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Barriers, facilitators, and cost of integrating HIV-related activities into STD partner services in Jackson, Mississippi

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Abstract

Background: Many US health departments now integrate HIV-related outcomes (e.g., re-linkage to HIV care; PrEP) into STD partner services (PS) programs. We sought to determine the barriers, facilitators, and cost of integrating these activities into PS.

Methods: From 2016–2018, The Mississippi State Department of Health integrated three new activities into STD PS: HIV testing for partners of HIV-negative men who have sex with men (MSM) with gonorrhea/chlamydia, re-linkage to HIV care for STD PS recipients previously diagnosed with HIV, and PrEP referrals. We conducted direct observations and interviews with disease intervention specialists (DIS) in Jackson to assess barriers and facilitators to implementing these activities. We completed time and motion studies with eight DIS and case tracking forms for 90 unique cases to estimate the incremental staff time and associated personnel cost of added services compared to a standard PS case.

Results: DIS were optimistic about integrating HIV-related activities but noted disparate data systems, non-systematic documentation, and lack of training as barriers. The mean time for a standard STD PS case without HIV-related activities was 195 minutes (cost=\$77.69/case). The cost to conduct PS for HIV-negative MSM with gonorrhea/chlamydia was 36% higher than a standard case. Integrating re-linkage to care and PrEP referrals resulted in a 44% and 20% increase in cost, respectively.

Conclusions: Integrating HIV care re-linkage and PrEP referrals into STD PS was generally acceptable by DIS and added marginal cost per case. Coupling these cost metrics with an assessment of the effectiveness of these activities can inform prioritization of PS activities.

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Conflicts of interest
None declared.

Short summary

Integrating re-linkage to HIV care and PrEP referrals into STD partner services added marginal time and cost to a standard partner services case.

Keywords

HIV; STDs; integration; partner services; costing

INTRODUCTION

Originally introduced to test and treat sex partners of persons with syphilis, many health department sexually transmitted disease (STD) partner services programs have recently broadened their scope to integrate a number of HIV-related activities (e.g., HIV testing, linkage to HIV care, and pre-exposure prophylaxis [PrEP] referrals) into existing services for index clients and partners.¹ Data to describe the effectiveness of these HIV-related activities is somewhat limited, but recent evaluations suggest that integration of HIV-related activities into STD partner services may identify new HIV cases among partners and may promote PrEP use among individuals with diagnosed STD.^{2–5} However, integration of these new activities into routine partner services work requires health department resources and the buy-in of disease intervention specialists (DIS), the health department staff who are responsible for contacting clients diagnosed with STD and their sex partners. Only a handful of health departments have systematically evaluated the barriers, facilitators, and cost of integrating HIV-related activities routine STD partner services activities.^{6,7}

The Mississippi State Department of Health (MSDH), like many other health departments in the United States (US), routinely provides partner services to individuals with newly diagnosed HIV, newly diagnosed early syphilis (primary, secondary, and early latent), and to individuals with diagnosed HIV who are newly diagnosed with gonorrhea or chlamydia. Compared to other US States, Mississippi has the sixth highest rate of HIV diagnosis⁸, the second highest rate of HIV diagnosis among men who have sex with men (MSM)⁹, the highest rate of gonorrhea¹⁰, the third highest rate of chlamydia¹⁰, and the second highest rate of syphilis among MSM.¹¹

Prior to 2014, MSDH had not routinely integrated HIV outcomes into STD partner services. In 2014, MSDH integrated HIV testing of partners into syphilis partner services, and in 2016, MSDH broadened the scope of STD partner services to include three new activities: (1) conduct partner services with HIV-negative MSM with gonorrhea, chlamydia, or urethritis to increase HIV testing and identification of new HIV cases among partners; (2) integrate HIV care re-linkage into STD partner services for partner services recipients living with HIV with newly diagnosed STD (i.e., ascertain care status, make an appointment with an HIV care provider, and follow-up with the provider to verify the appointment attendance); and (3) implement PrEP referrals for HIV-negative STD partner services recipients (i.e., make an appointment at a clinical PrEP provider, verify appointment attendance). In the setting of constrained resources for HIV/STD, MSDH sought to evaluate the feasibility, acceptability, and cost of implementing these new activities in Jackson, MS

to determine if these activities could be scaled-up statewide. The specific objectives of the present study were to: 1) identify the barriers and facilitators of implementing these three new partner services activities, and 2) determine the time and incremental cost to integrate these activities into MSDH's existing partner services program.

MATERIALS AND METHODS

Data collection and analytic methods are summarized in Table 1 and described below. All partner services activities occurred as part of routine MSDH practice. The present evaluation was conducted to improve the implementation of delivered services and was not considered research.

DIS Interviews

In January and February 2018, a member of the evaluation team (P.D.) conducted a rapid qualitative assessment¹² to assess DIS' perception of their role in the partner services program, the need for additional training for new activities, the challenges of integrating the new HIV-related activities into their daily workload, and any suggestions for improvement. These were semi-structured, one-on-one interviews with the eight DIS who serve the Jackson metropolitan area. Each interview occurred via video and lasted approximately one hour. We informed DIS that their participation was voluntary, they were able to refuse to answer any question, and they were able to stop the interview at any time. Interviews with DIS were summarized in structured case memos.

Individual Case Tracking

We used case tracking forms to estimate the mean amount of time for an STD case to be processed at MSDH, from the time the laboratory report was received until the case was closed. Each form moved from one staff person to another as the case transitioned from one step to another (e.g., the form moved from data entry staff to the regional DIS supervisor; from the DIS supervisor to the DIS). Each staff member documented the task(s) they completed for each case, along with the start and end time. We calculated the minimum, maximum, mean, and median time of each task across all cases. The cases tracked were not necessarily the same cases observed during the time and motion studies (described below).

Time and Motion Studies

A member of the evaluation team (P.D.) conducted time and motion studies with MSDH partner services staff over a two-week period in February 2018. DIS were directly observed (i.e., "shadowed") for approximately four consecutive hours each, for a total of about 40 hours of direct observation. Additional partner services and MSDH staff, including the DIS Supervisor, STD Epidemiologist, Regional Manager, and data entry staff were also directly observed, but for varying lengths of time throughout the two-week period (range: 1 hour to 3 hours). During all observation periods, P.D. electronically recorded a description of each task performed (e.g., phone call to reach an index client) along with the task start and end time. There was no interaction between P.D. and observed staff unless P.D. was unable to determine what task was being performed. From these observations, we calculated the time duration for each task. Each task was categorized according to pre-specified task categories

for the DIS and administrative staff, respectively. Not all tasks were observed for each DIS or administrative staff, as the focus of each staff person varied over the observation times. We calculated the minimum, maximum, mean, and median time of each task category.

Analysis

We qualitatively summarized the barriers and facilitators of integrating the three new HIV-related activities into STD partner services using data from the DIS interviews and direct observations of staff. We classified barriers as “structural barriers” (i.e., systemic or process barriers that can be directly addressed by MSDH) and “environmental barriers” (i.e., barriers that exist in the community that may not be directly addressable by MSDH).

To determine the time spent on activities, results from individual case tracking and observations from the time and motion study were combined for aligned categories. For example, the time estimate for the task “assign case” is based on 38 case reports and 7 observations. Tasks that were not directly observed or not reported in case tracking were ascertained by asking six DIS to report the average time for the task, with an overall mean calculated. Mean times were rounded up to the nearest minute. We took an ingredient-based approach to estimating time per activity – meaning each activity is composed of multiple tasks and one task may be completed for multiple activities (e.g., case review). The mean amount of time per task was assigned to the appropriate activity in the partner services process, which was previously delineated in process maps created by key stakeholders from the MSDH and the University of Washington team and supplemented with detail from interviews. Supplementary Table 1 describes which tasks comprise each activity, the number of case tracking reports and observations for each task, and the time variability for each task.

We estimated the incremental cost per case using only the cost of staff. Materials and facilities costs were not included as the data was not available; thus, our calculated estimates can be considered a lower bound of possible costs to integrate the new activities. The 2018 average annual salary, overhead expenses, and benefits of each staff role were totaled and a per-minute staff cost was calculated assuming 480 working minutes per day and 251 working days per year. The incremental time spent on a case was multiplied by the per-minute staff cost to calculate an incremental cost per case by staff role and by partner services activity, for the three new activities. Prior to 2016, partner services would not have been conducted with HIV-negative MSM with gonorrhea or chlamydia so all costs associated with this activity are considered incremental.

RESULTS

Barriers and Facilitators to Implementation

Interviews with the eight DIS revealed several barriers and facilitators (Table 2). During DIS interviews, staff perception of the new HIV-related activities integrated into STD partner services was generally positive. DIS stated that the new activities were well-integrated into their daily workload, but anecdotally noted that it was an increase in their workload. Previously, DIS only verified treatment for gonorrhea and chlamydia cases, but the new body of work involved conducting interviews with HIV-negative MSM with gonorrhea and

chlamydia. DIS noted that follow-up with individuals diagnosed with syphilis and HIV is generally easier than with MSM with chlamydia or gonorrhea, as patients feel a stronger sense of urgency with syphilis and HIV and are more accepting of DIS intervention. DIS consistently agreed that gonorrhea and chlamydia cases are their lowest priority, and that they are often following up on these cases several days after the client has been tested and treated—reducing the likelihood that they will be able to successfully contact them for an interview. DIS felt that patients were welcoming of information about PrEP in most cases. Some DIS explained that some patients are resistant to PrEP because of the cost or concerns about medication side effects. While DIS did feel they were adequately trained, some DIS expressed desire for more training on how to offer PrEP and more readily available resources for them to offer. In general, DIS reported that distrust of the MSDH and stigma experienced by MSM are barriers to overcome for all partner services activities. DIS also mentioned that trainings for DIS focused on addressing mental health issues among patients and working with transgender patients could help address environmental barriers.

In direct observation, we found that multiple and disparate data systems led to non-systematic manual data collection, entry, and analysis. In particular, data on PrEP referrals was not captured in an electronic form integrated into the STD surveillance database, completion of paper forms was not systematic, and the use of paper forms required manual data entry. Additionally, the automated processes within the STD surveillance database (e.g., automatic administrative closure of individuals without HIV who were newly diagnosed with gonorrhea and chlamydia) necessitated manual processes to re-open cases for DIS investigation.

Time and Incremental Cost of Implementation

Data from the individual case tracking forms (n=49 unique gonorrhea/chlamydia cases tracked) indicated that the mean amount of time to complete a gonorrhea or chlamydia case from the time the laboratory report was received by MSDH until the case was closed was 18 days (range: 6 – 36 days). Gonorrhea and chlamydia cases were assigned to administrative staff for approximately 2 days and to DIS for the remaining 16 days. Case tracking for syphilis (n=41 unique syphilis cases tracked) indicated that the mean amount of time required to complete a syphilis case was 15 days (range: 2 – 38 days). Syphilis cases were assigned to administrative staff for approximately 1 day and to the DIS for the remaining 14 days.

The mean amount of time actively working on a gonorrhea, chlamydia, or syphilis case without the new HIV-related activities was about 195 minutes. However, the time varied between 31 minutes and nearly 16 hours. The number of partners identified, the number of times a patient was contacted (or attempted to contact), the number of times a provider was contacted (or attempted to contact) were drivers of variability. The mean amount of time actively working on a syphilis case was approximately 5 minutes longer than a gonorrhea or chlamydia case; thus, for this analysis we considered 195 minutes to be the standard time for active work on all cases (gonorrhea, chlamydia, or syphilis) for standard partner services activities.

Table 3 details the mean time for each partner services task by staff role, comparing the existing partner services activities to the new activities incorporating HIV outcomes. Supplementary Table 1 describes the mean and median time for the individual tasks that comprise the activities listed in Table 3, and the number of staff observed or case tracking forms that informed the time estimates. Active partner services work for HIV-negative MSM with gonorrhea or chlamydia (a population that had not previously received partner services) took an average of 240 minutes per case (range: 45 – 1003 minutes). The additional 45 minutes (relative to a standard partner services case) was due to time required to identify cases of gonorrhea and chlamydia among HIV-negative MSM. For integrating HIV care re-linkage into STD partner services, the time needed to complete a case was approximately 268 minutes – a 37% increase relative to a standard case. The extra 73 minutes were primarily spent on verifying a patient’s linkage to care. Integrating PrEP into partner services only added only about 40 minutes (range: 12 – 246 minutes) to the time needed to complete a case, for a total of 235 minutes – a 21% increase relative to a standard case. The additional time was primarily spent on working with the clinical provider to secure an appointment, to follow-up with the provider to document attendance at the appointment, and to subsequently document the referral and attendance at the appointment.

Using the estimates of the additional time spent on partner services activities that incorporated HIV-related outcomes, we calculated the incremental cost per gonorrhea, chlamydia, and syphilis case incorporating new HIV-related activities, over and above the cost of working a standard case (i.e., one without new HIV-related activities) (Table 3). The incremental cost per case for conducting partner services with HIV-negative MSM with gonorrhea or chlamydia was \$106.00 (range: \$21.38 – \$418.79), which was 36% higher than a standard case. The incremental cost for re-linking HIV-positive clients to care was \$34.49 (range: \$16.43 - \$189.72), a 44% increase in total cost relative to a standard case. The incremental cost for adding PrEP referrals was \$15.72 (range: \$4.72 - \$96.68), a 20% increase in total cost relative to a standard case. The biggest contributor to the increase in cost was the time DIS spent per case.

DISCUSSION

In this evaluation of the integration of HIV-related activities into STD partner services in Mississippi, we found that DIS were generally accepting of the new body of work, though they acknowledged an increase in their workload and a need for additional training to support their work. We observed barriers to STD partner services—notably, disparate data systems and an inability to contact clients—that may impede the successful implementation of these new activities, and may impact the efficiency of partner services more broadly. Integrating re-engagement into HIV care and PrEP referrals into STD partner services added nominal time and cost per case worked by DIS, suggesting that these may be feasible activities for health department partner services programs to incorporate into *existing* services. However, taking on a new body of work—conducting partner services for HIV-negative MSM with CT/GC—was costlier than a standard partner services case. Although the budget impact of these activities will vary by health department, our findings can inform program planning, organization, and staff roles and tasks for similar health department partner services programs.

Using direct observation and individual case tracking, we found that the integration of HIV-related activities into STD partner services added about 40–240 minutes per case and cost approximately \$16–\$106. The high end of this estimate represents the time spent on gonorrhea and chlamydia partner services for HIV-negative MSM. Prior to 2016, MSDH did not provide these services, thus the added time and cost for this activity is reflective of the initiation of a new body of work, rather than the integration of an HIV-related activity into existing STD partner services. In contrast, HIV care re-linkage and PrEP referrals were integrated into MSDH's existing STD partner services cases, thus the time and cost of these activities—\$34.49 and \$15.72 (representing a 44% and 20% increase in cost, respectively, relative to a standard case without these activities) — only modestly increase the time and cost relative to a standard case. These estimates of time and cost are somewhat lower than that reported for other health departments. In an evaluation of Washington State STD partner services, Silverman and colleagues⁶ reported an average range of 1.9 hours to 3.4 hours spent on each gonorrhea and chlamydia case, at a cost of \$164 to \$547 for each patient interviewed. In New York State, Johnson and colleagues⁷ estimated a cost per gonorrhea or chlamydia case interviewed at \$608 and \$635, respectively. Of note, there is substantial variability in DIS salaries nationally, and it is likely that the relatively low DIS salaries in MS contribute to the lower cost per case in our analysis. This variability in cost, along with the fact that cost metrics are rarely available from partner services programs¹³, highlights the necessity for additional resources to support local jurisdictions to be able to complete evaluations of their partner services costs and efficiencies.

Although these estimates of time and cost were initially intended to highlight partner services processes that may benefit from improved efficiency, these findings can also be combined with an evaluation of the outcome of these interventions for budget impact analyses and program planning. For example, an analysis of chlamydia and gonorrhea partner services for HIV-negative MSM in Jackson, MS found that during an 18-month period in 2016–2017¹⁴, there were 103 HIV-negative MSM with gonorrhea or chlamydia initiated for partner services. DIS identified one new case of HIV among the partners of these index cases which implies a total cost of \$10,918 ($103 \times \106.00) to identify one new case of HIV. Although the effectiveness of the new HIV-related activities integrated into STD partner services have not been fully assessed, the costing data generated from the present study can be coupled with future evaluations to prioritize health department services that have the greatest impact for the lowest absolute cost.¹³

While adding HIV-related activities to STD partner services did increase the workload for DIS, there is room for efficiency. Qualitative findings from DIS interviews and data from our direct observations suggest that DIS spend much of their time attempting to contact providers, entering data, and traveling “to the field” for in-person interviews. Initiating more streamlined database and data collection procedures, promoting partner services work by telephone or video call, or creating team-based STD partner services models could substantially improve partner services efficiency.¹ For example, integrating HIV care re-engagement into STD partner services added 73 minutes to a standard partner services case, of which over one-third of the time (26 minutes) was spent to identify which cases of STD were previously diagnosed with HIV and were out-of-care or not virally suppressed. Creating automated systems to routinely link HIV and STD surveillance data to identify

individuals who need HIV re-engagement services could substantially reduce the time and cost of this activity. As the push to increase high-impact HIV prevention activities into STD partner services activities increases, re-evaluating these existing activities with a focus of improved efficiency is paramount in order to alleviate the added workload for DIS and other staff.

Our one-on-one interviews with DIS revealed additional barriers to existing and new bodies of work. Environmental barriers such as stigma and distrust of the health department limits the ability of DIS to conduct outreach to index cases and their partners. Although these are difficult to address and overcome, national and local DIS training programs that provide some specialized training for DIS to work with marginalized populations may be of benefit. Indeed, the MSDH DIS team identified a desire for specific trainings on working with transgender clients and clients that are experiencing mental health issues.

This evaluation had several strengths. We used different methods to ascertain time spent on activities and to gain the DIS' perspective on the integration of new work, which allowed for a more robust evaluation. This work also represented the first systematic evaluation of time spent on DIS activities at MSDH, providing valuable information for program planning. There were also several limitations. First, we only observed each DIS for four hours in one day, and the tasks we observed may not have been representative of all tasks needed to complete a case. Second, because of the structure of observations, we observed few non case-specific tasks, such as answering email, participation in team meetings, and "transition time" from one case to the next. This means our calculated time and costs systematically underestimate actual time to complete a case. In fact, if DIS only performed case-specific tasks, our time estimates suggest that they would work several hundred cases each year; however, DIS in the Jackson area typically work about 150 to 185 cases each in a given year. This difference in estimated versus actual number of cases worked based on time estimates highlights the challenges in estimating time spent on activities even with robust methods such as those we used here (e.g. time and motion studies). Third, for case tracking, some tasks were not recorded, but which tasks were not recorded was not systematic. Also, we did not account for the outcomes of the case activities in our time analysis (e.g., if someone immediately declined a PrEP referral or accepted a PrEP referral). Fourth, it was not possible to record the total number of cases that DIS worked during our periods of observation since DIS were switching from one case (or partner) to another. For example, we were able to determine the type of case a DIS was working on (e.g., syphilis case), but if the DIS made a phone call to an index case and then two hours later made another phone call to the same case, we were not able to determine if that was the same case, or a new case. Fifth, our cost analysis assumes that the additional work requires no additional infrastructure (e.g., no new space, computers). Sixth, we did not audio record the interviews with DIS at the request of MSDH. Thus, our findings reflect the written summaries of the interviews. Finally, these results are specific to MSDH's STD partner services program and may not be directly applicable to other health department programs.

In conclusion, we found that integration of HIV care re-linkage and PrEP referrals into HIV-related activities into existing STD partner services investigations was generally low-cost and acceptable to DIS, but initiating new work (STD partner services for HIV-negative

MSM with GC/CT) was relatively costly. Although a full evaluation of the effectiveness of these partner services activities is needed in order to assess their prioritization within the health department, our analysis provides critical information that can guide the implementation of more efficient partner services activities. Understanding these efficiencies and cost is particularly important in the present era of decreasing funding for STD programs¹⁵, increasing rates of STI¹⁰, and added pressure on partner services programs to focus on HIV-related activities in order to make progress toward the federal Ending the HIV Epidemic initiative.¹⁶ Insofar as integrating HIV outcomes into STD partner services results in obtaining relevant HIV outcomes (e.g., PrEP uptake) at an acceptable cost, this integration represents an opportunity to expand the funding base for STD partner services, which has synergistic benefits to reducing the burden of HIV and STD in the US.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1.

Summary of data collection methods and analysis for two primary objectives

Objective	Data Collection Methods	Analytic Methods
Identify barriers and facilitators to integrating HIV-related outcomes into MSDH's existing partner services program	<ul style="list-style-type: none"> • DIS interviews • Direct observation ("shadowing") conducted as part of time and motion study 	Summarized qualitatively (Table 2)
Determine the time and incremental cost to integrate HIV-related outcomes into MSDH's existing partner services program	<ul style="list-style-type: none"> • Time and motion study • Case tracking forms • Staff salary information provided by MSDH 	(Table 3 and Supplementary Table 1) <ul style="list-style-type: none"> • Calculate total duration of time (number of days) spent on each gonorrhea, chlamydia, or syphilis case • Calculate active time (minutes) spent working on each gonorrhea, chlamydia, or syphilis case • Calculate incremental cost per gonorrhea, chlamydia, and syphilis case

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Table 2.

Barriers and Facilitators of STD partner services activities generally and of integration of HIV-related activities into STD partner services

	General STD partner services activities	HIV-related activities integrated into STD partner services
Directly observed	<p>Structural Barriers</p> <ul style="list-style-type: none"> • Long process to determine if a client is in jurisdiction • Irregular manual data collection and analysis • Data in multiple systems • Multiple attempts needed to reach providers and patients <p>Environmental Barriers</p> <ul style="list-style-type: none"> • Field visits often do not yield results (e.g., patient interview) <p>Facilitators</p> <ul style="list-style-type: none"> • Regular and predictable lab reporting • Flow of case assignments 	<p>Structural Barriers</p> <ul style="list-style-type: none"> • Irregular manual data collection and analysis for some new activities not yet incorporated into existing systems • Data in multiple systems • Data entry staff close gonorrhea and chlamydia cases in the absence of HIV co-infection, leading to missed opportunities to test for HIV or provide PrEP • DIS are often unable to reach patients who have already been tested and treated for gonorrhea and chlamydia • No variable for “gender of sex partners” on case report form makes it difficult to identify MSM gonorrhea and chlamydia cases • PrEP referral is not offered systematically • PrEP referrals not systematically recorded in interview or electronic record
DIS interviews	<p>Structural Barriers</p> <ul style="list-style-type: none"> • Lack of frequent communication between clinics and DIS • Getting patients to attend appointments at STD clinic or attending at an unscheduled time <p>Environmental Barriers</p> <ul style="list-style-type: none"> • Distrust of MSDH • Stigma experienced by MSM makes it difficult to contact MSM • Finding MSM who are not already diagnosed with HIV (to do HIV testing) • Lack of valid addresses and phone numbers <p>Facilitators</p> <ul style="list-style-type: none"> • Patients who possess the attitude of wanting to help themselves • Perceived “seriousness” of the disease (in relation to HIV and syphilis) • Retrieving contacts from patients 	<p>Structural Barriers</p> <ul style="list-style-type: none"> • <i>Organization</i> <ul style="list-style-type: none"> – Lack of additional staff or additional compensation for new activities – Disparate forms in multiple systems; forms are tedious to complete – HIV and STD data linkage to alert DIS that client is not in HIV care sometimes happens after DIS have already completed interview • <i>Policy</i> <ul style="list-style-type: none"> – Needing to verify documentation on PrEP referral even if client refuses the referral – Need to wait to close cases until client attends HIV care appointment or PrEP appointment • <i>Patient Perception and Characteristics</i> <ul style="list-style-type: none"> – Patients lack demand for linkage to care by DIS – Some patients who are interested in PrEP live far away from PrEP provider <p>Environmental Barriers</p> <ul style="list-style-type: none"> • Identifying MSM who are not already diagnosed with HIV (to do HIV testing)

Table 3. Incremental cost of staff time for a standard partner services case and for new HIV-related activities integrated into STD partner services

Activity	Staff responsible	Partner services (standard case)		Conducting partner services with HIV-negative MSM with gonorrhea or chlamydia ¹		Re-linking partner services recipients living with HIV to care ²		Offering PrEP referrals to HIV-negative partner services recipients ²	
		Time (minutes)	Cost	Time (minutes)	Cost	Time (minutes)	Cost	Time (minutes)	Cost
Data entry	Data entry staff	3 (2-8) ³	\$.77 (0.51-2.05)	3 (2-8)	\$.77 (0.51-2.05)	-	-	-	-
Eligible case identification	Epidemiologist	-	-	50 (16-101)	\$30.82 (9.86-62.25)	26 (19-33)	\$16.02 (1.71-20.34)	-	-
Case assignment	Regional Manager	5 (2-25)	\$2.51 (1.00-12.53)	-	-	-	-	-	-
	DIS Supervisor	2 (1-10)	\$1.16 (0.58-5.79)	2 (1-10)	\$1.16 (0.58-5.79)	-	-	-	-
Case review and record search	DIS	23 (5-301)	\$9.04 (1.96-118.29)	23 (5-301)	\$9.82 (1.96-118.29)	-	-	-	-
	DIS	-	-	-	-	47 (12-431)	\$18.47 (4.72-169.38)	-	-
Patient and provider contact	DIS	38 (2-152)	\$14.93 (0.79-59.74)	38 (2-152)	\$14.93 (0.79-59.74)	-	-	-	-
	DIS	21 (5-55)	\$8.25 (1.96-21.61)	21 (5-55)	\$8.25 (1.96-21.61)	-	-	-	-
Partner contact and interview (per partner)	DIS	76 (10-224)	\$29.87 (3.93-88.03)	76 (10-224)	\$29.87 (3.93-88.03)	-	-	-	-
	DIS	-	-	-	-	-	-	40 (12-246)	\$15.72 (4.72-96.68)
Documentation	DIS	22 (2-140)	\$8.65 (0.79-55.02)	22 (2-140)	\$8.65 (0.79-55.02)	-	-	-	-
	Regional Manager	5 (2-12)	\$2.51 (1.00-6.01)	5 (2-12)	\$2.51 (1.00-6.01)	-	-	-	-
Total	Total	195 (31-927)	\$77.69 (12.52-369.07)	240 (45-1003)	\$106.00 (21.38-418.79)	73 (31-464)	\$34.49 (16.43-189.72)	40 (12-246)	\$15.72 (4.72-96.68)

DIS = disease intervention specialist; MSM = men who have sex with men

¹Partner services was not typically conducted with gonorrhea, chlamydia, or urethritis cases prior to 2016. Therefore, the entire time is incremental.

²This activity is completely incremental from a standard partner services (i.e., activities were integrated into standardized partner services procedures).

³The minimum to maximum range is indicated for times and costs in parenthesis.

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