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HIV PARTNER SERVICES: OPPORTUNITIES TO INTEGRATE PREVENTION AND TREATMENT

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HIV Partner Services: Opportunities to Integrate Prevention and Treatment

[video transcript]

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- - [Jim] Welcome to Physicians' Research Network. I'm Jim Braun, the course director of the monthly meetings of PRN in New York City. Since our beginning in 1990, PRN has been committed to enhancing the skills of our members in the diagnosis, management, and prevention of HIV disease, as well as its coinfections and complications. We hope this recording of Susan Little's presentation, HIV Partner Services: Opportunities to Integrate Prevention and Treatment, will be helpful to you in your daily practice, and invite you to join us in New York City for our live meetings in the future. PRN is a not-for-profit organization dedicated to peer support and education for physicians, nurse practitioners, and physician assistants, and membership is open to all interested clinicians nationwide at our website, prn.org. And now, allow me to introduce Susan Little, Professor of Medicine and Co-Director of the UCSD Antiviral Research Center at the University of California, San Diego.

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-[Susan] So, I'm gonna give you a bit of a story about partner services, but told from the perspective of someone who comes from San Diego, which, while a lovely city, does not have quite the resources in the public health department. But I think I'm gonna talk about services related to public health prevention and treatment that are relevant globally. And I'll talk about some of Dr. Daskalakis' own data, too. And I promise I was gonna do this before I knew he was the other speaker.

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So I'm gonna cover STD partner services then, where they started, what HIV and, now, STD partner services look like now, what I call next-generation partner services, third-party notification, and again, end at kind of the same place, Partner Services and the Continuum of Care: the Integration of Prevention and Care.

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So, partner services began in 19th century Britain. Partner notification was first documented as an STD control measure. The Contagious Disease Act in 1864, and really, this was pretty rigorous, with prostitutes being confined for up to six months if they were identified with an STD. And then, I won't read through all this in the sake of time, but 1916, STDs were spreading rampantly, so clinics were established to provide free testing. STDs continued to become more prevalent, and with that, in 1942, the British government decided that the people who provided sort of contact notification needed special training, and from this, the DIS, the Disease Investigation officer, was born. And then, finally, in 1968, the National Health Service Regulations provided the first official contact tracing practice, SOP. So this is where contact tracing or partner services, began.

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And then, during World War One, 18,000 servicemen were out of action every day due to STIs. And then along comes World War Two, and the US military would have none of that.

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A multimedia campaign went about to try and reduce STIs, and the US came along and partner services came into effect, to try and bring people into care to try and reduce the spread of STDs. So again, syphilis- all these men have it. I don't love without a glove, and neither should you! You've probably seen some of this.

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She may look clean. Booby Trap. Syphilis and gonorrhea. Lovely.

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So, partner notification for STDs in the United States began in 1939. A little bit later, Thomas Parran, the Surgeon General, was the architect of the federal anti-venereal disease program, advocated screening treatment, and contact tracing of people with syphilis. In 1938, congress passed the National Venereal Disease Control Act and gave support to STD control programs. By the 1940's, contact tracing had become a central feature of syphilis control programs. And then finally, in 1972, partner notification was included as part of the gonorrhea control program. So, I like this focus on, down here, 1948.

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So this is one of the first contact investigations of primary and secondary syphilis. So I just like to illustrate this. This is looking at 1,000 individuals with primary and secondary syphilis. And, shown here are the outcome measures that were measured back in 1948. Some of the same measures we use today. So contact index simply refers to the number of contacts named by the index. Epidemiologic index is the number of infected contacts per index. And brought-to-treatment, the number of individuals who are brought to treatment over the number of total indexes. And then finally, lesion-to-lesion index, something we don't really use anymore. The goal of contact tracing is to identify contacts of the index early enough in their disease state that you can interrupt either transmission or disease progression. And in this case, the idea is by finding partners who themselves have lesions; they themselves have primary or secondary syphilis; you've found people with early disease. So, lesion-to-lesion means you've found contacts who have primary and secondary syphilis. So lesion-to-lesion, a ratio of 0.2 was considered good in those days.

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STD partner services became the mainstay of public health STD control strategy for decades. The historical objectives. Many of these are exactly the same as they are today to ensure appropriate treatment for index cases, to elicit, notify, test, and treat partners, and to decrease STD transmission and morbidity. So what do, now, HIV and STD partner services look like now?

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So, just to get us all on the same page, there are four different strategies for partner notification.

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There is provider referral where the health department specialist, often referred to as the Disease Intervention Specialist or DIS, does the partner notification. There's third party referral, where partner notification is performed by a healthcare provider, a counselor, not the public health department. So, we in San Diego do third party referral at the research center that I work at, and I'll show you some of those data. Self-referral: the index or the newly-infected/newly-diagnosed person chooses to refer their partners themselves. Contract referral: the index says, "I'm going to refer my partners." But if after a certain period of time, that's negotiated, they don't refer their partners, the DIS steps in and takes over the notification. And then finally dual referral: joint partner notification by the patient and the provider. So just a note that gonorrhea and chlamydia cases are frequently too numerous to permit provider notification. So we'll get into this in a bit, but provider notification is immensely costly and as such, this is one of the reasons we have this discussion about whether or not partner notification services should be performed, how often they should be performed, and in what population. I am fully in support of partner services. I think they provide a very valuable public health service by bringing people into care and identifying people with both HIV and STDs. Having said that, this service is written into our public healthcare guidelines. The data that supports, the evidence-based data that supports partner services is incredibly limited. So when you look at the level of data that we require today to implement new policies and procedures, this is pretty sparse.

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This is one of the best studies to support partner notification. Written back, published New England Journal, 1992. This is a randomized clinical trial of partner notification for HIV. And I'm really gonna focus more on HIV at this point because STD partner notification is quite a bit different, and as I said, very focused on provider notification for HIV, much less so for STDs. So this is a study with 534 HIV infected people. Back in those days, they're tested positive and 46 percent don't return for their test results 'cause they have to come back in those days to get their test results. 22 percent are ineligible. Many of those are previously positive. They don't have new partners, they have unknown partners, or they're not local. So ultimately, we get down to 162 of them who are screened, who are HIV positive. They return and they're screened and asked if they will participate in partner notification services. 50 percent of them decline, and ultimately, out of the start, you end up with 74 who agree to enroll in partner notification services which simply means they're going to allow a DIS-type officer, or something, to talk to them about eliciting partners. So they are now randomized to either patient referral- they're going to find their own partners and notify them, or a combination of either/or. Whatever they wish. Provider and contract referral. So they can pick whether they want the provider, the DIS officer to notify their partners or engage in a contract where they are given two days, I think in this case it was two weeks, to notify their partners. And if they did not do so, then the DIS steps in. In this case, look to the left, 50 percent of partners were notified in the intervention arm. Of the 78 partners that were notified, 70 were notified by provider notification. So, only eight were notified by patient referral. So the vast majority of index individuals preferred to have the provider notify their partners. On the patient referral side, only seven percent of partners ended up being notified. So this is the study that demonstrated

most dramatically that provider notification was vastly more effective than self-referral. So in this case, provider referral 6.5 times more effective than patient referral. What's not really on the slide at all though, is again, if you go back to the left, 50 percent of partners were notified. Among those notified, only 50 percent of them agreed to be tested. Among those tested, a quarter or nine people, were HIV positive. So this really impressive study ends up with really small numbers at the end. That's the history of partner notification and it hasn't changed a lot since. It's a lot of work at the top filtering down to get a relatively small number of people. So if I have one message today it's that this incredibly important service, we've gotta learn how to prioritize the population in which we're delivering the service because it's very resource intensive. But the yield is really great if we can figure out how to prioritize.

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This is a second randomized clinical trial in a very different setting. So this partner notification for HIV among index individuals who had injection drug use. So partner notification for sexual contacts or injection drug using contacts. So in this case 386 injection drug users were screened for HIV in the field. Again, 97 received their results 'cause they're in the field. 63 ended up being HIV infected. 60 of those agreed to participate in the partner notification study. And they, again, were randomized to outreach assisted, which meant an outreach coordinator who had been trained to have DIS-type skill. So someone who was going to walk door to door, on the streets, in very bad neighborhoods, in Chicago, and do partner notification versus self-referral. In this case there was no difference between the two study arms. But I would argue that this is a very different setting than traditional partner services.

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Partner notification strategies- again the efficacy in terms of just finding, actually successfully notifying partners, provider referral is by far and away the most effective. I did not show you the other studies. Those were the best. But there are multiple other studies that are less well, more observational. And provider referral does appear to be the best. There's not data on third party notification. That is when a non-DIS provider notifies the partners. Self-referral is the least effective. I could find almost no good data on contract referral. But, the maximum notification rates are achieved with a combination of provider and partner notification, so dual notification.

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There was a review of partner services in 2005 to 15, and reviewed two, both patient referral interventions, provider referral interventions. When you look at patient referral interventions- and this I should say is a combination of partner services, both STD and HIV, expedited partner therapy for STDs predominantly. I think only. Expedited partner therapy most often delivered as patient-delivered partner therapy, which means when an index is identified with an STD, they are given drugs to hand to their partner to treat their STD. And expedited partner therapy is a patient-delivered intervention. And the data are very mixed. In some communities, quite successful. In others, not really at all. So I would say these data are mixed and it depends on what population you're studying, in what setting. Enhanced counseling techniques, that is improving the ability of the client to talk to their partner, to better refer their partners. And again, data very mixed. The best studies were those that had an interactive component that involved role-playing, question and answers that got the patient involved in the process rather than handing the index client a card. Hand these cards out to your contacts. That did not work

well in almost any study. So, again, very mixed; depends on the community, et cetera. So there aren't good recommendations for patient referrals. If you want to tell people to refer their own partners this works- it really depends on the patient population and the community that you're studying. Provider referral interventions, generally, are the most efficacious, especially for HIV, but they are considerably more expensive. However, it's uncertain if partner notification finds enough infected people to reduce transmission. This is one of the big problems with partner notification. The original goals of partner notification was to find partners to reduce disease morbidity and hopefully reduce transmission to the extent that you're finding people earlier in the course of their disease, thus reducing morbidity. But there are almost no studies that look at whether or not you actually reduce transmission and impact incidence or prevalence in the population. Almost no studies. And those studies that are out there are very limited; have a lot of problems. This study raises the question of whether or not provider referral could be used to complement cheaper case-finding strategies because, again, the idea that again if you live in Wonderland every single, newly diagnosed person is going to get access to partner services. But throughout the rest of the world, that's really not feasible.

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So in terms of effectiveness, now a second review in 2005, in terms of evaluation measures, one of the absolute constants in terms of more recent evaluation measures for partner services is the number needed to interview. So how many index, how many partners of an index do you need to interview to find one new case? One newly diagnosed case of either an STD or HIV, depending on what you're talking about. So the number needed to interview for STDs is four to five. You need to interview four to five partners to find one new case of STDs. But HIV, quite a bit higher. Double. You need to interview eight to 10 partners to find one new case of HIV. Successful partner notification was associated with index cases who self-presented for care with symptoms. So they're already seeking care. And partners with whom the index has sexual contact that is recent, frequent, and of long duration. So relatively stable partnerships.

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But, getting back to again, the national appearance of partner services, this is, again, a review from 2010 looking at partner services throughout the United States. They surveyed 51 of the 71 eligible public health jurisdictions that participated. So they looked at 51 public health jurisdictions across the United States. 43 percent of new HIV cases in these public health jurisdictions had been interviewed for partner services. Those interviews resulted in about 10,000 potentially exposed partners being identified. Another metric you'll see often, is now the number of partners to indexes. So in this case 0.9. So the number one comes up quite frequently. One partner to one index. Go off on a tangent here, one of the things I often wonder is why do people name the partner that they name? Because certainly in the people that I talk to they have more than one partner, but they name one. So it's always been interesting to me why they pick that name, but there's no data out there. Why do people pick the one name that they do when they may have five partners? Among those potentially exposed partners, 21 percent were previously HIV diagnosed. Eight percent newly diagnosed. 32 percent were negative. And 39 percent were not successfully notified or refused testing. The number needed to interview for this more recent study was 13.6, but again, of note, and I think this is interesting, the numbers differed depending on which coast you lived on. On the West Coast, the number needed to interview is

substantially higher, 25, compared to almost the rest of the country: the Midwest, North, South where it was closer to 13 to 14. So again I have thoughts about why it's higher on the West Coast, but no clear data. But again, overall the message here is most people in the United States who are newly diagnosed with HIV do not receive partner services. But what are the priorities? As I said, provider notification is very expensive, resource intensive. There are clear priorities established by the CDC for partner services. And they are, not surprisingly, identifying partners who have been exposed to an index that is more likely to transmit.

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Partners who've been exposed to an index within the last 72 hours because they're candidates for nPEP; partners of an index with a high viral load- so anybody, again, particularly acute HIV infection; and partners of an index who had another STD. So as you just heard, people who have STDs are more likely to acquire HIV in the ensuing year. Any STD raises the risk of transmission of HIV. But again, I've already said this.

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The impact of partner notification on disease incidence and prevalence- there's very little data. Little work to date to demonstrate a direct effect of partner services on incidence or prevalence of STDs. Randomized clinical trials are needed to examine the comparative efficacy and cost effectiveness of different partner notification strategies and their relative impact on disease incidence and prevalence. My interest in this whole field comes about the fact that I'm working on bullet point number two. So maybe in a year or two, I'll be back to talk about bullet two.

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Next generation partner services. So as the world changes, and more and more people are using apps to identify their sexual partners, many organizations, in this case, a group from Australia, are wondering how the risk of STDs are impacted by people who are using almost exclusively dating apps or hook-up apps to find their sexual partners.

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So this is a slide that I stole from Matt Golden, from his CROI presentation, and looks at the Australian Gay Community Periodic Survey, which to the best of my read is the NHBS of Australia. So it's a serial cross-sectional surveys conducted in Australian state capitals where they looked at and they're venue-sampled just like the National Health Behavioral Survey, HIV Behavioral Survey. So they go out to venues and they have people take surveys. Starting in 2010 and going to 2014 they looked at people who identified their sexual partners through the internet, mobile apps, and gay bars, and the prevalence of STDs in those individuals. First and foremost, they found that the percent of STDs- I guess I lost that on the vertical- but the percent of STDs in this population among people who use mobile apps had gone from 24 to 42 between 2011 and 2014. So a very dramatic increase in this particular group. The population that is using mobile apps to find sexual partners does appear, and there are several studies in the United States also demonstrating increased numbers of STIs in that population.

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So again, with the explosion of internet app dating now comes along mobile partner service technology. So there's internet partner services, text-based partner services, and these really are used to augment traditional partner services. So again, traditional partner services we think works well, but what about the very large number of people who simply don't, can't give you the names of their partners or sufficient contact information that you can adequately contact that individual? For this, I'm gonna present data from the New York City Public Health Department, so Demetre, feel free.

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So, this is a program, not a study, but a program where individuals with newly diagnosed HIV are interviewed. And they either, on the left, provide contact information for traditional partner services or they say, "I don't have any information, "I can't give you a name. "I maybe have a little bit of information related to the app that I used to reach this person." If no contact information, if the contact information is not sufficient to actually reach out through a traditional contact partner services DIS outreach, that information is turned over to the mHealth Coordinator. Both the traditional partner services- DIS and the mHealth Coordinator- both are trying to do the same thing: reach the individual through whatever means possible to bring them in and talk to them about their partners. Sorry, about their exposures and test them. Both traditional partner services and text, email, and phone.

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So this is very small, but what I really want you to look at is on the left is traditional partner services, the middle is internet, and the right is text. And really you only need to look at a few things. On the left is the number of these are all newly diagnosed HIV. On the left 69 percent of people are contacted through traditional partner services, compared to 41 percent in the middle through internet partner services, compared to 77 percent on the right through text partner services. So texting actually seemed to be quite effective at reaching, notifying a larger number of people so that was very promising. But then you move down to the next step. Now you have notified a large number of people. How many of them actually come in to get tested? And this is where there was a big drop off. So traditional partner services: 69 percent of people came in to get tested compared to internet partner services 34 percent. And then look on the right: 45 percent with text partner services. And then I think, perhaps most discouraging is the last line, is that there were 106 newly diagnosed people identified through traditional partner services, compared to five through the texting partner services. So again, to augment, I mean those are still five people you wouldn't have found before if you didn't have text-based or internet-based partner services. And it's potentially a relatively lower cost, scalable approach, but it's still very low yield compared to traditional partner services, the costly approach.

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So the contact rate was higher for text-based partner services than traditional or internet partner services. There was a higher likelihood of notifying the partners with internet and text rather than traditional partner services. Higher proportion of the partners notified through traditional partner services tested for HIV. Operationally, text-based partner services is likely to be simpler than internet partner services for implementation with most health departments.

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So I'm gonna talk a little bit about our data- third party notification. Our goals in San Diego, we're very focused on identification of people with acute HIV infection at our research program.

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And so one of the questions was, if we're finding people with acute infection and we deliver partner services, we hypothesize that those individuals will be better able to recall their sexual partners, the likelihood that we're gonna find sexual partners that are genetically linked to the index should be greater, and the number of partners that we should need to interview should be potentially lower to find a new case because the transmission maybe has happened recently.

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So we wanted to estimate the mean number needed to interview to find one new case, looking only at index individuals who are themselves acute and recently infected, and estimate the proportion of newly diagnosed sexual partners who are genetically linked to the index patient using the molecular epi.

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So partner services were offered to most index participants and by most. We have funding to do acute HIV infection and our funding waxes and wanes over the years at the whims of the NIH, and so some years we approach everybody for partner services, and other years not everybody. So this is not a systematic study. This is an observational, retrospective study during which time many people received access to partner services.

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And again, we characterized genetic linkage. If the sequences were less than 1.5 percent genetic distant, genetically different, which is very conventional now in the literature, and this was the study.

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So 574 index patients with acute and early HIV (AEH), 107 consented to partner services: 19 percent. That's not too far off from many of the studies which range from 20 to 40 percent depending on the study. 119 partners identified. 1.1 partner per index. Again, pretty typical. The number seems to hover right around one in most studies. 42.8 percent were HIV uninfected. 38, call it 39 percent were chronically infected, of the partners. And 18 percent were acute and early infected.

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Within those groups, we broke it down into the chronically infected. What we really care about is the newly diagnosed. Now, I would argue, we care about the newly diagnosed and the chronically infected who are out of care or not fully suppressed. But in this case, the newly diagnosed were 21 percent plus newly diagnosed AEH. In this case we identified 33 percent of our new HIV diagnoses were, of our HIV diagnoses, were newly diagnosed. Now you could argue the AEH arm, previously diagnosed, how do you have an acute that's previously diagnosed? They were diagnosed a couple of days earlier in our program, but for the sake of this analysis, they were previous. They were not found by partner services,

so then I'm gonna put 'em in a different category. Again, we're gonna get in to talking about how partner services can be used to link patients into prevention.

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The behavioral risk in this population among HIV positive and negative recruited partners was very similar, identical. So again, negative partners: an excellent opportunity to offer these people PrEP. 39 percent of the named seroconcordant partnerships were not genetically linked. So again, people who come in and name one partner, that partner comes in, 60 percent of the time they are genetically linked. We do believe that is a true transmission that occurred. 40 percent of the time it's not. So we're still missing transmissions. So if we're looking to interrupt transmission we're still not getting enough depth of sampling that we're finding partners. But if we're finding 60 percent of them, we're doing at least a reasonable job that I think we might be able to do a study to see whether or not we can effectively limit transmission in this population. In this group that is at much greater risk of transmitting. Recruited partners identified within 30 days of the index were more likely to be newly diagnosed themselves and genetically linked. And the rate of new case finding among the referred partners was 12 times higher than the rate of HIV in the screening program that we use to find the indexes. So when we went out and looked in the partners of the index HIV, we were 12 times more likely to find a case of HIV than in the screening program that we use, that we find our high risk index clients. So it is a very high yield program. It's just very resource-intensive.

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So we then compared our data, the Green Study over here, to the most recent National Survey. For the sake of speed, I'm gonna skip down to this. The one difference between these two studies is in the National Survey, we've got a clear estimate of the proportion of people who refused to participate. And in ours, I told you, we don't have that because we didn't systematically offer it to everyone. So I don't have a denominator. So what I did is I took this group of people and I simply removed them and now I can compare and adjust the numbers between the two studies. So what you can see is that between the two they're very comparable except that, as I said before, 33 percent of newly diagnosed compared to 13 percent. And the National Survey is almost uniformly providing partner services to people with prevalent, so newly diagnosed, prevalent infection as compared to newly diagnosed incident infection. So again, if you want to find people with new cases of HIV that are themselves newly diagnosed, this is a very effective strategy. Not cheap, just very effective. And when we look at the number needed to interview, again, our number was 15, which as I said before compares very favorably with the national estimate of 13, and very favorably with the number on the West Coast of 25. And the number needed to find one new case that was themselves acutely or early infected was 41, and I've not seen that number anywhere else in the literature. So I don't really know how it compares. But again, most newly diagnosed people did not receive partner services. So I'm gonna end with just a few slides that will wind us back to where Dr. Daskalakis ended up: partner services, the continuum of care, the integration of prevention and care.

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A study from Washington State looked at, again, a public health department study where partner services were routinely offered to every individual with common STDs. Gonorrhea, chlamydia, primary,

secondary syphilis. And what they did in this study was they said everybody that was gonna get these services, we were now gonna offer HIV testing to the partners that were brought in. And within that, because they made that change, in the course of this study, HIV testing among partner service recipients increased from 63 to 91 percent. The number of HIV diagnoses, not surprisingly, were greatest among, this is pre and post intervention; post intervention is the light gray. So the number of new diagnoses were greatest in the early syphilis, the rectal gonorrhea, and the urethral gonorrhea. And this was only a study in MSM. We can also use partner services to find HIV infected and unaware. I showed you that in our own data. This is public health department data from San Francisco. So in San Francisco they started partner services in 2005. Between 2005 and 2009, they really scaled up partner services. First at local public health clinics, and then gradually going to community clinics, to San Francisco General, and then really moving it out in to the private sector so that an increasing proportion of newly diagnosed, HIV diagnosed clients, were offered partner services.

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And during the course of their study between 2005 and 11, newly diagnosed indexed cases that were interviewed for partner services increased from 18 to 29 percent and overall, in that whole period, 25 percent of new HIV index patients participated. And the proportion who named one or more partners increased from 30 to 40 percent. And 40 percent is a really high number in the world of partner services, that's pretty good.

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Linking partner services to the continuum of care. Again, this is New York City data where field services. So in New York City, at the time of this study in 2013, 38 percent of newly diagnosed HIV cases were provided partner services by field service unit personnel. What they decided to do was evaluate the rate at which people were linked into care by those who had received partner services by field service unit personnel, versus those who did not receive partner services in the field. And they found that there was much more rapid linkage to an establishment in care among field service unit patients versus not field service unit patients. I think what's striking about this it's not a randomized controlled trial, but the bias. The question is, are these different populations? Yes, they're very different. In fact, the people who received field service unit services were, the bias goes in the exact opposite direction. The people who received field service unit services were more likely to be people of color, diagnosed late in disease, have more, I guess late in disease, there's one other metric that I can't remember, but they were they were the population you would expect to do less well. So the people who you would expect to do less well were the people who were linked into and established more readily into care. So again, field service unit staff were very effective at linking this group into care. So finally, linkage to PrEP- we've already talked about this a little bit.

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This is a Washington study presented at CROI where, again, they looked at people who, again an MSM group who were interviewed for partner services. They looked at the people who tested negative, thus were potentially eligible for PrEP. They were offered a referral so again, not given PrEP on site, but offered a referral. 145 of them, or 49 percent, accepted the referral. And then, of those, what proportion actually initiated PrEP. And overall, and I should say in the course of this study, the rates of

people already on PrEP in the community increased dramatically. So 53 percent. That's pretty striking in 2016. But in this study, one in five who was referred for PrEP took PrEP. And that is by all accounts, a conservative estimate because if they were referred for PrEP they could've ended up somewhere else. So not been captured by this study, but again, a very good starting point. The people who are testing for HIV, many of those we can predict will end up with HIV. So this is a great opportunity to offer them PrEP and PrEP services.

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So I'm gonna end at the same place. The new paradigm of partner services where an index case is identified, partner notification or elicitation occurs. You identify the exposed partner. They both end up in the same place with HIV and STD testing. Linkage to care and treatment and whether that treatment is ARTs, treatment of STIs, or PrEP. And then they remain in the same place with re-engagement. When people fail treatment or relapse, they simply need to be, if they're positive, re-engaged or linked into care, and for the negatives who stopped PrEP or interrupt PrEP, they need to be re-engaged back into regular testing, linked back into care and treatment. So again, it's this same cycle that I think people need to be engaged in the same circular cycle of care and treatment, hopefully, with the same people performing the same services and re-engaging these people in prevention and treatment services. And again, I think partner notification is a great segue to introduce people into this service. And I think one of my main goals as a result of looking at these data myself is to say if you were to add, I keep saying that provider notification is very costly, but if you were to add in everything else- the introduction to PrEP, the HIV testing, the linkage to care, the engagement to care, all of those other services- it's not clear to me that it wouldn't be very cost effective if you do wraparound services like that, and bring all of those other prevention and treatment services into the partner service arena. I'll stop there.