Comparison of In-Person Versus Telephone Interviews for Early Syphilis and HIV Partner Services in King County, Washington (2010-2014)

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Abstract

Background—The relative effectiveness of in-person versus telephone interviews for HIV/STD partner services (PS) is uncertain.

Methods—We compared outcomes of in-person versus telephone PS interviews for early syphilis (ES) and newly diagnosed HIV in King County, Washington from 2010-2014. We used multivariable Poisson regression to evaluate indices (number of partners per original patient (OP)) for partners named, notified, tested, diagnosed, and treated (ES only). Analyses controlled for OP age, gender, race/ethnicity, sexual orientation, time to interview, place of diagnosis, and staff performing interviews.

Results—For ES, 682 and 646 OPs underwent in-person and telephone interviews, respectively. In-person syphilis PS were associated with higher indices of partners named (in-person index [IPI]=3.43, telephone index [TI]=2.06, aRR=1.68 [95% CI=1.55-1.82]), notified (IPI=1.70, TI=1.13, aRR=1.39 [1.24-1.56]), tested (IPI=1.15, TI=0.72, aRR=1.34 [1.16-1.54]), and empirically treated (IPI=1.03, TI=0.74, aRR=1.19 [1.03-1.37]) but no difference in infected partners treated (IPI=0.28, TI=0.24, aRR=0.93 [0.72-1.21]). For HIV, 358 and 489 OPs underwent in-person and telephone interviews, respectively. In-person HIV PS were associated with higher indices of partners named (IPI=1.87, TI=1.28, aRR=1.38 [1.18-1.62]), notified (IPI=1.38, TI=0.92, aRR=1.24 [1.03-1.50]), and newly diagnosed with HIV (IPI=0.10, TI=0.05, aRR=2.17 [1.04-4.50]) but no difference in partners tested (IPI=0.61, TI=0.48, aRR=1.15 [0.88-1.52]).

Conclusions—Although in-person syphilis PS were associated with some increased PS indices, they did not increase the treatment of infected partners. In contrast, in-person HIV PS resulted in increased HIV case finding. These data support prioritizing in-person PS for HIV and suggest that in-person PS for syphilis may not have major public health benefit.

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Keywords

Partner services; program evaluation; syphilis; human immunodeficiency virus (HIV)

Introduction

Public health partner services (PS) seek to identify and notify the sex partners of persons with sexually transmitted diseases (STDs), including human immunodeficiency virus (HIV), with a goal of identifying undiagnosed persons, linking them to care, and assuring their treatment. Public health staff providing PS have traditionally conducted in-person interviews with infected persons, also known as original patients (OPs), to elicit the names of potentially exposed partners. The reason for using in-person meetings for PS is multifactorial, including confidentially concerns[1], facilitating collection of specimens for testing[2], providing treatment and linkage to medical care as appropriate[2], and the commonly held belief that in-person interviews are more effective.

The most recent Center for Disease Control (CDC) guidelines for STD/HIV partner services recommend that interviews should be conducted in person, but if no reasonable alternative exists, telephone interviews may be conducted.[3] In King County, Washington, disease intervention specialists (DIS) routinely interview persons with HIV and syphilis over the telephone with safeguards in place to ensure privacy and confidentiality. For the most part, DIS only perform in-person interviews if a patient is in the Public Health - Seattle and King County (PHSKC) STD Clinic or at the nearby affiliated hospital, if efforts to interview the OP over the telephone are unsuccessful, or if a person with newly diagnosed HIV does not successfully link to medical care. In-person interviews are commonly performed for patients at the STD clinic or the nearby affiliated hospital because DIS work onsite at the STD clinic. Other health departments have reported using telephone interviews for PS interviews, and some use email and text messaging for PS communications.[4-8]

Given resource constraints, it is important to maximize efficiencies in STD/HIV partner services.[9] Telephone interviews may be more efficient than in-person interviews; however, their relative effectiveness is uncertain. A survey of attendees of STD and community clinics as well as a community based organization about hypothetical PS found that there was no significant difference in favorability of in-clinic notification compared to telephone notification from the perspective of OPs or partners.[10] Another study conducted in New York City found that a change in program policy that allowed DIS to conduct telephone interviews of partners exposed to HIV resulted in an increase in number of partners notified and tested, though the proportion of notified partners known to have tested declined.[11] To our knowledge, no prior studies have compared the outcomes of in-person versus telephone PS interviews for OPs.

In this study, we compared in-person versus telephone PS interviews performed for OPs with early syphilis or new HIV diagnoses from 2010-2014 in King County, Washington to determine if there were differences in numbers of partners named, notified, tested, and newly diagnosed with infection. For early syphilis diagnoses, we also evaluated the number of partners empirically treated and number of infected partners treated.

Materials and Methods

Study design and data sources

We conducted a population-based retrospective cohort study of OPs who underwent PS interviews in King County, Washington from 2010-2014. Data were extracted and de-identified from PS records completed by DIS at PHSKC, the state's partner services data management system, and the enhanced HIV/AIDS Reporting System (eHARS). The University of Washington Institutional Review Board (IRB) defined the project as a program evaluation that did not require human subjects research review and approval.

Study population

The study population included all King County, Washington residents reported to PHSKC with early syphilis or newly diagnosed HIV infection who were interviewed by DIS for PS between 2010 and 2014. We excluded records from OPs with incomplete interviews. We defined cases as early syphilis (primary, secondary, or early latent syphilis) based on the staging evaluation of a single DIS who reviews all syphilis cases for the county. We considered HIV diagnoses to be new if they were never previously reported in Washington State, were not defined to have been previously reported in another state based on CDC de-duplication procedures, and the patient denied a prior HIV diagnosis during their PS interview.

Study data and outcomes

Study data included information obtained through interviews and subsequent investigations with the OP and their partners. The primary exposure of interest for this analysis was OP interview method (telephone or in-person). DIS recorded this information using a checkbox on the PS interview. Covariates related to the OP included age, gender, race/ethnicity, sexual orientation, diagnosing clinic type, time from diagnosis to interview, HIV status (for early syphilis only), and the DIS who performed the interview.

Data on partner outcomes were extracted from partner PS records and linked to the corresponding OP by case number. The outcome variables created for early syphilis were number of partners named, notified, tested for syphilis, tested for HIV, empirically treated for syphilis, diagnosed with syphilis, diagnosed with HIV, and diagnosed with and treated for syphilis. The outcome variables created for newly diagnosed HIV were number of partners named, notified, tested for HIV, and diagnosed with HIV. In order to be counted as a named partner, the partner record had to include at least one of the following: first and last name, usable contact information of any kind (e.g. phone number, address, email, internet profile, etc.), or any known final disposition. Similar to prior PS program evaluations, we assessed each outcome as an index of total numbers of partners divided by total number of OP interviews.[12,13] Each index therefore represents the mean number of partners with the outcome per OP interviewed. The six indices evaluated in this study were 1) contact index: number of partners named per OP interviewed, 2) notification index: number of partners notified per OP interviewed, 3) test index: number of partners tested per OP interviewed, 4) epidemiologic index: number of partners empirically treated per OP interviewed, 5) case-

finding index: number of partners newly diagnosed with infection per OP interviewed, 6) brought-to-treatment index: number of infected partners treated per OP interviewed.

Statistical Analyses

We used Stata 14.1 software for all statistical analyses.[14] We first compared key covariates between OPs that underwent in-person interviews and OPs that underwent telephone interviews. Age and time from diagnosis to interview were evaluated as continuous variables; Wilcoxon rank sum tests were used to evaluate between-group differences in medians. All other variables were categorical and we used a Pearson's chi squared test to evaluate between-group differences. For our notification, test, epidemiologic, case-finding and brought-to-treatment indices, we included outcomes based on either OP self-report or DIS confirmed outcomes. While this approach may overestimate outcomes due to misreporting by OPs, the alternative, assuming all OP-reported outcomes are false, clearly underestimates PS outcomes. To address uncertainty related to this issue, for the syphilis brought-to-treatment index and the HIV case-finding index, we also calculated verified indices that only included outcomes that were verified by the health department through direct communication with the partner, direct communication with the provider, or medical record review. We used unadjusted Poisson regression models to calculate indices and relative risks (RR) with 95% confidence intervals (CI). We then used multivariable Poisson regression models, which adjusted for OP age, gender, race/ethnicity, sexual orientation, time from OP diagnosis to interview, diagnosing clinic type, and the DIS who performed the interview, to calculate adjusted RRs with 95% CIs. For early syphilis outcomes, we also adjusted for HIV status. Next we evaluated whether in-person interviews were conducted in the field or at the STD clinic and repeated the multivariable Poisson regression models to compare field-based interviews versus telephone interviews and STD clinic interviews versus telephone interviews. Lastly, we evaluated the association between OP age, gender, race/ethnicity, sexual orientation, and time from OP diagnosis to interview and the syphilis brought-to-treatment and HIV case-finding indices.

Results

Early Syphilis

Clinicians and laboratories reported a total of 1,630 OPs with early syphilis, of whom 1,328 underwent a complete PS interview and were included in the analysis. A total of 682 OPs underwent in-person interviews and 646 OPs underwent telephone interviews (Table 1). Compared to persons interviewed by telephone, OPs interviewed in person were younger, interviewed sooner after syphilis diagnosis, and were more likely to be non-white, HIV negative, and diagnosed in the PHSKC STD Clinic or an affiliated community-based organization (CBO) (p<0.001). The percentage of cases receiving in-person and telephone interviews varied by DIS (p<0.001).

Compared to telephone interviews, in-person interviews resulted in significantly more partners per OP being named, notified, tested for syphilis, tested for HIV, and empirically treated for syphilis, with adjusted relative risks (aRRs) ranging from 1.19 to 1.68 (Table 2). Despite these differences, there was no significant difference between in-person and

telephone OP interviews in syphilis case-finding or brought-to-treatment indices. Similarly, the HIV case-finding index among persons with early syphilis did not vary significantly between OPs interviewed in-person and by telephone.

Of the 682 in-person interviews, 26 were conducted as part of field investigations and 624 took place in the STD clinic. We found fewer differences between field-based interviews and telephone interviews with no significant difference in the contact, syphilis test, HIV test, epidemiologic, syphilis case-finding, HIV case-finding, and syphilis brought-to-treatment indices. Field-based interviews were associated with a lower notification index than telephone interviews (aRR 0.60, 95% CI 0.38-0.98). The evaluation of STD clinic interviews versus telephone interviews resulted in the same findings as our primary analysis. Overall, white race (RR 1.28, 95% CI 1.01-1.62) and a time from diagnosis to interview of less than 14 days (RR 1.44, 95% CI 1.16-1.80) were associated with higher brought-to-treatment indices.

Newly diagnosed HIV

Clinicians and laboratories reported 1,167 new HIV diagnoses, of whom 959 underwent a complete partner services interview. Of the 959 interviewed persons, 847 had method of interview (telephone or in-person) recorded and were included in the analysis. A total of 358 OPs underwent in-person interviews and 489 OPs underwent telephone interviews (Table 3). Compared to persons interviewed by telephone, those interviewed in-person were younger, interviewed sooner after HIV diagnosis, and were more often male, non-white, men who have sex with men, and diagnosed at the PHSKC STD Clinic or an affiliated CBO (p<0.001). Compared to telephone interviews, in-person interviews resulted in significantly more partners per interviewed OP being named, notified, and newly diagnosed with HIV (Table 4). Adjusting for OP age, gender, race/ethnicity, sexual orientation, time from diagnosis to interview, type of diagnosing clinic, and DIS who performed the interview, in-person interviews were associated with a more than two-fold increase in HIV case-finding. There was no significant difference between in-person and telephone interviews in number of partners tested for HIV per OP interviewed.

Of the 358 in-person interviews, 27 occurred as part of field investigations and 323 took place in the STD clinic. We found fewer differences between field-based interviews and telephone interviews with no significant difference in the notification, HIV test, and HIV case-finding indices. Field-based interviews were associated with a lower contact index than telephone interviews (aRR 0.63, 95% CI 0.40-0.97). The evaluation of STD clinic interviews versus telephone interviews resulted in the same findings as our primary analysis. There were no associations found between OP age, gender, race/ethnicity, sexual orientation, and time from OP diagnosis to interview and the HIV case-finding index.

Sensitivity Analyses

There were no substantial differences between verified and unverified outcomes. For in-person interviews, the verified syphilis brought-to-treatment index was 0.26 (94% of outcomes were verified) and the unverified brought-to-treatment index was 0.27. For telephone interviews, the verified syphilis brought-to-treatment index was 0.22 (91% of

outcomes were verified) and the unverified brought-to-treatment index was 0.24. We found that all new HIV cases were verified, so the verified and unverified HIV case-finding indices were the same.

Discussion

In this retrospective cohort study of OPs who underwent PS interviews in King County, Washington from 2010-2014, we found that in-person PS interviews for syphilis were associated with identifying, notifying, testing, and empirically treating more partners compared to telephone PS interviews, but were not associated with identifying and treating more partners diagnosed with syphilis. In contrast, in-person HIV PS interviews were associated with better outcomes for almost all metrics, including HIV case finding. We found fewer differences between field-based in-person interviews and telephone interviews; however, the small number of field-based interviews conducted by our PS program limited the power and utility of that analysis.

The overall case-finding indices and brought-to-treatment indices we report are consistent with those reported in prior studies. A study that compiled PS outcomes across the United States from 1976-2004 found that the median case-finding index for syphilis was 0.22 (range 0.05-0.46) and for HIV was 0.13 (range 0.03-0.75).[12] Our overall syphilis brought-to-treatment index (0.26) was almost identical to this historical estimate, while our HIV case-finding index (0.07) was lower, though still within the range previously reported. More recent HIV case-finding indices from Texas (index=0.06), Florida (index=0.11) and North Carolina (index=0.06) in 2015 are similar to those we report (personal communication with Emily Rowlinson, Dan George, and Erika Samoff).

Because in-person and telephone interviews for ES had similar brought-to-treatment indices, we interpreted our findings to indicate that in-person interviews were not clearly better for syphilis. Some persons looking at these data would emphasize that contact indices and epidemiologic indices were higher for in-person interviews and conclude in-person interviews were better. The issue is really whether they were superior enough to justify their cost. Different programs will likely come to different conclusions on this point based on available resources, the competing demands on their programs, the value they place on treating a small number of persons who may have incubating syphilis, and the extent to which their staff are effective in linking partners identified through syphilis interviews to other services (e.g. HIV care or HIV pre-exposure prophylaxis).

Onsite DIS and decreased time from diagnosis to interview have been associated with improved PS outcomes.[15,16] A study evaluating HIV PS outcomes in San Francisco found a case-finding index of 0.13 for OPs interviewed within 2 weeks of diagnosis compared to 0.05 for those conducted more than 2 weeks after diagnosis.[17] Interestingly, our study found that in-person HIV PS interviews, which are typically performed by onsite DIS, occur a median of 10 days after diagnosis with a case-finding index of 0.10 and our telephone HIV PS interviews occur a median of 42 days after diagnosis with a case-finding index of 0.05. While time to interview may have influenced our results, the differences we observed in case finding between in-person and telephone HIV PS interviews remained significant after

adjusting for time to interview, suggesting that the timing of interviews did not entirely explain the differences we observed.

It is also possible that the significant psychosocial impact of receiving a new HIV diagnosis may be a reason why telephone interviews are not as effective as in-person interviews for HIV PS. A prior study found that HIV peer counselors perceive in-person interventions to be more effective than telephone interventions because face-to-face counseling allows for personal contact and facilitates trusting relationships.[18] Another study revealed that patients notified of their HIV status by telephone delayed establishing primary care considerably longer than those notified in person,[19] and it may be that HIV patients contacted by phone are reluctant to participate in detailed PS interviews.

The strengths of our study include the large, population-based sample size, the long-standing use of both in-person and telephone interviews for PS in our HIV/STD control program, and our use of multivariable models to adjust for baseline differences in characteristics between persons interviewed in-person and by telephone. However, our analysis has significant limitations. First and foremost, this is an observational study, and we cannot eliminate the possibility that our findings are influenced by residual confounding. In particular, the results for in-person interviews may be confounded by the fact that in-person interviews were used when telephone attempts were unsuccessful. However, this occurred infrequently, and we believe is unlikely to have significantly influenced our results. Second, our results may have been influenced by ascertainment bias. Many persons diagnosed with STDs, including HIV, notify their partners without assistance from DIS. It is possible that PS interviews allow health departments to identify and link more partners to index patients, but that those same partners would have been notified and tested in the absence of any intervention. Insofar as in-person interviews identified more partners, it may be that this ascertainment bias is greater for in-person interviews than for telephone interviews. Indeed, we previously found that most partners identified through PS with newly diagnosed HIV infection were actually notified and tested prior to being contacted by DIS.[20] A randomized trial of different approaches to PS interviews would overcome the problem of residual confounding but might still be affected by ascertainment bias. To date, only one very small randomized controlled trial has evaluated HIV PS in the U.S., and we are not aware of any recent randomized trials related to syphilis PS.[21] Given the significant programmatic costs associated with PS and the many competing demands on DIS time, it may be worth conducting trials to better assess the true benefit of the more expensive traditional approach that focuses on in-person interviews. Furthermore, our results may not be generalizable to other health jurisdictions. Predictors of PS success have been shown to vary by location.[22] Perhaps even more importantly, very few of the in-person interviews undertaken by King County DIS involved field investigations; most persons were interviewed in our STD clinic, either because they were diagnosed there or came to the clinic after being diagnosed. As a result, our procedures were dissimilar from many other areas where most interviews are conducted in the field and are initiated within days of a program learning of a new HIV or syphilis diagnosis.

Many U.S. health departments are trying to modernize their PS programs to evolve toward a broader model of field services. This effort requires reorganizing programs to confront a growing syphilis epidemic while simultaneously taking on new work providing HIV PS to

all persons with newly diagnosed HIV infection, linking and relinking patients to HIV care, and promoting HIV pre-exposure prophylaxis. Success with this expanded portfolio of work will require willingness to reconsider traditional procedures. Our findings suggest that in-person interviews may not be superior to telephone interviews for syphilis, at least in terms of syphilis case finding and treatment of infected partners. While our results suggest that in-person interviews are better for HIV, insofar as they involve field investigations, they are almost certainly substantially more costly. If the resources required for in-person interviews lead to fewer persons with newly diagnosed HIV being interviewed, the cost of the intervention could offset its greater efficacy leading to lower public health impact. Ultimately, how to allocate scarce DIS resources requires defining the costs and outcomes associated with different bodies of work and then setting priorities. We believe that our findings support health departments adopting a more flexible approach to PS, one that allows for more routine use of telephone PS for syphilis, and perhaps for some use of telephone interviews for HIV, particularly when such interviews facilitate future in-person contact, ensure linkage to care, or are the only viable option given resource constraints or patient's willingness to participate in PS. More rigorous, prospective studies of procedures are needed to define the most cost-effective methods for accomplishing the many tasks assigned to PS teams in the modern era of high impact HIV prevention.

Acknowledgments

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Summary

A study comparing in-person versus telephone partner services in King County, Washington found no difference in finding or treating syphilis cases but found increased HIV case finding with in-person interviews.

Table 1

Characteristics of Original Patients with Early Syphilis Interviewed by Public Health - Seattle and King County Partner Services from 2010 to 2014, by Method of Interview (In-Person versus Telephone)

Original Patient Characteristic	Syphilis In-Person Interview N=682		Syphilis Telephone Interview N=646		P-value
Age					
Median years (interquartile range)	37	(28-45)	41	(32-48)	<0.001
Sex, n (%)					
Male	668	(98)	627	(97)	0.299
Female	14	(2)	19	(3)	
Race/ethnicity, n (%)					
White	426	(63)	455	(70)	
Black	79	(12)	48	(7)	
Latino	80	(12)	76	(12)	0.001
Asian	25	(4)	15	(2)	
Other	49	(7)	26	(4)	
Sexual orientation, n (%)					
MSM	632	(93)	594	(92)	
MSWE	36	(5)	27	(4)	0.114
WSM	12	(2)	17	(3)	
Other	2	(<1)	8	(1)	
HIV status, n (%)					
Negative	358	(52)	226	(35)	<0.001
Positive	324	(48)	420	(65)	
Location of interview, n (%)					
STD clinic	624	(91)	-		
Field	26	(4)	-		
Time to interview					
Median days (interquartile range)	6	(0-14)	21	(12-34)	<0.001
Place of diagnosis, n (%)					
STD Clinic and/or MSM CBO	405	(59)	57	(9)	
MSM and/or HIV Specialty Clinic	125	(18)	304	(47)	
Non-Specialty Provider	152	(22)	285	(44)	<0.001
Caseworker, n (%)					
DIS #1	328	(48)	171	(26)	
DIS #2	91	(13)	275	(43)	
DIS #3	111	(16)	123	(19)	
DIS #4	6	(1)	44	(7)	
DIS #5	40	(6)	12	(2)	<0.001
Other DIS	106	(16)	21	(3)	

HIV: Human immunodeficiency virus, STD: Sexually transmitted disease, MSM: Men who have sex with men, MSWE: Men who have sex with women exclusively, WSM: Women who have sex with men, CBO: Community based organization, DIS: Disease intervention specialist. Other DIS category includes all other small volume caseworkers. Numbers may not sum to total because of missing data; all variables have 5% missing.

Table 2

Partner Services Indices for Early Syphilis in King County, WA 2010-2014

*Partner Services Indices	In-person Interview N=682 Counts Index	Telephone Interview N=646 Counts Index	**Unadjusted Relative Risk (95% CI)	P-value	***Adjusted Relative Risk (95% CI)	P-value
Contact index	2340 3.43	1329 2.06	1.67 (1.56, 1.78)	<0.001	1.68 (1.55, 1.82)	<0.001
Notification Index	1155 1.70	724 1.13	1.51 (1.38, 1.66)	<0.001	1.39 (1.24, 1.56)	<0.001
Syphilis test index	786 1.15	463 0.72	1.61 (1.43, 1.80)	<0.001	1.34 (1.16, 1.54)	<0.001
HIV test index	355 0.52	131 0.20	2.57 (2.10, 3.14)	<0.001	1.45 (1.14, 1.86)	0.003
Epidemiologic index	703 1.03	477 0.74	1.40 (1.24, 1.57)	<0.001	1.19 (1.03, 1.37)	0.017
Syphilis case-finding index	193 0.28	162 0.25	1.13 (0.92, 1.39)	0.257	0.91 (0.71, 1.17)	0.470
HIV case-finding index	14 0.02	5 0.01	2.65 (0.96, 7.36)	0.061	1.83 (0.56, 5.95)	0.316
Brought-to-treatment index	189 0.28	153 0.24	1.17 (0.95, 1.45)	0.149	0.93 (0.72, 1.21)	0.600

HIV: Human immunodeficiency virus

Contact index: Partners named

Notification index: Partners notified

Syphilis test index: Partners tested for syphilis

HIV test index: Partners tested for HIV

Epidemiology index: Partners empirically treated for syphilis

Syphilis case-finding index: Partners diagnosed with syphilis

HIV case-finding index: Partners diagnosed with HIV

Brought-to-treatment index: Partners diagnosed with and treated for syphilis

*
All indices have a denominator of total original patients interviewed (N). Numerators are:

**
Unadjusted Poisson regression model

***
Multivariable Poisson regression model adjusted for age, gender, race/ethnicity, sexual orientation, HIV status, time from diagnosis to interview, place of diagnosis, and disease intervention specialist who performed the interview.

Table 3

Characteristics of Original Patients with New HIV Diagnoses Interviewed by Public Health - Seattle and King County Partner Services from 2010 to 2014, by Method of Interview (In-Person versus Telephone)

Original Patient Characteristic	HIV In-Person Interview N=358		HIV Telephone Interview N=489		P-value
Age					
Median years (interquartile range)	32	(25-41)	36	(28-46)	<0.001
Sex, n (%)					
Male	333	(93)	430	(88)	0.015
Female	25	(7)	59	(12)	
Race/ethnicity, n (%)					
White	188	(53)	310	(64)	
Black	53	(15)	78	(16)	
Latino	63	(18)	61	(12)	<0.001
Asian	28	(8)	22	(5)	
Other	26	(7)	18	(4)	
Sexual orientation, n (%) [*]					
MSM	301	(84)	349	(72)	
MSWE	18	(5)	45	(9)	<0.001
WSM	20	(6)	50	(10)	
Other	6	(2)	8	(2)	
Location of interview, n (%)					
STD Clinic	323	(90)	-		
Field	27	(8)	-		
Time to interview					
Median days (interquartile range)	10	(5-18)	42	(24-72)	<0.001
Place of diagnosis, n (%)					
STD Clinic and/or MSM CBO	278	(78)	33	(7)	
MSM and/or HIV Specialty Clinic	7	(2)	78	(16)	
Non-Specialty Provider	73	(20)	378	(77)	<0.001
Caseworker, n (%)					
DIS #1	178	(50)	234	(48)	
DIS #2	128	(36)	173	(35)	
DIS #3	18	(5)	40	(8)	
DIS #4	4	(1)	13	(3)	0.125
DIS #5	2	(1)	6	(1)	
Other DIS	28	(8)	23	(5)	

HIV: Human immunodeficiency virus, STD: Sexually transmitted disease, MSM: Men who have sex with men, MSWE: Men who have sex with women exclusively, WSM: Women who have sex with men, CBO: Community based organization, DIS: Disease intervention specialist. Other DIS category includes all other small volume caseworkers. Numbers may not sum to total because of missing data.

[*] Sexual orientation for telephone interviews has 7.6% missing data; all other variables have 5% missing.

Table 4

Partner Services Indices for New HIV Diagnoses in King County, WA 2010-2014

*Partner Services Indices	In-person Interview N=358 Counts Index	Telephone Interview N=489 Counts Index	**Unadjusted Relative Risk (95% CI)	P-value	***Adjusted Relative Risk (95% CI)	P-value
Contact index	670 1.87	628 1.28	1.46 (1.31, 1.62)	<0.001	1.38 (1.18, 1.62)	<0.001
Notification Index	495 1.38	448 0.92	1.51 (1.33, 1.71)	<0.001	1.24 (1.03, 1.50)	0.026
HIV test index	219 0.61	235 0.48	1.27 (1.06,1.53)	0.010	1.15 (0.88, 1.52)	0.303
HIV case-finding index	36 0.10	24 0.05	2.05 (1.22, 3.43)	0.006	2.17 (1.04,4.50)	0.039

HIV: Human immunodeficiency virus

Contact index: Partners named

Notification index: Partners notified

HIV test index: Partners tested for HIV

HIV case-finding index: Partners diagnosed with HIV

*
All indices have a denominator of total original patients interviewed (N). Numerators are:

**
Unadjusted Poisson regression model

***
Multivariable regression model adjusted for age, gender, race/ethnicity, sexual orientation, time from diagnosis to interview, place of diagnosis, and disease intervention specialist who performed the interview.