Case finding among sexual partners to HIV positive individuals in Cameroon.

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Abstract

Case finding among sexual partners to HIV positive individuals in Cameroon.

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Background: Heterosexual transmission of HIV accounts for a significant proportion of new HIV infections in sub-Saharan Africa with individuals unaware of HIV status at risk of transmitting the virus to their sexual partners. Partner services (PS) have been in use at the Cameroon Baptist Convention Heath Services (CBCHS) program to promote partner notification, early HIV testing, diagnosis and initiation to treatment for sexual partners to newly diagnosed HIV positive individuals (index persons). The goal of this study is to define the scalability, effectiveness and safety of partner services within the CBCHS PS program.

Methods: We conducted a secondary analysis of CBCHS program data from 2007 to 2015 to evaluate the overall scale and partner notification outcomes; using data from 2014-2015, we determined index person (IP) and program factors associated with HIV case-finding; as well as adverse outcomes including partnership dissolution, loss of financial support and physical intimate partner violence (IPV). Descriptive analyses were used to define the overall scale of the program; and adverse outcomes at enrolment and follow-up, overall and stratified by gender. Logistic regression with clustering on the IP was used to describe factors associated with HIV case finding.

Results: Overall, the CBCHS program interviewed 18,730 IPs who mentioned 21,057 sexual partners (index: partner ratio = 1:1.08) with a 10-fold increase in number of individuals that occurred mainly from

2007- 2010 before slowing down from 2011 - 2015. Between 2014 and 2015, 1261 IPs and 1357 sexual partners were mentioned. IPs were mainly female (63.8%), median age: 36 years (Interquartile Range [IQR]: 30, 43), married monogamous: 47.9% and seen at rural facilities (70.1%). Sexual partners were male (61.3%), median age 36 years (IQR: 30, 42), and married (57.0%). Ninety percent (n=1224) of the 1357 sexual partners, were notified in-person either by the IP or the health advisor and were offered HIV testing services. HIV prevalence among the 1224 notified sexual partners was 27.2% [previously diagnosed: 170/1224, 13.9%; newly diagnosed HIV positive: 163/1224, 13.3%]. HIV case finding was less likely to be associated with health advisor notification compared to IP notification [adjusted odds ratio [aOR] = 0.66, 95% confidence interval [CI]: 0.47, 0.93]. 19.7% of the IPs reported a history of IPV at enrolment to the PS program (female: 24.2%, male: 15.8%). On IP follow-up after receipt of PS, 61 (6.3%) had partnership dissolution, 15 (1.5%) had lost financial support while 11 (1.1%) sustained physical IPV. Three clients of the eleven reporting physical IPV after receiving PS (27.3%) attributed it to the intervention.

Discussion: The CBCHS PS program was scalable, safe and had high HIV case finding compared with other HIV testing methods. IPV was relatively common in Cameroon. However, very few IPs receiving PS reported adverse outcomes following receipt of partner services. Partner services can be a useful component of routine HIV services to augment HIV testing to individuals at risk of HIV acquisition in sub-Saharan Africa countries.

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1. INTRODUCTION

Heterosexual HIV transmission to sexual partners of HIV infected individuals contributes to a significant proportion of new HIV infections globally, with sub-Saharan Africa (SSA) accounting for over 70% of incident HIV infections (1). Partner notification has been a routine part of HIV care programs in US and Europe to increase HIV case finding and testing, and has been implemented at a programmatic level in SSA in Cameroon and Mozambique (2–7). Early sexual partner tracing, notification and HIV testing have been shown to markedly reduce HIV transmission to sexual partners of newly diagnosed HIV positive individuals, leading to earlier diagnosis, referral and initiation of HIV care including anti-retroviral therapy (ART) uptake and increased life expectancy (8–12).

The WHO published guidelines on partner notification in December 2015, underscoring the importance of achieving the first target of diagnosing 90% of all people with HIV as part of the United Nations (UN) 90–90–90 global HIV targets (13). Randomized clinical trials on partner notification conducted the USA (2), Malawi (14,15) and Kenya (16,17) and have shown a higher uptake of HIV testing among partners of people with HIV compared to passive referral methods. These studies were in general populations in Africa and key populations in the US, and there was improved identification of high proportions of HIV-infected persons, and increased linkage to care through the referral of newly identified HIV-infected partners to ART services. A meta-analysis of the US and Malawi randomized controlled trials showed that provider initiated PS resulted in a nearly 2-fold increase in the uptake of HIV testing among the partners of HIV-positive individuals compared to those who received passive referral. Similarly, the average rate of testing or return of partners to the clinic per index person in the provider initiated PS group was twice that in the passive referral group (13).

PS, though widely available in USA and some parts of Europe, is slowly gaining traction in SSA, with Cameroon at the forefront in its implementation. The Cameroon Baptist Convention Health Services (CBCHS) pioneered a PS program in August 2007 with the services offered including sexual partner tracing, notification and HIV testing (18). Health advisors trained on the provision of PS, including nurses,

peer educators, lab technicians, chaplains, and support group coordinators, have offered the service to over 24,000 individuals since program inception. Other SSA countries such as Kenya, Mozambique and Malawi have also implemented PS in programmatic and research settings but none has achieved the scale of the Cameroon program (7,14,16). PS has been incorporated to the WHO guidelines, with an anticipation that more countries in resource-constrained settings will start to implement it (13). An evaluation of the CBCHS data will be useful in demonstrating the scalability, effectiveness and safety of PS programs, and will aid policy makers interested in identifying factors affecting HIV case-finding that might help prioritize which patients should receive the interventions.

We conducted a secondary analysis on three key objectives using CBCHS program data. The first objective was to define the overall scale and partner notification outcomes of the CBCHS program over a period of eight years (2007 – 2015). The second objective was to assess the correlates of HIV case finding within PS by assessing index client and site characteristics that increase case finding in 2014 – 2015. The third objective was to evaluate the risk of adverse outcomes such as partnership dissolution, physical IPV and loss of financial support, among sexual partners who received PS in Cameroon from 2014 to 2015.

2. METHODS

2.1. ETHICAL APPROVAL

Ethical approval for this study was obtained from University of Washington and the CBCHS Institutional Review Boards; both gave a non-research determination for the program data analysis.

2.2. PROGRAM OVERVIEW AND STUDY SETTING

This secondary data analysis utilized programmatic data collected from the CBCHS program in Cameroon between 2007 and 2015. CBCHS introduced assisted HIV partner notification in 2007 as a strategy to break the chain of HIV transmission in communities by integrating these services into antenatal clinics, inpatient facilities and community-based HIV testing programs in rural, peri-urban and urban areas in the Northwest and Southwest Regions. In 2013, CBCHS introduced PS to other programs including 22 sites implementing prevention of mother to child transmission of HIV (PMTCT) programs offering Option B+ regimen, as a strategy to increase male partner disclosure, notification, testing and linkage to care. The CBCHS PS program further expanded in 2015 to the Center and Littoral Regions of Cameroon. As of January 2017, the program was operational in 70 sites in Cameroon within 5 regions in Cameroon; 16 CBCHS sites and 54 CBCHS supported facilities (8 in the North West region, 8 South West region, 22 Centre Region in Djoungolo health district and 16 sites in Douala - Deido health district).

2.3. PROGRAM PARTICIPANTS

The study population was comprised of Index Persons (IPs) defined as individuals newly testing positive for HIV infection at the CBCHS facilities and their sexual partners. IPs were considered eligible for the program if they were above 18 years of age and willing to provide informed consent for HIV testing services (HTS) and willing to provide information on at least one sexual partner. Sexual partners were considered eligible if they were willing to provide informed consent for HTS.

2.4. PARTNER NOTIFICATION PROCEDURES

Health advisors (HAs) obtained verbal consent to interview IPs about their sexual partners. The HA and the IP would then agree on whether to use passive, provider or contract referral to notify their sex partners

of their exposure to HIV and the need to test for HIV, as described by the World Health Organization (13). The three partner notification approaches used in the CBCHS program were passive, contract and provider referral. In p*assive referral,* the IP is encouraged to disclose the results to his/her partners without direct involvement of a health care provider. In c*ontract referral,* the IP is allowed a short period of time in which to contact and refer his/her sex partners, after which the provider intervenes and notifies partners. In *provider referral,* the healthcare provider directly contacts the sex partners of the IP, without a waiting period. For both the contract referral and provider referral, the HAs obtained consent from the IP to trace, notify and interview their sexual partners and inform them of HIV exposure without revealing the identity of the index case.

HAs notified sexual partners in person or by phone that they were exposed to HIV, conducted pre-test counseling, offered to do an HIV test or referred the sexual partner to a clinic for HIV testing. HAs followed up to confirm that the sexual partner was tested for HIV and recorded the test result. The HAs also referred all IPs and HIV positive sexual partners for HIV care and treatment services, linked HIV positive pregnant IPs or sexual partners to PMTCT services and educated all clients on HIV prevention and risk reduction.

2.5. RETENTION

At enrolment, IPs were informed of the need to link to care at facilities of their choice and that they would be reviewed routinely for linkage to HIV care. Similar procedures applied to HIV positive sexual partners. HAs routinely reviewed their progress to ensure linkage and retention to HIV care, though this was largely dependent on resource availability at site level. In 2015, HAs started retesting a sample of sexual partners who were initially HIV negative to determine the incidence of HIV in this high risk group and to reeducate them on risk reduction.

2.6. INTIMATE PARTNER VIOLENCE (IPV) MONITORING

Safeguards were incorporated due to concerns that PS could lead to adverse outcomes including partnership dissolution, loss of financial support and physical intimate partner violence (IPV) among IPs.

IPV refers to any form of physical, sexual, emotional or psychological harm by a current or former partner or spouse (19). Health advisors were trained according to a specific IPV screening protocol on identifying, counselling, and referring IPs with recent history of IPV (within 3 months) or who feared for IPV after PS. IPs were encouraged to alert the HA in case of any IPV after PS were offered, whether relationship dissolution, physical assault or loss of financial support, in order to receive individual or couple counselling and support. Subsequent follow-up was made on IPs who sustained IPV after PS to ensure participant safety.

2.7. DATA COLLECTION AND STORAGE

At enrollment, a standardized interview with the IP was conducted with information on demographic characteristics, sexual risk behavior, HIV testing history and contact details of sexual partners collected. For sexual partners, information on demographic characteristics, sexual risk behavior and HIV testing history was collected at the enrolment visit. Both IPs and their sexual partners were followed up for linkage to care beginning in 2015, and for review of adverse outcomes. HAs would follow HIV positive sexual partners up to ascertain initiation of treatment at a HIV care facility, by recording either the client's registration or pharmacy number. All newly diagnosed HIV positive clients were initiated ART based on WHO staging and CD4 count levels.

HAs recorded HIV testing results for IPs on facility registers used for routine HIV testing services accessible only to the facility staff. The stored data was used to evaluate partner notification and clinical outcomes. In addition, HAs noted pertinent sociodemographic information from IPs and sexual partners on separate forms that were filed in a securely locked office area that was then entered into an EpiInfo or Excel database in password protected computers for further analysis. Details on clients either lost to follow-up or not engaged in care were divulged only to authorized staff for further tracing.

2.8. STATISTICAL ANALYSIS AND METHODS

The scale of PS and its outcomes was analyzed from the overall program data (2007-2015), while a subset analysis of data from 2014-2015 was used to analyze IP and sexual partner characteristics, HIV case finding as well as adverse outcomes.

Descriptive analyses for partner notification outcomes were conducted based on overall distribution with a trend analysis of partner notification outcomes over time. The number of IPs who received PS, partners notified and testing HIV positive was estimated. Variables were summarized using median and inter-quartile range for outcome variable and predictor variables to determine their central location and spread, while categorical variables were summarized with percentages.

Logistic regression using robust standard errors with clustering of the sexual partner based on the IP was used to evaluate the correlates of HIV case finding among sexual partners. Associations between each covariate and HIV case finding were assessed, and baseline characteristic variables associated with case finding in the bivariable analysis ($p<0.1$) were included simultaneously in the multivariable model. Estimates were presented using odds ratios (ORs) and 95% confidence intervals (CI).

The risk of adverse outcomes (physical IPV, partnership dissolution and loss of financial support) among IPs who received PS was described at enrolment and follow-up, and presented overall and stratified by gender. Analysis was conducted using Stata 14.0 (StataCorp, College Station, TX).

3. RESULTS

3.1. CBCHS PARTNER SERVICES PROGRAM SUMMARY

From 2007 - 2015, the CBCHS PS Program has provided services to 18,730 IPs and 21,057 sexual partners, increasing almost 10-fold from 227 IPs and 278 sexual partners in 2007 to 2193 IPs and 2372 sexual partners in 2015. **Table 1** represents the overall coverage of the program derived from summary reports of all CBCHS facilities. Over half of the sexual partners mentioned were notified (61.1%), with 71.5% of them receiving HIV testing services, 51.8% testing HIV positive and 65.3% of those HIV positive linking to care.

Table 1: Overall coverage of the Cameroon Baptist Convention Health Services (CBCHS) partner services program: 2007 – 2015

	Partner notification outcome per year										
	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**Total**	**%**
Index Persons	227	1610	2174	2587	2061	2409	2439	3030	2193	**18730**	**-**
Sexual Partners	278	1701	2384	2812	2476	3041	2710	3283	2372	**21057**	**-**
SP Notified	167	1309	1742	2184	1416	1627	1336	1981	1105	**12867**	**61.1%**
SP Tested	110	1004	1477	1681	808	1139	863	1339	781	**9202**	**71.5%**
SP Testing HIV +ve	55	557	688	969	446	588	470	592	399	**4764**	**51.8%**
SP Linked to Care [1]	0	37	90	633	302	587	473	591	399	**3112**	**65.3%**

SP – Sexual partner

[1] There was a marked increase from 2010 in the proportion of sexual partners linking to care after testing HIV +ve relative to total sexual partners testing HIV +ve that year

There was rapid scale-up of HIV partner services from 2007- 2010 which slowed between 2011-2015 due to financial constraints (**Figure 1**). However, CBCHS received additional funding in 2016 with preliminary results showing improved capacity within pre-existing and new healthcare facilities indicating that PS programs are scalable with adequate and timely provision of resources.

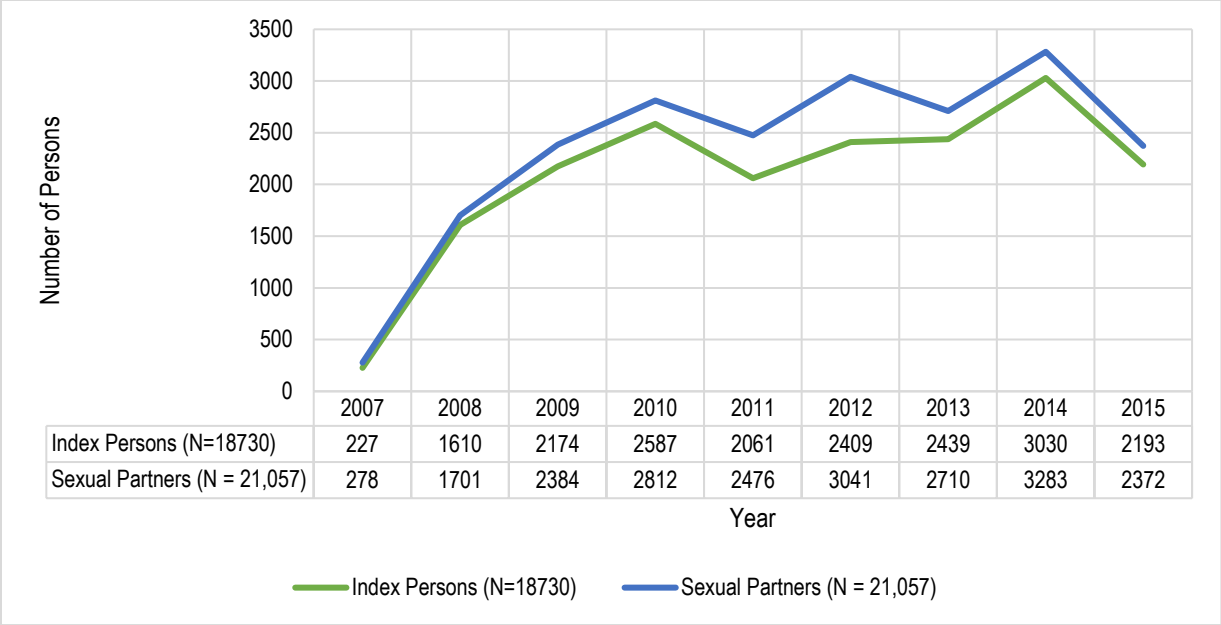
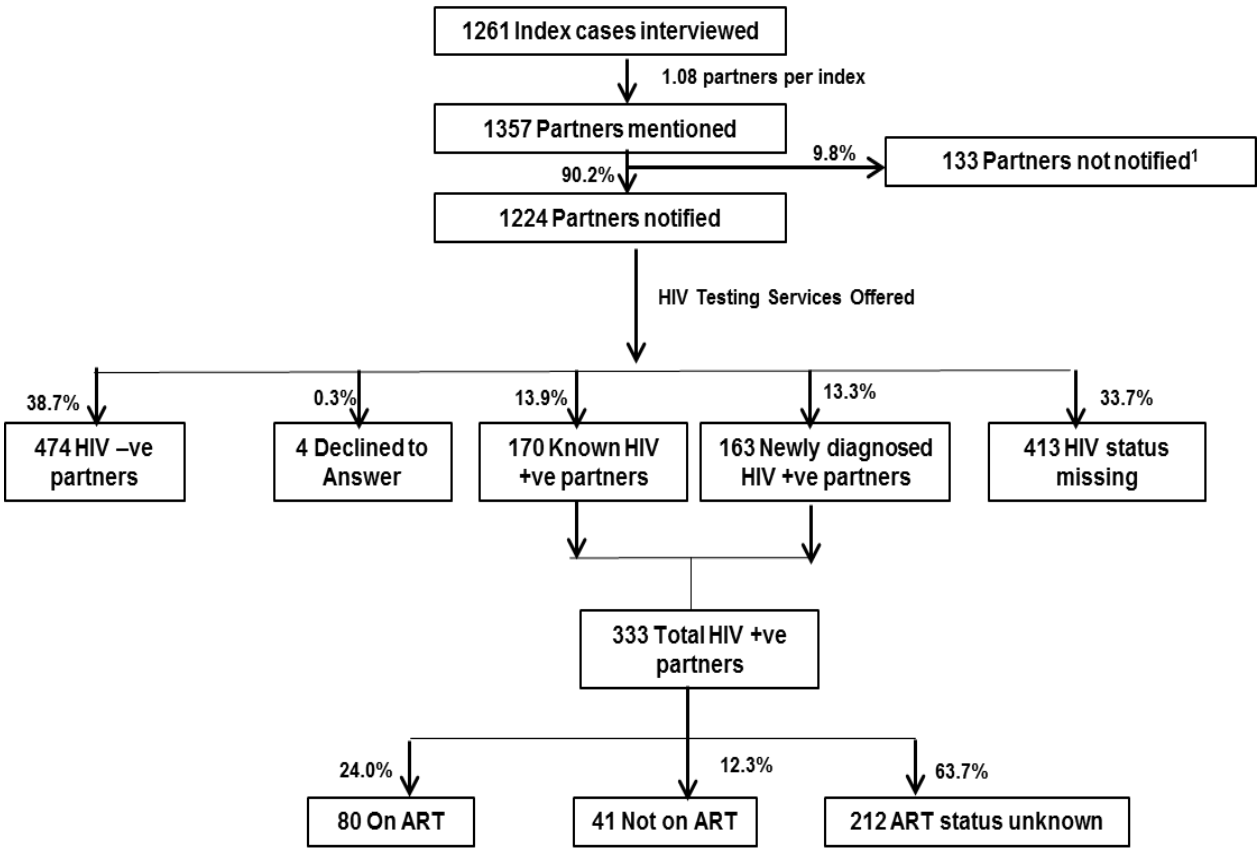


Figure 1: Index person and sexual partner mentioned by year: 2007 - 2015

3.2. INDEX PARTICIPANT AND SEXUAL PARTNER MENTIONED CHARACTERISTICS

In the sub-analysis of 2014 – 2015 data, records from 1261 IPs and 1357 sexual partners were mentioned were reviewed in the CBCHS program (**Figure 2**). These records represent about a quarter of all 2014 – 2015 data available on IPs (1261/5223, 24.1%) and sexual partners (1357/5655, 24.0%). Incomplete client records received from facilities for data entry would be returned for completion, an issue that affected all CBCHS facilities uniformly. However, some forms would either not be completed or not returned in time for data entry and reporting.



ART – Anti-Retroviral Therapy

[1] Reasons partners not notified not available

Figure 2: Flow diagram of partner notification outcomes for 1261 index persons with 1357 sexual partners mentioned with data available: 2014 - 2015

Over 90% of sexual partners mentioned (1224/1357) were notified by the CBCHS program and offered HIV testing services indicating the success of the program in targeted notification and testing of partners at risk for HIV infection. IP characteristics are outlined in **Table 2** [female: 63.8%, median age: 36 yrs (Interquartile Range – IQR: 30, 43), married monogamous: 47.9%, IP seen at rural facility: 70.1%]. Most IPs tested for HIV after provider initiated testing and counseling (PITC) (67.1%) underscoring the importance of offering HIV Testing Services (HTS) to all individuals seeking treatment at healthcare facilities. Pregnant women attending antenatal care (ANC) formed 12.0% of individuals receiving PS, a potential area of scale-up for partner services for HIV positive women at risk for re-infection from already HIV positive partners or who risk of transmitting HIV to their HIV negative sexual partners. Most of the

IPs were enrolled to a HIV care clinic (84.3%) with 72.6% having a CD4 count done and 59.7% initiating ART in 2014/2015 (Test and Start recommendation by WHO had not yet been adopted in Cameroon). There were low proportions of ART initiation relative to the UNAIDS 90:90:90 targets indicating the need for additional program support to facilitate appropriate care and treatment for IPs.

Characteristics of sexual partners mentioned are outlined in **Table 2** [Index-Partner ratio: 1:1.08, median age: 36 years (IQR: 30, 42)]. Majority of the sexual partners mentioned were men (61.3%) a priority population for the partner services program. Most IPs were in relatively stable relationships with their sexual partners (wife/husband: 57.0%).

Table 2: Demographic and HIV testing characteristics for index persons and sexual partners mentioned: 2014 - 2015

	Index Persons N = 1261	
	N / Median	**% / IQR**
Demographic characteristics		
Age (years)#	36	30, 43
Gender		
Female	805	63.8%
Male	456	36.2%
Marital status		
Single	317	25.1%
Married monogamous	603	47.9%
Married polygamous	53	4.2%
No of wives	2	1,3
Divorced	124	9.8%
Widow/widower	109	8.6%
Missing	54	4.3%
Sites[1]		
Rural	884	70.1%
Urban	376	29.8%
Other (Not Specified)	1	0.1%
HIV testing characteristics		
Reason for testing for HIV*		
Had other symptoms (PITC)	846	67.1%
Sexual partner told index person s/he has HIV	84	6.7%
Index person notified by health advisor	7	0.6%
As part of antenatal care (ANC)	151	12.0%
Client initiated testing	202	16.0%
Other reason (Unknown)	17	1.3%
Other(Specified)	16	1.3%
HIV care outcomes at index follow-up		
CD4 count done at diagnosing site		
Yes	916	72.6%
No	32	2.5%
Missing	313	24.8%
Index person on anti-retroviral therapy [2]		
Yes	753	59.7%
No	185	14.7%
Missing	323	25.6%
	Partners Mentioned N = 1357	
Sexual partner mentioned characteristics	**N / Median**	**% / IQR**
Partners identified	1357	
Index:Partner ratio	1:1.08	
Age (years)#	36	30,42

Gender		
Male	832	61.3%
Female	515	38.0%
Missing	10	0.7%
Relationship to sexual partner		
Wife/husband	773	57.0%
Girlfriend/boyfriend	549	40.5%
Other	11	0.8%
Missing	24	1.8%

IQR – Interquartile Range; PITC – Provider Initiated Testing and Counselling; IP – Index Person; SP – Sexual partner

\# Data were missing for the following variables: Index person age (n=49, 3.9%), Sexual partner age reported by IP (n=216, 15.9%)

* Adds up to more than 100%

[1] *Rural facilities*: Banso Baptist Hospital (BH), Mbingo BH, Lassin Baptist Health Center (BHC), Ngounso BHC, Jikijem BHC. *Urban facilities:* Nkwen BHC, Nkwen Rural, Mutengene BH, Etoug-ebe BHC, Mboppi BHC, Bamenda Regional Hospital, Azire Integrated Health Center (IHC)

[2] World Health Organization's (WHO) Test and Treat all recommendation for HIV management had not been initiated

3.3. PARTNER NOTIFICATION AND HIV CARE OUTCOMES FOR SEXUAL PARTNERS

Of the 1357 mentioned partners, 1224 (90.2%) were traced for notification with 1,170 (95.6%) successfully notified (**Table 3**). Similar proportions were traced by the IP (43.7%) and the HA (44.3%). Sexual partners were mostly notified in person (71.1%) as compared phone notification. Overall HIV prevalence among the sexual partners was 27.2% [known HIV positive: 170/1224, 13.9%, newly diagnosed HIV positive individuals: 163/1224, 13.3%].

Table 3: Sexual partner notified HIV characteristics and care outcomes: 2014 - 2015

	Sexual Partners N = 1224	
Sexual Partner (SP) HIV Characteristics	**n**	**%**
Sexual partner was notified		
Yes	1,170	95.6%
No	21	1.7%
SP was dead	2	0.2%
Missing	31	2.5%
Method of notification		
Notified by index person	535	43.7%
Notified by health advisor	542	44.3%
Both health advisor and index person	62	5.1%
Tested and diagnosed same time as IP	38	3.1%
Missing	47	3.8%
Phone or in-person notification		
In-Person	870	71.1%
Phone	293	23.9%
Other	6	0.5%
Missing	55	4.5%
HIV status of sexual partner [1]		
Newly tested HIV -	474	38.7%
Previously diagnosed HIV +	170	13.9%
Newly diagnosed HIV +	163	13.3%
Declined to answer	4	0.3%
HIV status missing	413	33.7%
HIV Care outcomes for HIV +ve partners on follow-up	**n=333**	
CD4 count done at diagnosing site		
Yes	141	42.3%
No	26	7.8%
Missing	166	49.8%
Partner on anti-retroviral therapy (ART)[2]		
Yes	80	24.0%
No	41	12.3%
Missing	212	63.7%

IP – Index person

1 HIV status recorded by the Health advisor based on test results or sexual partner self-report

2 World Health Organization's (WHO) Test and Treat All recommendation for HIV management had not been adopted in Cameroon

HIV care outcomes for HIV positive sexual partners at follow-up are described in **Table 3**. Of the 333 HIV positive sexual partners, 42.3% had a CD4 count done and 24.0% were initiated on ART, markedly lower than UNAIDS 90:90:90 targets for ART initiation. Approximately one-third of sexual partners who were notified and tested HIV positive received subsequent partner services to trace additional partners (known HIV positive: 63/170, 37.1%; newly diagnosed HIV positive: 50/163, 30.7%), providing an opportunity to reach other potentially infected sexual partners.

3.4. HIV CASE FINDING

Analyses of IP and program characteristics for HIV case finding are described in **Table 4**. In the univariate analysis, IPs in married monogamous (OR: 1.99, 95% CI: 1.18, 3.34) and in married polygamous relationships (OR: 3.65, 95% CI: 1.63, 8.18) were more likely to be associated with HIV case finding compared to those IPs who were single. IPs tested at urban facilities were 1.60 times (95% CI: 1.09, 2.35) more likely to be associated with HIV case finding compared to IPs tested in rural facilities. Female gender of the IP (OR: 0.69, 95% CI: 0.48, 1.00), health advisor notification (OR: 0.60, 95% CI: 0.41, 0.88) and phone notification (OR: 0.49, 95% CI: 0.29, 0.83) were less likely to be associated with HIV case finding compared to male gender of IP, index person notification, and in person notification respectively.

In the multivariate analysis, HA notification was less effective at identifying HIV positive sexual partners [adjusted odds ratio- aOR: 0.65, 95% CI: 0.46, 0.92] when compared to index person notification, after adjusting for gender, marital status, site and how the sexual partner was notified (phone or in-person). There was a trend for partners notified in person rather than by phone to be more likely to be HIV positive. No differences were observed in HIV case finding in multivariate analyses comparing gender, marital status, facility location and phone or in-person notification after adjusting despite them being present in the univariate analysis.

Table 4: Index person characteristics and notification method: Associations with identifying newly HIV positive sexual partners

	HIV positivity*		OR	95% CI	p-value	aOR	95% CI	p-value
Index participant	**#/Total**	**%**						
Gender: Female	82/363	22.6%	**0.69**	**0.48, 1.00**	**0.05**	0.99	0.71, 1.39	0.97
Age	38 (30,44)	36 (30,43)	1.01	1.00, 1.03	0.12	1.00	0.98, 1.02	0.94
Marital status								
Single (Ref)	22/126	17.5%	1	-	-	1	-	-
Married - monogamous	100/338	29.6%	**1.99**	**1.18, 3.34**	**0.01**	1.37	0.89, 2.10	0.15
Married - polygamous	17/39	43.6%	**3.65**	**1.63, 8.18**	**0.00**	1.96	0.93, 4.14	0.08
Divorced	9//56	16.1%	0.91	0.39, 2.11	0.82	1.14	0.59, 2.20	0.70
Widow/er	5//36	13.9%	0.76	0.26, 2.20	0.62	1.01	0.47, 2.14	0.99
Tested as part of ANC	15/67	22.4%	0.82	0.45, 1.51	0.53	1.05	0.65, 1.71	0.83
Site: Urban	57/176	32.4%	**1.60**	**1.09, 2.35**	**0.02**	1.12	0.78, 1.61	0.54
Notification method								
Who notified partner								
1 - IP (Ref)	76/258	29.5%	1	-	-	1	-	-
2 - Health Advisor	64/321	19.9%	**0.60**	**0.41, 0.88**	**0.01**	**0.66**	**0.47, 0.93**	**0.02**
3 - Both HA and IP	11//35	31.4%	1.10	0.52, 2.33	0.81	1.22	0.66, 2.27	0.53
How partner was notified								
1 - In person (Ref)	140/501	27.9%	1	-	-	1	-	-
2 - By phone	19/119	16.0%	**0.49**	**0.29, 0.83**	**0.01**	0.64	0.41, 1.02	0.06

HIV positivity = New HIV +ve/(Sum of new HIV +ve and HIV negative cases); aOR: Adjusted odds ratio for gender, marital status, site, who notified the partner and how partner was notified; OR: Odds ratio; CI: Confidence Interval; ANC – Antenatal Care, HA – Health advisor, IP – Index person

3.5. ADVERSE OUTCOMES

Adverse outcomes including partner dissolution, physical intimate partner violence (IPV) and loss of financial support at enrolment are described in **Table 5**. IPs reported intimate partner violence (IPV) from 19.7% (267/1357) from the sexual partners they mentioned with 24.2% of women IPs (195/805) and 15.8% of male IPs enrolled in the program having ever sustained an adverse outcome prior to receiving partner services. 7.4% of IPs (101/1357) feared for IPV from their sexual partners. Timing of the IPV was relatively similar with 54.3% (145/267) occurring more than 3 months prior to the IP enrolment and 43.5% (116/267) having occurred within 3 months of enrolment to the PS program.

Table 5: Adverse outcomes among index persons based on reported sexual partner characteristics: 2014-2015

	Sexual partners N = 1357	
History of adverse outcomes reported at enrolment	**n**	**%**
Ever sustained an adverse outcome from sexual partner (partnership dissolution, loss of financial support, physical IPV)		
Yes	267	19.7%
Female IP (n=805)	195	24.2%
Male IP (n=456)	72	15.8%
No history of an adverse outcome ever	1018	75.0%
Declined to answer	4	0.3%
Missing	68	5.0%
Timing of adverse outcome among 267 index persons		
Adverse outcome occurred > 3 months prior to receipt of PS	145	54.3%
Female IP (n=805)	103	12.8%
Male IP (n=456)	42	9.2%
Adverse outcome from sexual partner in last 3 mons	116	43.5%
Female IP (n=805)	89	11.2%
Male IP (n=456)	27	5.9%
Declined to answer	1	0.4%
Missing	5	1.9%
Fears adverse outcome from this sexual partner		
Yes	101	7.4%
Female IP (n=805)	67	8.3%
Male IP (n=456)	34	7.5%
No fear of adverse outcome from partner	993	73.2%
Unsure if to fear for adverse outcome	153	11.3%
Declined to answer	3	0.2%
Missing	107	7.9%

IP – Index person; IPV – Intimate Partner Violence; PS – Partner Services

Adverse outcomes among IPs after receipt of partner services were rare (**Table 6**). On follow-up, 61 IPs reported subsequent adverse outcomes from their sexual partners (61/976, 6.3%), all of them involving partnership dissolution and 41.0% (25/61) of them remaining separate from their partners for at least 2 years. (**Table 6**). Loss of financial support and physical IPV accounted for 1.5% and 1.1% respectively.

Physical IPV due to HA notification was rare. Despite the rigorous IPV screening of IPs, three cases of physical IPV were reported due to HA notification among the 976 recipients of APS for whom follow-up date were available. These cases included: 1) 42-year-old single female, not pregnant with no prior history of or fear of IPV; 2) 42-year-old single male with no prior history or fear of IPV; and 3) 37-year-old pregnant female in a married monogamous relationship with no prior history of IPV, though she feared for IPV. With the varied demographic characteristics, it may be difficult to predict the occurrence of IPV among IPs, though this does not diminish the need for adequate IPV screening, counselling and referral as part of the CBCHS PS program.

Table 6: Adverse outcomes reported among index persons at follow-up: 2014 -2015

	Index persons N=976	
Adverse outcomes reported at follow-up	**n**	**%**
Any adverse outcome (IPV, partnership dissolution, loss of financial support)	61/976	6.3%
Partnership ended since testing HIV +	61/976	6.3%
Are you still separated from them?		
Yes	25/61	41.0%
Duration of separation		
<2 years (n=25)	2	8.0%
2 years (n=25)	14	56.0%
3 years (n=25)	6	24.0%
>3 years (n=25)	3	12.0%
No	10/61	16.4%
Missing	26/61	42.6%
Sexual partner left because index person tested HIV+		
Yes	14/61	23.0%
No	6/61	9.8%
Don't know	17/61	27.9%
Declined to answer	2/61	3.3%
Missing	22/61	36.1%
Sexual partner stopped financial support		
Yes	15/976	1.5%
SP stopped financial support because of HIV+ result		
Yes (n=15)	5	33.3%
No (n=15)	2	13.3%
Don't know (n=15)	5	33.3%
Missing (n=15)	3	20.0%
No	18/976	1.8%
Never received financial support from this sexual partner	15/976	1.5%
Declined to answer	1/976	0.1%
Missing	12/976	1.2%
Sustained physical IPV from sexual partners since testing HIV +		
Yes	11/976	1.1%
Physical IPV from SP because of testing HIV + (n=11)	7	63.6%
Physical IPV from SP because of HA notification (n=11)	3	27.3%
Reason missing (n=11)	1	9.1%
No	29/976	3.0%
Don't know	15/976	1.5%
Declined to answer	1/976	0.1%
Missing	5/976	0.5%

IP – Index person; SP – Sexual partner; IPV – Intimate partner violence; PS – Partner services

4. DISCUSSION

CBCHS partner services program, the longest running PS program in SSA, continues to show scalability and effectiveness in targeting large numbers of sexual partners at high risk of HIV acquisition from newly diagnosed HIV individuals. In this program evaluation, partner services were shown to be safe with adverse outcomes after receipt of partner services noted to be rare.

As the largest partner services program in SSA, grew rapidly during the initial years of program implementation, with stable levels of persons receiving APS in subsequent years. Over 90% sexual partners notified compared to 83.8% compared to a prior analysis of the program's data in 2013 (6). Though a smaller pilot program in an urban clinic Mozambique has shown acceptability, safety and effectiveness of the intervention, it has not been done at the same scale as CBCHS (7). There was high HIV case finding in the program with HIV prevalence among the sexual partners almost six times Cameroon's national prevalence indicating high disease burden among sexual partners to newly diagnosed HIV positive individuals and the need for targeted partner notification (20).

The program reached married monogamous individuals, mainly women, receiving provider-initiated testing and counseling (PITC) at rural facilities, offering an opportunity to increase HIV testing among their male sexual partners who would have otherwise not attended a healthcare facility. Similar observations were made in the Kenyan and Malawi studies (14,16). Sexual partners within more casual relationships might be at higher risk for HIV acquisition and therefore more focus and innovation needs to be put in reaching such groups, possibly with more engagement of provider referral.

HIV case finding less likely to be associated with health advisor notification compared to index person notification in the univariate analysis and this relationship is maintained after adjusting for gender, marital status, site, who notified the partner and how partner was notified (on phone or in person). The IP might be at an advantage due to their familiarity with the sexual partner when discussing confidential matters such as HIV status and sexual behavior. Most of the notified sexual partners were notified in person rather than on phone with the IP playing a key role in the notification process. In a study conducted in

New York, partners notified in person were more likely to test for HIV compared to those contacted by either text messaging or internet services (21). Given the challenges in mobile phone connectivity in many SSA countries, in-person notification might still be a preferred notification method by PS programs. Mozambique's pilot program utilized a low intensity notification strategy primarily involving mobile phone notification due to concerns for staff safety (7). However, this strategy might have limited success in partner notification. Implications on staff time and financial costs need to be considered to ensure effective implementation and sustainability of PS programs. Though we did not conduct a cost-effectiveness review for this analysis, partner services have been shown to be cost-effective in research settings in Kenya and Malawi (22,23). The Malawi study showed that provider referral, though more expensive, was more effective in partner notification compared to patient referral.

ART initiation was low among both the index persons and HIV positive sexual partners, a potential area of focus for the CBCHS program to ensure improved long-term health outcomes. With the Joint United Nations Program on HIV and AIDS (UNAIDS) 90-90-90 targets to increase HIV diagnosis, ART initiation and viral suppression, and the WHO's 2015 guidelines on when to start antiretroviral therapy, it is anticipated that a larger proportion of HIV positive program participants initiate antiretroviral therapy (24,25). Cameroon adopted the 2015 WHO guidelines in May 2016 after the period included in this analysis and it is expected that proportion of HIV positive clients initiating ART will significantly increase depending on adequate availability of resources such as medications.

Adverse outcomes including partnership dissolution, loss of financial support and physical IPV were relatively common among both men and women in this population. However, adverse outcomes due to receipt of PS were rare. Despite high prevalence of intimate partner violence in women in West Africa, estimated at 42% (26), adverse outcomes related to receipt of partner services within SSA are uncommon. Clinical trials conducted in Kenya and Malawi, and in program settings in Mozambique have shown partner services to be safe to program participants (7,16,15). Rigorous screening for intimate

partner violence among the index persons is crucial in order to reduce the risk of harm from their sexual partner.

There are several key strengths in this analysis. First, this is a follow-up analysis to a large partner services program within SSA that enables review of effectiveness of the intervention and can advise policy makers on the implementation of large-scale partner services programs in other settings. Second, the length of the program offers crucial lessons in the scalability and effectiveness of partner services over time that will be useful in designing partner services programs for other SSA countries.

This analysis had a number of limitations. First, only a quarter of all records from the CBCHS facilities were entered to the database and were therefore available for analysis. Data entry was limited due to incomplete forms that could not be entered into the central database. Though there might be potential selection bias in the analysis, the incomplete data entry affected all facilities uniformly. Second, a large proportion of data was missing from program forms that might affect generalizability of the results. Finally, due to limited staff capacity and financial constraints, follow-up for the index persons and their sexual partners was done based on availability of staff rather than at scheduled times after enrolment into the program making it challenging to determine suitable timeframes within which to offer partner services.

In conclusion, partner services are scalable, effective and safe in augmenting HIV testing, diagnosis and linkage to care for index persons and their sexual partners within a large program setting. Countries within resource-constrained settings should consider integrating partner services to their routine HIV testing services as a means to curb the spread of the HIV epidemic.

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