and exported into Stata 10.0 for cleaning and analysis. We generated descriptive statistics for the index cases stratified by sex; defined the percentage of partners who were successfully notified, HIV counseled and tested, received HIV results, and enrolled into HIV care; and calculated sex-specific ratios for the number of index cases that health advisors needed to interview (NNTI) to notify 1 partner, test 1 partner, identify 1 HIV-positive partner, and/or enroll an HIV-positive partner into care. Similar metrics have been used in prior evaluations of PS programs in the United States.<sup>10,11</sup> The NNTI is analogous to the number needed to treat commonly used in clinical epidemiology.

## RESULTS

Health advisors interviewed 1462 index cases during the study period. The study population had a median age of 31.0 (range, 15–70) years and was predominantly female (72.9%) and married (53.1%; Table 1). Participants reported a median of 4 lifetime sex partners (range, 1–50) and 1 sex partner (range, 1–50) in the last 3 years. A small proportion (5%) of participants reported ever giving or receiving money or gifts for sex, and less than 7% reported having sex with a known HIV-infected partner. Cases provided information on 1607 partners (median, 1; range, 1–6). Most of identified partners were either spouses (43.8%), or a boyfriend or girlfriend (41.8%) (Table 2). Of the index cases who accepted PS, women were significantly more likely than men to report that they were afraid of being hit or hurt if their partner found out about their HIV status (7.4% vs. 3.4%,  $P < 0.001$ ).

Health advisors recorded a partner notification plan for 93% of the identified partners (1500 partners). Most index cases (59.5%) elected to have health advisors notify their partners for them using provider referral. Of the 1607 partners, health advisors and/or index cases successfully notified 1347 (83.8%) individuals. The partners of married index cases were significantly more likely to be notified than the partners of unmarried index cases (87.0% vs. 80.8%,  $P = 0.001$ ). Overall, 90 partners (6.7%) were notified by index cases on their own, 1245 partners (92.4%) were notified by health advisors, and 12 partners (0.9%) were notified jointly by both the index case and health advisor. Married index cases were significantly more likely than unmarried index cases to notify their partners on their own (8.6% vs. 4.6%,  $P = 0.003$ ). Health advisors notified 63% of partners in person and 35% by telephone. (Information on notification method was missing for 2% of notified partners.) A total of 900 (66.8%) of the 1347 notified partners were tested for HIV infection, of whom 451 partners (50.1%) were HIV positive. Partners notified in person were significantly more likely to get tested than those notified by telephone (91.1% vs. 73.3%,  $P < 0.001$ ). Among HIV-positive partners, 386 (85.6%) were successfully linked to HIV care and treatment (Fig. 1). A total of 151 (41.7%) of the 362 partners who tested HIV negative were spouses of infected cases, and 38.7% of 390 tested spouses were HIV uninfected. There were no reported cases of domestic violence resulting from PSs provided during this period.

HIV PS staff interviewed an average of 3.2 index cases to identify 1 new case of HIV (Table 3). Case-finding efficacy was higher for male index cases than for female index cases; the NNTIs for male and female index cases were 2.6 and 3.6, respectively. On average, program staff interviewed 3.8 index cases to enroll 1 HIV-positive partner into care and treatment.

## DISCUSSION

Our findings demonstrate that it is possible to provide HIV PS to large numbers of persons diagnosed as having HIV infection at antenatal care, VCT, and inpatient health facilities in sub-Saharan Africa and indicate that these services have the potential to identify large numbers of HIV-positive persons and link them to HIV medical care.

Although a small body of research has investigated PS for curable STIs in developing countries,<sup>12</sup> we are not aware of published reports evaluating large-scale HIV PS programs

in developing nations. Studies conducted in Africa measuring the proportion of infected persons who disclose their HIV status to sex partners after testing HIV positive have produced highly variable results, with 17% to 92% of persons disclosing their status to at least 1 sex partner.<sup>13–19</sup> In many instances, disclosure rates are less than 50%,<sup>16,19–22</sup> disclosure is delayed many months after HIV diagnosis,<sup>20</sup> and notified partners do not test for HIV.<sup>23</sup> Thus, the need to increase the number of partners who are notified and tested is evident.

Relatively little evidence exists demonstrating that HIV PS can increase the number of partners diagnosed as having HIV, lead to other outcomes that might prevent HIV transmission, or improve the health of persons living with HIV/AIDS. Only 2 randomized trials have evaluated HIV PS. The first enrolled 74 persons in North Carolina in the early 1990s and found that PS increased HIV testing among partners.<sup>4</sup> More recently, a randomized trial conducted in Malawi found that HIV PS increases the number of partners tested among persons with recently diagnosed HIV.<sup>7,24</sup> Our findings build on the results of that trial, demonstrating that a large PS program is feasible and acceptable in an African nation. Although our study did not include a control group, we believe that our results support the hypothesis that PS increases HIV case finding. Although some of the partners notified and tested through our program would almost certainly have been notified by their partners and tested in the absence of PS, given the large number of persons identified with HIV infection through PS, it is likely that the program notified many partners who otherwise would not have tested for HIV or received care. Furthermore, HIV PS provides a mechanism to reach HIV-positive men. HIV testing through CBCHS, like testing in many parts of Africa, is focused on the antenatal setting, and less effort has been directed toward testing men. However, several studies have found that testing male partners is associated with increased condom use<sup>25</sup> and improved retention of HIV-infected women in HIV care.<sup>26</sup> Our findings demonstrate that HIV PS is an effective means of testing male partners. Future studies should investigate whether this testing affects outcomes within a partnership and among families.

The NNTI observed in our study, 3.2, is well below that recently observed in the United States, where the median NNTI for PS programs in 2006 was 13.6.<sup>27</sup> However, similarly low NNTI indices were reported very early in the HIV epidemic in the United States.<sup>2,28</sup> These findings suggest that PS is a particularly effective intervention when used in populations in which HIV testing is not widespread. Cameroon and at least some other parts of sub-Saharan Africa likely fit this description and are ideal environments in which to institute PS programs.

Our study has several limitations. First, our findings are derived from a program evaluation, not a randomized controlled trial. Thus, we cannot say how many of the partners notified, tested, and linked to care through our program would have experienced similar outcomes in the absence of the program. Second, because some partners were likely tested at non-CBCHS sites without informing health advisors, we may have underestimated HIV testing outcomes. Third, we did not collect data on the total number of persons with diagnosed HIV who were offered PS through our program and, as a result, cannot define the precise acceptability of the intervention. Fourth, PS recipients in our program reported a mean of 1.6



sex partners in the prior 3 years, the contact period used for PS in Cameroon. This may reflect underreporting of partners or, if valid, suggest that a longer contact period may be worth evaluating. In either case, efforts to increase the number of partners elicited per index case merit evaluation. Fifth, we have limited data on potential deleterious effects of PS, including partnership dissolution or loss of emotional or financial support. A randomized trial of HIV testing conducted in Kenya, Tanzania, and Trinidad found that HIV testing was significantly associated with partnership dissolution and being neglected or disowned by family, but not with an increased risk of physical violence.<sup>15</sup> Seven percent of women in our study who accepted PS services reported fear of violence from a partner associated with PS, although, to date, we have identified only 2 cases of domestic violence among the more than 9100 recipients of PS served through our program. However, our data were collected from index cases who accepted PS services; thus, we cannot be sure of how many individuals may have declined services because of fear of their partners' reactions. Further investigation of the social harms and benefits associated with PS is needed. Finally, we did not systematically collect data on whether notified partners had a prior HIV diagnosis, and some of the partners who tested positive through our HIV PS program may have already known about their HIV infection before receiving PS.

Despite these limitations, our results demonstrate that HIV PS can be successfully implemented in a developing country and suggest that the intervention is highly effective in identifying persons with HIV infection and linking them to care. The CBCHS continues to provide HIV PS services and has also incorporated HIV PS into its prevention of mother-to-child transmission program. Thus, we believe that programs such as this are sustainable. Based, in part, on procedures developed in Cameroon, a cluster-randomized trial is now ongoing in Kenya to further evaluate PSs (C. Farquhar, personal communication), and a recent study from Malawi found that the intervention is cost-effective.<sup>29</sup> Future research should further address the cost-effectiveness of PS, its potential adverse effects, its impact on perinatal transmission, and its effect on sexual risk behavior in discordant couples. There is also a need for operations research in diverse settings to define where and with which populations PS is most effective. However, given the large proportion of infected persons who remain unaware of their HIV status, we believe that our findings should prompt others to develop, institute, and evaluate HIV PS programs in developing countries.

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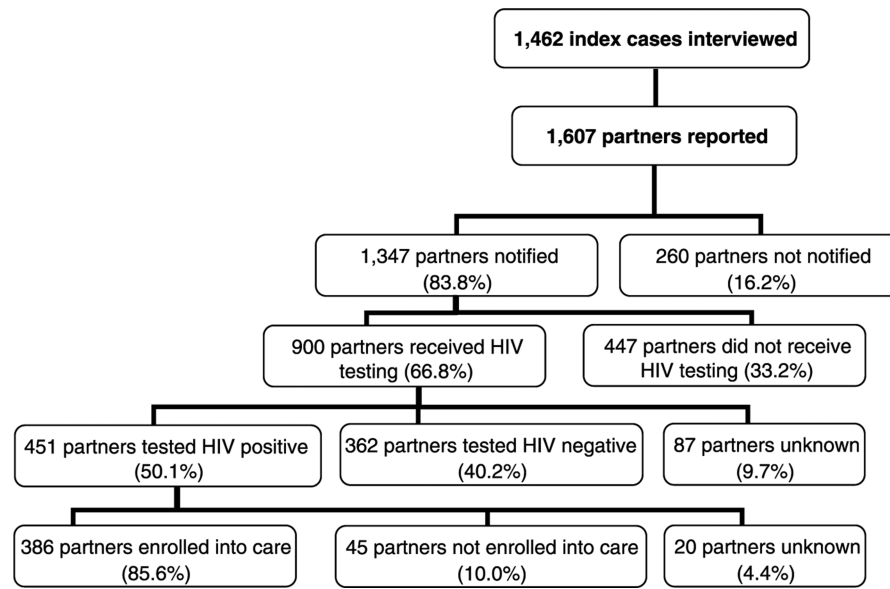
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**Figure 1.**  
Partner notification outcomes.

**TABLE 1**

Baseline Characteristics and Sexual Behaviors of Index Cases (n = 1462) by Sex of Index Case: Male Index Cases (n = 396) and Female Index Cases (n = 1066)

Characteristic	Male Index Cases		Female Index Cases	
	n	%	n	%
Clinic site, region				
Banso	76	19.2	178	16.7
Mbingo	64	16.2	188	17.6
Nkwen	203	51.3	583	54.7
Ndu	8	2.0	16	1.5
Lassin	2	0.5	1	0.1
Sakibak	17	4.3	38	3.6
Missing	26	6.6	62	5.8
Age, y, mean (range)	38.6 (19-70)	30.2 (15-60)		
Missing	56	14.1	114	10.7
Marital status				
Single	105	26.5	366	34.3
Married, monogamous	222	56.1	478	44.8
Married, polygamous	30	7.6	46	4.3
Divorced	7	1.8	66	6.2
Widow/er	10	2.5	69	6.5
Missing	22	5.6	41	3.9
Mean lifetime sex partners (range)	8.3 (1-50)	4.0 (1-30)		
Missing	128	32.3	245	23.0
Mean sex partners in last 3 y (range)	2.2 (1-50)	1.4 (0-10)		
Missing	65	16.4	189	17.7
Given money/gifts for sex?				
No	302	76.3	884	82.9
Yes	44	11.1	30	2.8
Refuse/Don't know	3	0.8	6	0.6
Missing	47	11.9	146	13.7
Received money/gifts for sex?				
No	322	81.3	820	76.9
Yes	12	3.0	82	7.7
Refuse/Don't know	6	1.5	13	1.2
Missing	56	14.1	151	14.2
Any vaginal or anal sex without condoms in last 3 y?				
No	92	23.2	255	23.9
Yes	227	57.3	662	62.1
Refuse/Don't know	14	3.5	18	1.7
Missing	63	15.9	131	12.3
Sex with known HIV-positive person(s)?				

Characteristic	Male Index Cases		Female Index Cases	
	n	%	n	%
No/Don't know	296	74.7	801	75.1
Yes	15	3.8	64	6.0
Refuse	18	4.6	26	2.4
Missing	67	16.9	175	16.4
Why did you test for HIV?				
Symptoms	184	46.5	307	28.8
Part of antenatal care visit	10	2.5	393	36.9
Voluntary screening test	119	30.1	233	21.9
Partner or health worker notified me of exposure	41	10.4	42	3.9
Other	12	3.0	33	3.1
Missing	30	7.6	58	5.4
Did you ever do an HIV test before you first tested positive?				
No	259	65.4	640	60.0
Yes	88	22.2	295	27.7
Refuse/Don't know	3	0.8	12	1.1
Missing	46	11.6	119	11.2

**TABLE 2**

Characteristics of Index Case's Relationship With Each Reported Partner(s) (n = 1607)

Question and Responses	n	%
Index's relationship to partner (n = 1607)		
Wife/Husband	704	43.8
Girlfriend/Boyfriend	672	41.8
Someone I had sex with for fun	25	1.6
Someone who pays me or gives me things for sex	19	1.2
Someone who forced me to have sex	8	0.5
Missing	179	11.1
Is male index afraid of being hit/hurt if partner finds out HIV status? (n = 448)		
No	362	80.8
Yes	15	3.4
Refuse	2	0.5
Don't know	23	5.1
Missing	46	10.3
Is female index afraid of being hit/hurt if partner finds out HIV status? (n = 1159)		
No	822	70.9
Yes	86	7.4
Refuse	9	0.8
Don't know	121	10.4
Missing	121	10.4
Partner notification plan chosen by index (n = 1607)		
Patient referral	316	19.7
Contract referral	228	14.2
Provider referral	956	59.5
No plan chosen	107	6.7

**TABLE 3**NNTI Ratios<sup>\*</sup>

Indicator	NNTI Ratio
Overall notified	1.1
Female index per heterosexual male partner notified	1.1
Male index per heterosexual female partner notified	1.0
Overall tested	1.6
Female index per heterosexual male partner tested	1.7
Male index per heterosexual female partner tested	1.4
Overall HIV-positive partner	3.2
Female index per heterosexual male HIV-positive partner	3.6
Male index per heterosexual female HIV-positive partner	2.6
Overall HIV-positive partner enrolled in care	3.8
Female index per heterosexual male HIV-positive partner enrolled in care <sup>8</sup>	4.2
Male index per heterosexual female HIV-positive partner enrolled in care <sup>9</sup>	3.0

<sup>\*</sup> Homosexual females were not included in the analysis because the sample size was too small (n = 2). There were no cases of homosexual males.