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Authors

Hecht, Jennifer

Facente, Shelley N

Cohen, Stephanie

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TakeMeHome: A novel method for reaching previously untested people through online ordering and self-collect HIV and STI testing

Jennifer Hecht MPH[*1], Shelley N. Facente PhD[1,2,3], Stephanie Cohen MD[4], Tim Menza MD[5], Nikole Trainor MPH[4], Christine Heumann MD[6], Marta Juhasz MS[7], Patrick Sullivan PhD[8].

[1] Springboard HealthLab and Building Healthy Online Communities, Richmond, CA, USA

[2] School of Public Health, University of California Berkeley, Berkeley, CA, USA

[3] Facente Consulting, Richmond, CA, USA

[4] San Francisco Department of Public Health, San Francisco, CA, USA

[5] Oregon Health and Science University, Portland, OR, USA

[6] Indiana University School of Medicine, Indianapolis, IN

[7] Saluda Analytics, Hungary

[8] Rollins School of Public Health, Emory University, Atlanta, GA, USA

Corresponding Author:

Jennifer Hecht

Springboard HealthLab

5601 Van Fleet Ave

Richmond, CA 94804

jen@springboardhealthlab.org

401-595-4819

Summary: TakeMeHome is a sexual health home testing ordering platform that partners with health departments and dating apps to promote its services. This paper describes its expansion to offer self-collected, lab-processed comprehensive STI testing, including process and outcomes.

Abstract

Background: Despite national testing guidelines, rates of testing for HIV, sexually transmitted infections, and hepatitis C remain lower than recommended for men who have sex with men (MSM) in the US. To help address this, the TakeMeHome (TMH) program was started in March 2020 by a consortium of public health organizations and dating apps - Building Healthy Online Communities - to work with health departments to increase access to HIV testing for MSM on dating apps.

Methods: Users of participating dating apps were sent messages about opportunities for testing with self-collected specimens through TMH. Program users were eligible to receive test kits if they lived in a participating zip code and were aged at least 18. Users who were interested in testing could order kits to be mailed to them for lab-based testing of HIV, hepatitis C, chlamydia, gonorrhea, and/or syphilis, depending on risk and availability in their zip code. Orders were sent via application programming interface (API) to Molecular Testing Labs (MTL) for fulfillment; kits were provided at no cost to the program user. Within approximately 24 hours of order receipt, MTL mailed program users a kit with required collection supplies, directions, and a link to a video instruction for self-collection. Program users received an automated email after testing was complete with a link to access results through their online account. Individuals with positive results on any of the relevant tests were directed to additional information and supported with linkage to additional testing or treatment, depending on local protocols.

Results: The positivity rate of specimens processed through TMH was 1.4% for HIV, 0.6% for hepatitis C, and 2.9% for all STIs combined. The per-person positivity rate was 15.3% across all STIs.

Conclusions: The TakeMeHome program demonstrates that self-collected lab-processed testing is feasible and effective at identifying new HIV and STI cases.

Keywords: HIV; STI; self-testing; MSM; internet; dating apps

Background

The US Centers for Disease Control and Prevention (CDC) currently recommends that sexually active gay, bisexual, and other men who have sex with men (MSM) be screened for both HIV and sexually transmitted infections (STIs) at least annually and screened for STIs every 3 to 6 months if they are living with HIV, on HIV pre-exposure prophylaxis (PrEP), or if they or their sex partners have multiple partners [1, 2]. However, substantial gaps remain in access to HIV and STI testing for this group. While annual HIV testing increased among MSM from 62% to 77% between 2008 and 2017 [3], nearly a quarter of MSM did not access annual testing, even before the COVID-19 pandemic. Of all people living with HIV in the US, 14% remain undiagnosed [4]. Similarly, numerous studies have found that MSM in the US do not screen as frequently for STIs as recommended; a recent analysis of MSM in 15 cities throughout the US found that without symptoms MSM screened an average of every 12.6 months, and increased behavioral risk for STIs did not lead to substantial increases in screening frequency, in accordance with CDC guidelines [5].

Hepatitis C virus (HCV) is most commonly transmitted through blood-to-blood transmission, often through injection drug use; however, especially for MSM living with HIV, sexual transmission of HCV has been well-documented [6]. In some cases, MSM also inject drugs related to sexual activity or for other reasons, but because they do not match stereotypical profiles of "people who inject drugs" [7] they may not be encouraged by providers or peers to regularly test for HCV. Accordingly, HCV testing rates are low among MSM in many cases, with fewer than 2 in 3 MSM living with HIV in the US testing for HCV even once from 2011-2019, despite ongoing HIV care and the known increased risk of sexual transmission of HCV in

the presence of HIV infection [8].

Over the past decade, dating/hook-up apps have become a major way that MSM find sexual partners, especially for young MSM, MSM of color, and MSM in rural areas [9, 10]. Importantly, during the 2019 American Men's Internet Survey (AMIS), nearly a quarter of program users who had used at least one MSM-focused dating/hookup app in the past 12 months had never tested for HIV [11]. Significant barriers for HIV testing among MSM include not knowing where to test, concerns about judgment, privacy, stigma, transportation and limited clinic hours [12, 13].

In response to low HIV testing rates among MSM dating app users, the TakeMeHome (TMH) program was started in March 2020 by Building Healthy Online Communities (BHOC), a consortium of public health organizations and dating apps started in 2014 to improve HIV and STI prevention on dating websites and apps. Health departments are offered a program promotion mechanism via BHOC's partnerships with dating apps focused on gay/bisexual men and other MSM, a streamlined ordering platform, shipping and fulfillment logistics, and data reporting. A recent review of the first year of TMH found that more than 1 in 3 people who used the service had never before tested for HIV, and an additional 56% had tested more than one year ago [14]. Previous studies of mailed at-home HIV testing and laboratory-based testing of self-collected sexually transmitted infection (STI) samples demonstrate substantial use by individuals who do not typically test for HIV or STIs [15]. Accordingly, BHOC explored the addition of lab-based testing to TMH, so that program users could benefit from both STI and HIV testing and health departments could access results directly from the laboratory portal for

easier linkage to care and treatment. Our first step was reaching out to an existing project, Iwantthekit.org; however, in conversation with project leaders at the time, they indicated that it was a Baltimore-based research study and did not have the capacity or interest in expanding to health departments across the country. We then partnered with Molecular Testing Labs (MTL) and NASTAD to begin offering these services directly.

In late January 2021, TMH expanded to offer a full panel of lab-based testing, including HIV, 3-site chlamydia and gonorrhea testing, creatinine, syphilis antibody, and HCV antibody testing. Three locations – Oregon; San Francisco, California; and Marion County, Indiana – initially piloted the lab-based testing expansion with TMH. By February 2022, 27 health jurisdictions were participating in TMH, with 14 offering lab-based testing. This article details the TMH expansion to integrated lab-based HIV/STI testing and summarizes program user characteristics, kit return rates, and test positivity findings from implementation in late January 2021 through September 30, 2022.

Methods

Program user promotion and program eligibility. TMH is a public health intervention offered by BHOC, not a study. As such, this was not considered human subjects research, and program users consented programmatically to order a test kit but did not complete other informed consent paperwork typical for human subjects research. Health departments initiated participation in the program based on their awareness of, interest in, and ability to pay for test kits in their area. Users of participating dating apps (e.g. Grindr, GROWLr, Adam4Adam, Sniffies, and others) in participating zip codes were sent in-app messages for the service, which

linked users to the TMH website to order a free HIV/STI test. In some cases, health departments and other stakeholders also promoted the service using digital assets provided by TMH; this was optional, as the TMH model was built upon partnerships with dating apps for promotion. However, some health departments were eager to complement the TMH promotion strategy with their own efforts. When health departments signed up to participate in TMH, they used local surveillance data to determine which zip codes would comprise their catchment area and which test kit options would be available in those zip codes; they also determined local program eligibility criteria based on program users' reported time since their last HIV test. Once health departments made these selections, they were not involved in the day-to-day operations of the program, aside from follow-up on positive results and optional complementary promotion efforts. Program users completed a few screening questions and then were offered options for kit types based on their stated risk history and the kit options their local health department had chosen to have available; they were eligible to receive kits if they lived in a participating zip code and were aged at least 18 years (or other age according to local laws).

Program users ordering lab testing were asked about current STI symptoms, whether they had a prior syphilis diagnosis, and about their risk for HCV. People who indicated a history of any of the following: injecting drugs, smoking crack or speed, being incarcerated, engaging in anal sex without a condom and/or using sex toys, and/or having a tattoo at an unregulated tattoo parlor; anyone living with HIV infection; and anyone reporting concerns they may have been exposed to HCV were eligible to receive an HCV test kit, unless they already knew they were living with HCV. Program users who indicated STI symptoms were not offered at-home test kits and were directed to a nearby clinic for in-person services; those with prior syphilis were

recommended to get tested for syphilis in-person. Those deemed eligible for home testing were then asked to create an account to order test kits. Program users were informed that the laboratory was required to submit all positive cases to state or local health departments by law, according to local requirements and order data to health departments. Digital orders were sent via application programming interface (API) to MTL for fulfillment; kits were provided at no cost to the program user.

Specimen Collection and Mailing. Within approximately 24 hours of order receipt, MTL mailed program users a kit via USPS Priority mail with required collection supplies (e.g., swabs, urine cup, lancet, and/or dried blood spot card), directions, and a link to video instructions for self-collection. Program users were encouraged to collect samples relevant to their sexual activities ("If you use it, swab it") and mail the postage-paid USPS Priority envelope with their specimens back to the lab for processing. The kit was valid for up to 60 days from receipt and within 30 days of specimen collection. Program users received an automated email when results were ready with a link to sign into their account to access results. Ten days after the initial order was placed, program users received a follow-up email with a survey asking about their experience.

Positive Test Results and Health Department Follow-Up. Individuals with positive results on any tests were directed to additional information, and in most jurisdictions were contacted directly by local health departments for linkage to care. To participate in lab testing, all health departments identified one clinician licensed in the state who was available to assist with follow-up, answer program user questions, and facilitate any required confirmatory testing and

treatment of reactive tests. Authorized health department staff were given access to a lab portal with real-time results for program users in their jurisdiction. Participating sites were also securely sent monthly data with demographic and other information collected during the ordering process and follow-up survey.

Test Panel Availability. Three lab-based testing packages were available to program users based on the choices of the local health department: A) HIV dried blood spot (DBS) testing only; B) HIV with creatinine testing via DBS card; and C) HIV, syphilis antibodies, and HCV antibodies via DBS card and 3-site (urine, rectal, and pharyngeal swabs) testing for *Chlamydia trachomatis* (CT) and *Neisseria gonorrhoeae* (Gonorrhea NAAT, or GC). To receive an HCV antibody test, program users also needed to answer yes to any of the 7 possible choices indicating HCV risks . After online screening, an order was placed for the panel using the following assays:

- **HIV:** GS HIV Combo Ag/Ab EIA [Bio-Rad Laboratories, Hercules, CA]
- **HIV confirmation:** Geenius HIV 1/2 Supplemental Assay [Bio-Rad Laboratories, Hercules, CA]
- **CT/GC**: BD ProbeTec™ CT/GC Q^x Amplified DNA Assay using Strand Displacement Amplification (SDA) on the BD Viper System [Becton Dickinson, Canaan, CT]
- **Syphilis antibody:** Trep-Sure™ Syphilis Total Antibody EIA [Trinity Biotech, Bray, Ireland]
- **HCV antibody**: Ortho® HCV Version 3.0 ELISA Test System [Bio-Rad

Laboratories, Hercules, CA]

- **Creatinine**: Liquid chromatography tandem mass spectrometry (LC-MS/MS)

Protocol Modifications. As this was a new program, three iterations were made to improve it during the time period described here. First, following a higher specimen rejection rate for DBS specimens, in March 2021 an instructional video for DBS collection was added. Second, starting July 2021 program users indicating a prior diagnosis were no longer offered a syphilis antibody test, due to the high likelihood of receiving a positive treponemal antibody result even in the absence of currently active infection and need for a quantitative rapid plasma regain (RPR) titer to evaluate for new infection in those with prior syphilis. Third, starting in July 2021, program users who had not yet returned their kits to the lab after 18 days were sent an additional email reminder to complete their specimen collection and return their kits.

Statistical Analysis. Statistical differences in categorical variables were assessed using the chi-square test of independence or Fischer's exact test, as appropriate, with p-values considered significant at $\boldsymbol{\alpha} = 0.05$. Continuous variables were assessed using descriptive statistics of their univariate distribution. Multivariate analyses focused on kit return rate, timely return rate, and STI positivity rate as main outcomes. A generalized linear model with a binomial distribution and a log link (log-binomial model) was used to estimate the predicted prevalence ratios of kit return and positive test rate within each age, race, gender, and jurisdiction group, adjusted for the model's other demographic characteristics. All analyses were conducted using SAS version 9.4 software [SAS Institute, Cary, North Carolina].

Results

Program user Demographics. Twenty-five percent of program users who ordered a kit were aged 15-24, 21% were 25-29, 34% were in their 30s, and 20% were aged 40 or older. Forty-four percent of program users self-identified as white, 6.6% as Black, 18% as Hispanic, 10% as Asian or Pacific Islander, and 21% as another race. Sixty-eight percent self-reported being a man, 23% as a woman, 8% as genderqueer, and <1% as another gender. The highest proportion of program users were from Oregon (32%) or San Francisco (21%).

Return rates, specimen sufficiency, and percentage of new testers. From January 2021 through September 2022, 2285 lab kits were mailed in partnership with the 14 health departments that had chosen to participate in this expansion program, and 1068 (46.7%) total orders were returned and processed by MTL. The remaining 1217 kits were not returned within 60 days, and therefore no results were provided. Twenty-four percent of program users self-reported TMH as their first HIV test. Program users under 40 years of age, who identified as male, and with a residence outside of Fresno County (with the lowest return rate) were significantly more likely to return the kits within 60 days compared to those 40 years and older, within Fresno County and who identified as female (**Table 1**). There were no differences in return rates by race.

Almost half of kits ordered, 48.3% (1104/2285), included the full STI panel of HIV, HCV, syphilis, and 3-site GC/CT testing (**Table 2**). Another 27.8% (635/2285) were HIV, syphilis, and 3-site GC/CT testing without HCV antibody testing, and 9.8% (224/2285) of kits were HIV testing only, with or without creatinine. The return rate for ordered kits was comparable across

the test types: 43.2% (984/2278) returned blood cards and 47.6% (981/2278) returned specimens for GC/CT testing. Of these, 47.5% (979/2061) returned urine samples, 47.0% (969/2061) returned oral swabs and 37.3% (769/2061) returned rectal swabs (**Table 3**). Of all specimens returned, 95% were sufficient for processing, with the highest proportion of sufficient specimens being urine samples for GC/CT testing (98.7% sufficient) and the lowest proportion being blood cards (93.3% sufficient).

Almost all test kits were shipped from MTL within 24 hours of ordering (median time to shipment = 0 days, with interquartile range [IQR]=0-1 days). The median time from MTL shipment to lab receipt of self-collected specimens was 13 days (IQR=8-25 days), and the overall time from ordering to reporting of results was a median of 17 days (IQR=13-29 days) (**Supplemental Table S1**).

Specimen and person-level positivity. The positivity rate of tests during this period was 1.4% for HIV, 0.6% for HCV, and 2.9% for all STIs combined; the specimen-specific STI positivity ranged from 1.1% for urethral gonorrhea to 7.6% for rectal chlamydia (**Table 4**). Results were similar in the three original pilot sites of San Francisco, Marion County, and Oregon; San Francisco residents experienced a notably lower rate of rectal chlamydia (4.8% compared to 9.3% in Oregon and 9.1% in Marion County, although not statistically significant at this small sample size (p=0.0726 and 0.2782, respectively). They also had a notably higher rate of urethral gonorrhea (2.1% compared to no positive results in Oregon (p=0.0116) or Marion County (p=0.5889)). Statistically significant difference was found in the rate of urethral

chlamydia in San Francisco when compared to Oregon (2.1% vs. 6.1%, p =0.0200). The HIV positivity compares favorably to other testing locations, which ranged from 0.2% to 0.8% across sites as varied as STD clinics, in-patient facilities, and outreach settings. [16]

Person-level results demonstrate 15.3% positivity rate for at least one STI among program users with results, with significant differences by race and gender, but not age or jurisdiction. STI rates were 2.15 times higher among Hispanic program users and 1.79 times higher among program users in the 'Other' race category compared to White program users (aPR=2.15, p-value<.0001; aPR=1.79, 2.61, p-value<.0001, respectively), after adjusting for differences in age, gender and jurisdiction. Differences were also seen by gender; men to women: aPR=3.37 (95% p-value<.0001) and genderqueer program users to women: aPR=4.82 (95% p-value<.0001), adjusted for age, race and jurisdiction (**Table 5 and Supplemental Figure 1**).

Discussion

The number of otherwise-untested people receiving HIV and STI test kits through TMH demonstrates the importance of a self-collection testing model to increase access to testing overall, which is critical in an era where both HIV and STI screening rates are below national and international goals for ending the HIV epidemic [4, 17] and stopping the spread of STIs [5]. Equally important is the return rate, as only people who return kits with quality specimens can learn their HIV/STI status. During this period TMH had a return rate of 46.7%, highlighting an opportunity to enhance the program's return rates, though this rate is comparable to that seen in other mail-based self-testing programs in the US [18, 19].

TMH's specimen rejection rate was low for most specimen types, with the highest being 6.7% for DBS. Other studies have similarly found that people can collect their own samples with a quality comparable to that of trained professionals [20-24]. Notably, HIV and STI self-collection has proven to be highly acceptable among key populations [25, 26], and it is becoming increasingly common in the US for "express testing sites" for HIV and STIs to allow program users to self-collect samples at the testing site [27, 28]. The low rejection rate supports the feasibility of expansion of self-testing to reach people who are not otherwise testing for STIs; in particular, this may help address the rising rates of syphilis [16, 29-30, 31s].

Health departments have raised concerns about the lack of RPR screening, as this is the most reliable way to screen for syphilis among people who have had prior diagnoses. From January through June 2021, 96 program users tested for syphilis antibodies with 9 reactive results (9.4% positivity). We sought feedback from health departments with large numbers of reactive tests, determining that a substantial proportion of these antibody positive specimens likely represented evidence of historical infections, leading to a change in screening protocols. From July 2021 through August 2022, 899 program users mailed kits for syphilis antibody testing, and 24 were reactive (2.9% positivity rate); these results validate the decision to begin excluding testing of those with prior syphilis diagnoses. This revised protocol reduces the number of spuriously reactive syphilis results, but has limitations in data accuracy due to self-reported diagnosis history, and failure to test people who may indeed have been re-infected. TMH hopes to begin using new-to-market self-collection devices that will allow for mail-based, self-collected specimens for quantitative RPR testing, which would address this issue directly.

Our evaluation has several limitations. First, we do not know why program users did not return full testing kits with each type of site swab, and thus are unable to determine site-specific feasibility or acceptability of self-collection for lab-based STI testing through this mail-based program. Second, although we evaluated time-to-return by age, race, gender, and jurisdiction, there may be other unmeasured factors that biased our findings. Third, for this analysis we were not able to obtain complete linkage to care data and were therefore unable to compare rates of linkage to care for people using TMH vs. those testing in brick-and-mortar clinics; however, in prior studies, self-testing linkage has been comparable to linkage at brick-and-mortar sites [32s]. Fourth, dried blood spot testing has some challenges. Some users are unable to collect specimens and would need to be referred to other testing options. DBS specimens provide lower sample volumes for testing low quality specimens [33s, 34s], although evaluations of sensitivity suggest minimal decrements in sensitivity using modern HIV antibody assays. However, the predictive value of positive tests remains high, and self-collect testing offers opportunities for routine retesting, and nascent infections would likely be detected in a subsequent period test [35s]. Finally, we acknowledge that program users were recruited for the service primarily from MSM-focused dating apps, and that some, but not all, health departments complemented TMH promotion with other promotion processes. Therefore, these findings are not generalizable to all populations.

Conclusions

TMH has the potential to improve STI, HIV, and HCV testing access for MSM beyond that provided at more traditional testing sites, importantly offering additional options to address the US's large and growing STI burden [36s], and often unrecognized risk of HCV from sexual

transmission or injection drug use among MSM [7]. Although smartphone-based apps are increasingly used for everything from ordering groceries to counting calories [37s], the COVID-19 pandemic strongly accelerated the acceptance of self-collected diagnostic testing [38s] and virtual medical care [39s]. Lab-based testing also allows health departments to access results and provide follow-up testing and linkage to care. It is imperative that public health systems and providers recognize these trends and continue to expand options that meet the screening desires of people at risk for HIV, STIs, and HCV.

For testing models like TMH to proliferate in the US, there must be wider regulatory support for mail-based testing using self-collected samples. As of this article's writing, the US Food and Drug Administration (FDA) has approved only one assay for use with at-home self-collection of specimens for STIs [40s] but it is limited to vaginal use only, and requires labs to conduct their own expensive validations before providing these services. The OraQuick® In-Home HIV Test was FDA approved in 2012 and 12 years later, remains the only HIV self-test with such approval [41s]. TMH demonstrates that self-collected lab-testing is acceptable, feasible, and reaches people who otherwise might have infections that remain undiagnosed and transmissible to others. The United Kingdom, Spain, and many other countries already offer these self-directed screening services with a high degree of acceptability and success [42s]. The US public health system must reduce barriers to more widespread use of at-home HIV, STI, and HCV testing services; our data support the demand for and impact of these services.

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Table 1. Participant Demographics and Adjusted Prevalence Ratios of Kit Return

		Kit came back?**								Timely return of specimens***			
		Yes		No		Adjusted Prevalence Ratio				Yes		No[&]	
Group	Kits mailed*	n	%	n	%	aPR	95% CI		p-value	n	%	n	%
All	2285	1068	46.7	1217	53.3					1008	94.4	60	5.6
Age group													
15-24	562	277	49.3	285	50.7	1.35	1.17	1.54	<.0001	264	95.3	13	4.7
25-29	489	235	48.1	254	51.9	1.26	1.10	1.45	0.0011	226	96.2	9	3.8
30-39	772	363	47.0	409	53.0	1.20	1.05	1.36	0.0063	336	92.6	27	7.4
40+	462	193	41.8	269	58.2	Ref.				182	94.3	11	5.7
Race													
White	1011	494	48.9	517	51.1	Ref.				462	93.5	32	6.5
Black	152	68	44.7	84	55.3	0.90	0.75	1.09	0.2906	67	98.5	1	1.5
Hispanic	411	176	42.8	235	57.2	0.90	0.79	1.03	0.1184	166	94.3	10	5.7
API	221	108	48.9	113	51.1	0.93	0.80	1.07	0.3123	103	95.4	5	4.6
Other	490	222	45.3	268	54.7	0.91	0.81	1.02	0.1126	210	94.6	12	5.4
Gender													
Man	1562	771	49.4	791	50.6	Ref.				727	94.3	44	5.7
Woman	526	220	41.8	306	58.2	0.83	0.74	0.93	0.0014	206	93.6	14	6.4
Genderqueer[#]	186	70	37.6	116	62.4	0.72	0.60	0.87	0.0007	68	97.1	2	2.9
All others	11	7	63.6	4	36.4	1.19	0.77	1.85	0.4313	7	100.0	0	0.0
Jurisdiction													
Marion County, IN	152	66	43.4	86	56.6	1.86	1.24	2.80	0.0029	60	90.9	6	9.1
Montana	56	24	42.9	32	57.1	1.82	1.13	2.92	0.0133	22	91.7	2	8.3
Orange County, CA	190	79	41.6	111	58.4	1.73	1.16	2.58	0.0074	77	97.5	2	2.5
Oregon	739	366	49.5	373	50.5	2.10	1.45	3.06	<.0001	347	94.8	19	5.2
Riverside, CA	92	34	37.0	58	63.0	1.55	0.99	2.44	0.0556	34	100.0	0	0.0

Sacramento, CA	145	68	46.9	77	53.1	1.97	1.32	2.94	0.001	64	94.1	4	5.9
San Bernardino County, CA	147	57	38.8	90	61.2	1.63	1.07	2.47	0.0219	53	93.0	4	7.0
San Diego, CA	104	41	39.4	63	60.6	1.63	1.06	2.52	0.0272	40	97.6	1	2.4
San Francisco, CA	482	283	58.7	199	41.3	2.55	1.75	3.70	<.0001	264	93.3	19	6.7
Wyoming	69	22	31.9	47	68.1	1.37	0.83	2.26	0.2251	20	90.9	2	9.1
Others	17	6	35.3	11	64.7	1.46	0.70	3.05	0.3116	6	100.0	0	0.0
Fresno, CA	92	22	23.9	70	76.1	Ref.				21	95.5	1	4.5

* Kits that were mailed, to a deliverable address, in a state where testing was legal

** Kit that received by MTL at any time, regardless of sufficiency of specimens

*** Kit received by MTL within 60 days of shipment of kit and within 30 days of collection of specimen

[&]Includes 13 people who were timely, but returned unusable samples

[#]Includes Trans, Non-binary, and Genderqueer

Table 2 Total tests ordered

Test ordered*	#	%
HIV	153	6.7
HIV with creatinine	71	3.1
HIV/Hepatitis C/Syphilis/3-site GC/CT	1104	48.3
HIV with creatinine/Hepatitis C/Syphilis/3-site GC/CT	4	0.2
HIV/Syphilis/3-site GC/CT	635	27.8
HIV/3-site GC/CT†	15	0.7
HIV/Hepatitis C/3-site GC/CT	106	4.6
Hepatitis C/3-site GC/CT	40	1.8
Hepatitis C/Syphilis/3-site GC/CT	69	3.0
Syphilis/3-site GC/CT	81	3.5
3-site GC/CT	7	0.3
Total ordered	2285	

† It was not until July 2021 that participants were screened for prior syphilis diagnosis, leading to only a small number of test panels with HIV and 3-site GC/CT but no syphilis test (presumably because those participants had prior positive syphilis results).

GC = Gonorrhea Culture, CT = *Chlamydia trachomatis* test

Table 3. Test return rate, Participant (kit)-level

Test/specimen	Ordered	Returned/Ordered		Resulted/Returned		Resulted/Ordered	
	N	n/N	%	S/n	%	S/N	%
Syphilis/HIV/Hepatitis C (DBS)	2278	984/2278	43.2	934/984	94.9	934/2278	41.0
GC/CT - Pharyngeal	2061	969/2061	47.0	925/969	95.5	925/2061	44.9
GC/CT - Rectal	2061	769/2061	37.3	727/769	94.5	727/2061	35.3
GC/CT - Urethral (Urine)	2061	979/2061	47.5	932/979	95.2	932/2061	45.2

GC = Gonorrhea Culture, CT = *Chlamydia trachomatis* test

Table 4. Testing outcomes by specimen

Test type	Resulted	Overall Positivity*	Not Detected	QNS/ Equivocal	San Francisco positivity	Oregon positivity	Marion County positivity
All Tests	7391	212 (2.9%)	6942	237	51/1909 (2.7%)	80/2708 (3.0%)	11/444 (2.5%)
Chlamydia	2584	97 (3.8%)	2453	34	17/671 (2.5%)	49/948 (5.2%)	5/153 (3.3%)
Urethral	932	30 (3.2%)	901	1	5/243 (2.1%)	21/347 (6.1%)	1/54 (1.9%)
Rectal	727	55 (7.6%)	646	26	9/187 (4.8%)	24/257 (9.3%)	4/44 (9.1%)
Pharyngeal	925	12 (1.3%)	906	7	3/241 (1.2%)	4/344 (1.2%)	0/55 (0%)
Gonorrhea	2584	67 (2.6%)	2485	32	19/671 (2.8%)	19/948 (2.0%)	3/153 (2.0%)
Urethral	932	10 (1.1%)	922	0	5/243 (2.1%)	0/347 (0%)	0/54 (0%)
Rectal	727	26 (3.6%)	675	26	8/187 (4.3%)	8/257 (3.1%)	2/44 (4.6%)
Pharyngeal	925	31 (3.4%)	888	6	6/241 (2.5%)	11/344 (3.2%)	1/55 (1.8%)
Syphilis	800	33 (4.1%)	691	76	8/202 (4.0%)	9/309 (2.9%)	2/48 (4.2%)
Hepatitis C	543	3 (0.6%)	493	47	1/142 (0.7%)	1/200 (0.5%)	0/40 (0%)
HIV	880	12 (1.4%)	820	48	6/223 (2.7%)	2/303 (0.7%)	1/50 (2%)

*Positive includes: “Detected”, “Reactive” and “Prelim Detect” responses.

= Interquartile range

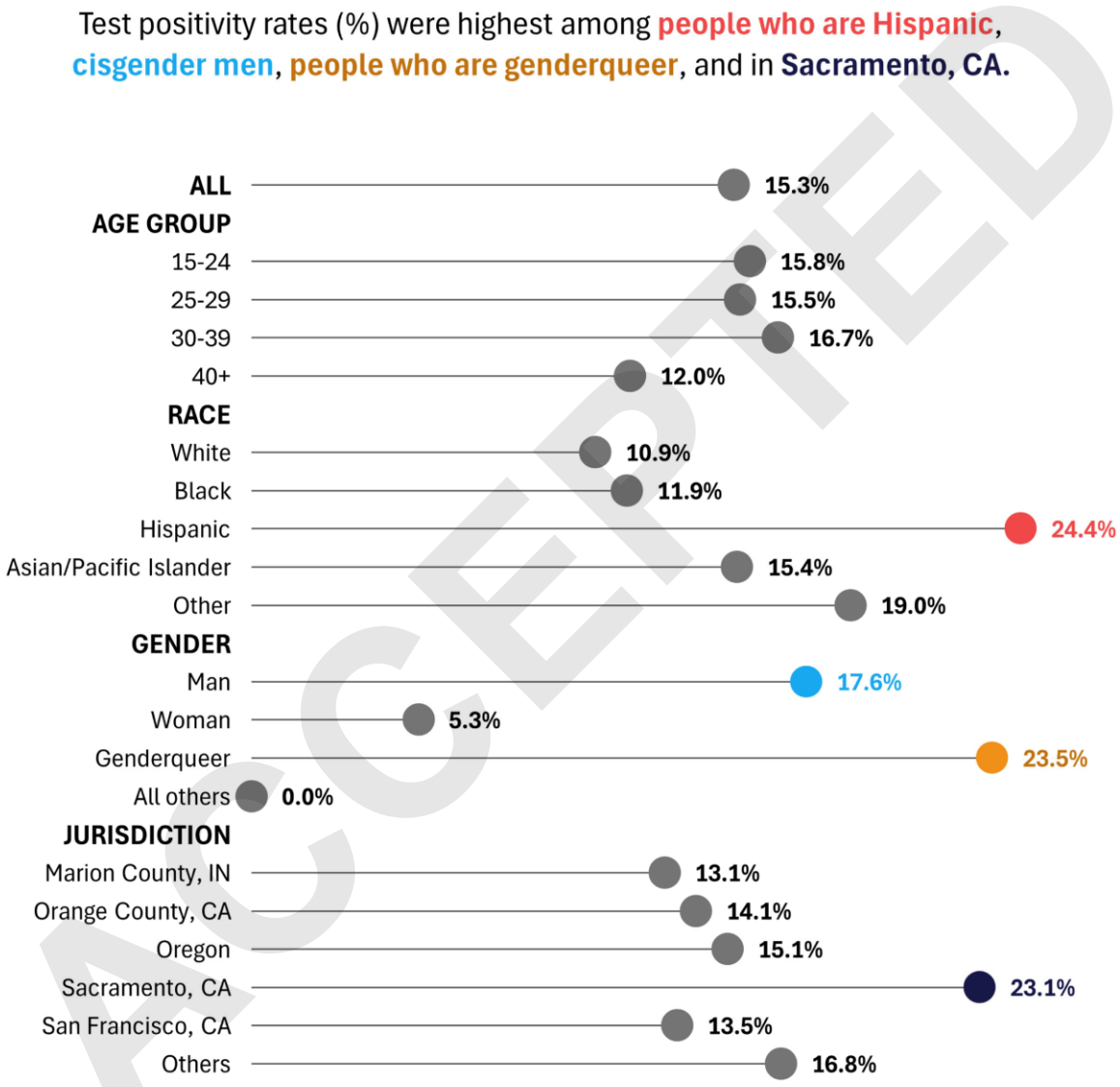
Table 5. Person-level overall positivity by demographic characteristics and adjusted prevalence ratios of a positive test result

	Any resulted	Positive*		Negative or QNS		Adjusted Prevalence Ratio			
Group	**STI test**	**n**	**%**	**n**	**%**	**aPR**	**95% CI**		**p-value**
All	1017	156	15.3	861	84.7				
Age group									
15-24	266	42	15.8	224	84.2	1.08	0.67	1.75	0.7402
25-29	226	35	15.5	191	84.5	1.18	0.72	1.92	0.5128
30-39	342	57	16.7	285	83.3	1.21	0.77	1.90	0.4112
40+	183	22	12.0	161	88.0	Ref.			
Race									
White	467	51	10.9	416	89.1	Ref.			
Black	67	8	11.9	59	88.1	1.30	0.65	2.61	0.4611
Hispanic	168	41	24.4	127	75.6	2.15	1.47	3.15	<.0001
Asian/Pacific Islander	104	16	15.4	88	84.6	1.43	0.85	2.41	0.1809
Other	211	40	19.0	171	81.0	1.79	1.22	2.61	0.0027
Gender									
Man	733	129	17.6	604	82.4	3.37	1.86	6.13	<.0001
Woman	209	11	5.3	198	94.7	Ref.			
Genderqueer[#]	68	16	23.5	52	76.5	4.82	2.35	9.87	<.0001
All others	7	0	0	7	100	N/A			
Jurisdiction									
Marion County, IN	61	8	13.1	53	86.9	Ref.			
Orange County, CA	78	11	14.1	67	85.9	0.90	0.39	2.10	0.8110

Oregon	350	53	15.1	297	84.9	1.32	0.66	2.62	0.4357
Sacramento, CA	65	15	23.1	50	76.9	1.90	0.88	4.10	0.1021
San Francisco, CA	266	36	13.5	230	86.5	1.05	0.51	2.13	0.8976
Others	197	33	16.8	164	83.3	1.17	0.58	2.39	0.6629

*Positive includes: “Detected”, “Reactive” and “Prelim Detect” responses.
#Includes Trans, Non-binary, and Genderqueer

Supplemental Figure 1



Supplemental Table

Table 4. Median time for each step in the ordering, shipment, and resulting process

Time from order to lab shipment N=2285		Time from shipment to specimen collection N=1067		Time from shipment to lab receipt N=1068		Time from lab receipt to result reporting N=1019		Time overall (order to result reporting) N=1019	
Median days	IQR	Median days	IQR	Median days	IQR	Median days	IQR	Median days	IQR
0	0,1	7	4,20	13	8,25	3	3,5	17	13,29

IQR = Interquartile range

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