



High HIV/STI Test Acceptance Through a Behavioral Health Encounter in Latino Immigrants with Substance Use and Mental Health Problems

Julie H. Levison^{1,2} · Margarita Alegría^{1,6,7} · Ye Wang⁷ · Sheri L. Markle⁷ · Larmiar Fuentes⁷ · Dianna L. Mejia² · Andrew Tarbox² · Lucía Albarracín García³ · Lucía Cellerino⁴ · Nabila El-Bassel⁵

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Abstract

Latino immigrants with substance use and mental health problems are at risk for undiagnosed HIV and sexually transmitted infections (STIs). Participants in a randomized control trial were recruited in Boston, USA and Madrid and Barcelona, Spain. Eligibility criteria were Latino self-identification, age 18–70, elevated substance use and mental health symptoms, and not currently in substance or mental health care. A multinomial logistic regression examined predictors of HIV/STI testing decline and lost to follow-up (LTFU) prior to testing compared with acceptance. Of 341 participants, 74% accepted testing, 4% declined, and 22% were LTFU. The odds of LTFU were higher in those with high concern for HIV and those whose main partner had done HIV testing. Age ≥ 35 years, females, higher education, and higher report of discrimination lowered the odds of LTFU. Delivery of HIV/STI testing through community agencies and outreach could overcome barriers to HIV/STI diagnosis in this population of Latinos.

Clinical Trial Number: NCT02038855

Keywords HIV · Sexually transmitted infections · Testing · Latinos · Mental health · Substance use

Resumen

Los inmigrantes de origen latino con problemas de uso de sustancias y salud mental presentan un mayor riesgo de no ser diagnosticados del VIH y de las infecciones de transmisión sexual (ITS). Los participantes de este ensayo aleatorio controlado fueron reclutados en Boston, Estados Unidos y en Madrid y Barcelona, España. Los criterios de elegibilidad incluían autoidentificarse como Latino, tener edad entre 18 y 70 años, síntomas elevados de uso de sustancias y un trastorno psicológico, y no estar recibiendo ningún tratamiento para estas condiciones. Una regresión logística multinomial examinó los predictores de la disminución del test del/las VIH/ITS y pérdida de seguimiento (PDS) antes de ofrecer el test del/las VIH/ITS comparándolo con los que aceptaron realizar el test y mantenerse en tratamiento. De los 341 participantes, un 74% aceptó realizarse las pruebas, un 4% las rechazó, y un 22% fue PDS. La probabilidad de PDS fue mayor en aquellos con alta preocupación por el VIH y en aquellos cuya pareja principal se había realizado el test del VIH. Tener más de ≥ 35 años, ser mujer, alcanzar la educación superior, e indicar un alto nivel de discriminación percibida fueron factores relacionados con la reducción de la probabilidad de PDS. La realización del test del/las VIH/ITS a través de las agencias comunitarias y sus actividades de captación podrían superar las barreras del diagnóstico de VIH/ITS en esta población de Latinos.

✉ Julie H. Levison
jlevison@partners.org

¹ Department of Medicine, Massachusetts General Hospital of Harvard Medical School, Boston, USA

² Division of General Internal Medicine, Massachusetts General Hospital, Boston, USA

³ Department of Psychiatry, Hospital Universitario Fundación Jiménez Díaz, Madrid, Spain

⁴ Department of Psychiatry, Vall d'Hebron University Hospital, Barcelona, Spain

⁵ Columbia School of Social Work, New York, USA

⁶ Department of Psychiatry, Massachusetts General Hospital of Harvard Medical School, Boston, USA

⁷ Disparities Research Unit, Department of Medicine, Massachusetts General Hospital, Boston, USA

Introduction

A sizeable portion of HIV-infected persons (~ 15%) are unaware of their HIV serostatus in the US and Spain [1, 2]. Men who have sex with men and persons who inject drugs are at greater risk for unknown HIV serostatus [1], which is associated with high-risk behaviors in Latinos and other ethnic groups [3–5]. Undetected HIV infection undermines HIV prevention and treatment goals to curb the epidemic and improve treatment outcomes [6].

In 2015, there were nearly 250 million international immigrants of whom 32.5 million were from Latin America and the Caribbean region [7, 8]. Latino immigrants are a sizeable portion of the population in US and Spain. In the US, Latinos represent 56.5 million persons of whom 34% are non-US born [9]. In Spain, there are 4.6 million immigrants with a rising number of individuals from Central and South America in recent years [10, 11]. The UNAIDS considers immigrants a particularly vulnerable population to HIV infection [12]. In Spain, the Ministry of Health defines immigrants as a key population at risk for HIV infection as immigrants represent 32% of new HIV infections [13]. The US Centers for Disease Control (CDC) identifies Latinos as a key population in the HIV epidemic as they comprise 18% of the general US population and 24% of new HIV infections [14].

Many of the characteristics associated with immigration track with risk factors for sexually transmitted infections (STIs), including HIV. Economic disruption, psychological stress, population mobility and displacement, trauma and physical violence, and military activity associated with migration are risk factors for HIV transmission [15, 16]. Untreated substance use and mental health problems can affect the perceived risk for HIV acquisition and promote high-risk behaviors such as sexual concurrency, unprotected anal intercourse, and injection drug use (IDU) [17–19].

Latinos, particularly foreign-born, experience delays in HIV diagnosis due to a number of individual and system-level factors [20–23]. Social isolation, and “double discrimination” of HIV infection and immigrant status can delay HIV testing in Latino immigrants [24–27]. Furthermore, fear of unjust treatment, perceived discrimination, and medical mistrust are barriers to HIV services in the US and abroad [3, 28, 29]. Cultural factors, such as gender roles [30], degree of acculturation [31, 32], and risk taking behaviors that are a product of acculturative stress [33, 34], can impair the perceived need for HIV and STI testing. Mental health and substance use problems can also decrease the perceived value of HIV testing [35, 36]. Characteristics that predict HIV testing in Latinos with co-occurring mental health and substance use problems remains poorly understood.

Since migration can serve as a risk factor for HIV and delayed HIV testing is more common in foreign-born persons, targeting HIV testing in Latino immigrants could uncover an important population who could benefit from HIV prevention and treatment services. Furthermore, including HIV testing in mental health or community settings may importantly broaden the paradigm of HIV testing to reach key populations [37].

Our study had two objectives: (1) to assess HIV/STI test acceptance within a behavioral health setting for a population with historically delayed HIV diagnosis and (2) to understand factors that predict HIV/STI test decline and loss to follow-up (LTFU) to inform more tailored testing interventions. We hypothesized that offering HIV/STI testing by bicultural, bilingual staff and through a behavioral health encounter would facilitate test acceptance in Latino immigrants with substance use and mental health problems.

Methods

Study Setting and Population

The study was conducted from September 2014 to February 2017 at three large health systems in Boston, USA, Madrid, and Barcelona, Spain. These sites were selected due to their high density of Latino immigrants and their experience collaborating on behavioral health interventions for Latinos [38–40]. Study referral sources were primary care and HIV clinics, emergency rooms, community-based agencies, and peers or family. All participants were self-reported Latinos, Spanish or English speaking, and between the ages of 18–70 years. Since the majority of participants were foreign-born Latinos, they are referred to here as Latino immigrants.

Eligible participants screened positive to both substance use and mental health problems as determined by the AC-OK screener [41, 42]. Participants needed to score positive in at least two items of the mental health and two items in the substance use subscales. The Spanish-language version of the AC-OK had good concordance (using the current cut-offs) with drug misuse (DAST-10 score ≥ 3) and alcohol misuse (AUDIT-C score ≥ 3) [41].

Exclusion criteria were evidence of any of the following: (1) recent (last 3 months) or upcoming (in the next month) specialist appointment for mental health or substance use treatment; (2) lack of capacity to consent to the study (as measured by a validated screener); and (3) current suicidal risk or risk of harm to others [43]. Self-report of current use of psychotropic medications was not an exclusion.

HIV/STI Testing Procedures

HIV/STI testing occurred through a randomized trial of a brief behavioral intervention called “Integrated Intervention for Dual Problems and Early Action” (IIDEA), a part of the International Latino Research Partnership (NIDA R01DA034952). The trial was delivered in primary care settings to address mental health, substance use and prevention of HIV/STIs, in particular to test the effectiveness of this intervention on depression, anxiety, post-traumatic stress disorder symptomatology, and drug and alcohol use [44]. In the IIDEA arm, participants received an 8–10 session program of cognitive behavioral therapy and mindfulness treatment as well as two sessions focused on HIV and STIs prevention as adapted for Latino immigrants from the CONNECT and RESPECT interventions [45, 46]. In enhanced usual care, participants received five telephone calls from study staff over the 6 month period to assess for any deterioration of mental health and, if necessary, link the participant to services.

HIV/STI testing was offered in both intervention and usual care conditions. In the intervention, study clinicians offered HIV/STI testing at week 7 during an HIV-focused session. In the usual care condition, study staff offered HIV/STI testing at week 6 study calls. In patients with medical record documentation of HIV infection, study staff offered STI testing alone. Participants who tested positive for HIV infection, *C. trachomatis*, or *N. gonorrhea* were linked to services for confirmatory testing and treatment. Those who tested negative were encouraged to repeat HIV testing in the future and were provided information. At study conclusion, staff re-contacted participants who had not received HIV/STI testing. Participants were compensated with a \$25/30€ gift card for assessments and up to a \$50/40€ gift card for transportation costs and completing HIV/STI testing.

HIV testing was offered as an oral swab point-of-care test with OraQuick (OraSure Technologies, Inc, Bethlehem, PA) and results were available in 20 min. *N. gonorrhea* and *C. trachomatis* testing was performed by urine nucleic acid amplification test (NAAT) (Choplogic/Gen-Probe Inc., San Diego, CA). Study staff collected urine specimens from participants and samples were retrieved by a local standardized laboratory. Results were available in three to seven days of specimen receipt. Within 7 days of receiving NAAT results, study staff provided participants an appointment for result notification.

Measurements

All participants took part in a baseline assessment measuring potential predictors of HIV/STI test acceptance (e.g. socio-demographic, access to services, mental health, migration and culture, and HIV/STI risk factors). Mental health

problems, as reported in the baseline assessment, were major depression (PHQ-9 ≥ 10), anxiety (GAD-7 ≥ 10) and trauma (PCL-5 ≥ 33).

Depressive symptoms were measured with the 9-item Patient Health Questionnaire (PHQ-9). Items were summed. Higher scores reflected greater severity of depression (outcome range 0–27) ($\alpha = 0.85$) [47].

The Generalized Anxiety Disorder (GAD-7) scale has seven questions. Responses were summed. Higher scores represented more severe symptoms (outcome range 0–21) ($\alpha = 0.86$) [48].

The 20-item Post-Traumatic Stress Disorder Checklist (PCL-5) measured PTSD based on DSM-V criteria (outcome range 0–80) ($\alpha = 0.94$) [49].

Substance abuse was measured with the 10-item Drug Abuse Screening Test-10 (DAST-10). “Yes” items were added (outcome range 0–10) ($\alpha = 0.87$) [50]. Harmful or hazardous drinking was measured by a score of 3 or higher on the 3-item alcohol use disorders identification test (AUDIT-C) ($\alpha = 0.78$) [51].

The Benzodiazepine Dependence Questionnaire (BDEPQ) measured experiences with benzodiazepenes (outcome range 0–27) ($\alpha = 0.90$) [52]. We chose 10 items with higher loading and face validity in Latinos. Higher scores reflected greater severity of benzodiazepene dependence.

We measured factors related to migration and culture. The 10-item brief trauma questionnaire assessed traumatic exposure according to DSM-IV [53, 54]. Two questions queried citizenship and residency status, which we grouped into three categories: citizen, undocumented immigrant, and documented immigrant. Sense of belonging was measured with one item from the Family/Culture Stress subscale of the Hispanic Stress Inventory (HSI): “Do you feel like you do not belong in either your Latin country or the US/Spain?” [55]. Health literacy was measured with three items from the Health Literacy Screening Questionnaire and one item from the Single Item Literacy Screener (outcome range 3–5) ($\alpha = 0.80$) [56, 57]. Higher scores signified higher health literacy.

Routine experiences of discrimination were measured with the 9-item Everyday Discrimination Scale [58]. Responses were reverse coded and summed (outcome range 9–45) ($\alpha = 0.83$). Higher scores reflected more severe everyday discrimination.

Acculturative stress was measured with 3 questions on a Likert-scale: “You feel rejected by other people because you are Latino?”; “You’ve had problems making friends, because you don’t know enough of their language, customs or ways of interacting?”; and “You haven’t been treated well, because you don’t speak their language well or speak with an accent?”. Responses were summed (outcome range 0 to 9) ($\alpha = 0.82$). Higher responses signified more acculturative stress. Family conflict was measured with 4 items from the

Family/Culture Stress subscale of the HSI (outcome range 0–10) ($\alpha=0.67$) [59, 60].

HIV risk behaviors were measured with items from the Data Harmonization instruments employed by the National Institute on Drug Abuse (NIDA) [61–63].

Data Analysis

The primary outcome was uptake of either HIV or STI testing. We hypothesized that the predictors of HIV and STI testing would be similar since these tests were offered simultaneously. We were interested in comparing differences between three groups of participants: test accepters, test decliners, and those LTFU. The LTFU group were individuals who had dropped-out of the study due to inability for a study staff member to reach them. Therefore, these participants were unable to receive HIV/STI testing. The primary analysis included all enrolled individuals. We included covariates based on their reported relevance described in the literature as associated with health care utilization and HIV/STI risk in Latinos.

To assess risk behavior, we selected potential predictors of chlamydia, gonorrhea, and HIV infection from the published literature [64–66]. These variables were concern for acquiring HIV, prior HIV testing, number of sex partners in the past year, history of HIV testing in the main sexual partner, lifetime history of IDU in the participant and his/her main sex partner, history of sex without a condom in the main or casual partner in the past year, history of anal sex without a condom in the main or casual partner in the past year, lifetime history of sex with a commercial sex worker, and lifetime history of a STI.

We assessed differences in the groups (test accepters, decliners, and those LTFU), comparing proportions and means (with standard deviations [SD]), using Chi square and t-tests, respectively, for significance. Multinomial logistic regression controlled for covariates to evaluate factors associated with test acceptance as the reference category. A multinomial model enabled a complete description of the observations by accounting for those participants who were LTFU [67]. We then added fixed effects to assess for differences in outcomes by city of recruitment. To create a parsimonious model, we examined the distribution of potential predictors. We excluded variables that led to perfect prediction of test decline due to the small sample size in this group [68]. Composite mental health (PHQ-9, GAD-7, and PCL-5) and substance use (DAST-10, AUDIT-C, and BDEPQ) variables were created to avoid multi-collinearity. To avoid collinearity between study site and recruitment site, we combined the participants recruited from the emergency room with participants recruited from the primary care setting. This re-categorization of recruitment site allowed us to examine recruitment for HIV/STI testing from healthcare

settings versus community agencies. We aggregated the corresponding measures and standardized them to a scale of 0–100. Backward elimination removed variables that were not statistically significant at $p > 0.25$. Results were expressed as odds ratios (OR) with 95% confidence intervals (CI) and computed by Stata software [69].

Informed Consent

This study was approved by institutional review boards in Boston, MA, Madrid, and Barcelona, Spain. A Certificate of Confidentiality was implemented from NIDA for the US-based participants. Study staff met with potential participants in a private area of the clinic to administer informed consent. The consent form described key elements of the protocol, including that study staff would offer HIV/STI testing and, in Boston, that the Certificate of Confidentiality protected participants from forced disclosure of identifiable research information. During the consent process, study staff also obtained patient consent to contact emergency service providers should the participant endorse harmful thoughts or behaviors.

Results

Characteristics of HIV/STI Test Acceptance, Decline, and LTFU in Latino Immigrants

Three hundred forty-one individuals were enrolled and offered HIV/STI testing, of whom 74% ($n=252$) accepted, 4% ($n=15$) declined, and 22% ($n=74$) were LTFU (Table 1). Participants recruited from Barcelona were 52% ($n=176$), from Madrid were 25% ($n=84$), and from Boston were 24% ($n=81$) of the study population. The significant clinical variables were major depression and alcohol abuse. The mean PHQ-9 score was 10.92 ($SD \pm 5.73$) and mean AUDIT-C score was 5.40 ($SD \pm 3.46$). Past history of trauma was reported in 95% ($n=324$) and the mean PCL-5 score was 26.47 ($SD \pm 17.20$).

In unadjusted analyses, those who declined HIV/STI testing or were LTFU were more likely to be younger (age 18–34 years) than those who accepted testing ($p=0.003$). In those who accepted testing, 52% ($n=132$) were age 18–34 years, compared with 60% ($n=9$) of those who declined and 74% ($n=55$) of those LTFU. The distribution of country of origin differed by testing category ($p=0.003$). In those who accepted testing, 6% ($n=16$) were from the U.S., 14% ($n=36$) were from Central America, and 68% ($n=172$) were from South America. Of the 15 participants that declined testing, 20% ($n=3$) were Latinos from the U.S., 20% ($n=3$) were from Central America, and 40% ($n=6$) were from South America. In those who were LTFU,

Table 1 Characteristics of participants (n=341) in a retrospective study of HIV/STI test acceptance in Latino immigrants with co-occurring substance abuse and mental health disorders enrolled in a bi-national randomized behavioral trial

Charateristics	Total (n = 341)		Accept HIV/STI Test (n = 252)		Decline HIV/STI Test (n = 15)		Lost to Follow-Up (n = 74)		p value
	N	%	N	%	N	%	N	%	
Socio-demographic									
Age (years)									
18–34	196	58	132	52	9	60	55	74	0.003
35–49	96	28	75	30	6	40	15	20	
50+	49	14	45	18	0	0	4	5	
Gender									
Male	167	49	115	46	7	47	45	61	0.070
Female	174	51	137	54	8	53	29	39	
Race									
White	60	18	49	19	1	6.7	10	14	0.226
Black	18	5	15	6	1	6.7	2	3	
Indigenous/Native American	26	8	22	9	1	6.7	3	4	
Hispanic/Latino/Caribbean	35	10	27	11	3	20	5	7	
Mixed	201	59	138	55	9	60	54	73	
Country of origin									
United States	21	6	16	6	3	20	2	3	0.003
Spain	2	1	1	1	1	7	0	0	
Central America	45	13	36	14	3	20	6	8	
South America	239	70	172	68	6	40	61	82	
Caribbean	34	10	27	11	2	13	5	7	
Study site									
Boston	81	24	64	25	6	40	11	15	0.003
Madrid	84	25	71	28	2	13	11	15	
Barcelona	176	52	117	46	7	47	52	70	
Educational status									
Less than high school	131	38	91	36	7	47	33	45	0.006
High school diploma and vocational	144	42	100	40	7	47	37	50	
College degree and higher	66	19	61	24	1	7	4	5	
Access to services									
Insurance status									
No insurance	22	7	19	8	0	0	3	4	0.335
Yes with insurance	318	92	233	93	15	100	70	95	
Unknown/no response	1	0	0	0	0	0	1	1	
Recruitment site									
Primary care	148	43	106	42	8	53	34	46	0.848
Community agency/referral	174	51	131	52	6	40	37	50	
Emergency room	19	6	15	6	1	7	3	4	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	p value
Mental health									
Depression (PHQ-9) (0–27)	10.92	5.73	11.22	5.71	11.07	6.75	9.86	5.53	0.200
Generalized anxiety (GAD-7) (0–21)	8.59	5.07	8.85	5.07	8.27	5.70	7.78	4.91	0.277
PTSD (PCL-5) (0-80)	26.47	17.20	26.82	17.06	28.53	19.51	24.85	17.32	0.615
Substance use disorders (DAST-10) (0–10)	1.36	2.30	1.31	2.27	1.20	1.90	1.60	2.50	0.601
Alcohol abuse (AUDIT-C) (0–12)	5.40	3.46	5.36	3.50	5.33	3.24	5.55	3.43	0.911
Benzodiazepines (BDEPQ) (0–27)	2.12	4.25	2.38	4.40	1.33	3.68	1.41	3.76	0.169

Table 1 (continued)

	Mean	SD	Mean	SD	Mean	SD	Mean	SD	p value
Migration and culture									
Health literacy scale	12.46	2.81	12.39	2.84	12.67	2.85	12.67	2.75	0.722
Discrimination scale	17.94	7.97	18.51	8.10	18.47	9.44	15.88	6.90	0.042
Acculturative stress scale	2.36	2.19	2.55	2.22	1.60	1.80	1.86	2.07	0.023
Family conflict scale	2.23	1.96	2.22	1.88	2.53	2.70	2.19	2.09	0.822
	N	%	N	%	N	%	N	%	p value
Trauma exposure									
No	17	5	10	4	1	7	6	8	0.339
Yes	324	95	242	96	14	93	68	92	
Citizenship status									
Citizen	189	55	135	54	10	67	44	60	0.090
Documented immigrants	41	12	35	14	3	20	3	4	
Undocumented immigrants	104	31	76	30	2	13	26	35	
Unknown/No response	7	2	6	2	0	0	1	1	
Sense of belonging									
No	139	41	106	42	10	67	23	31	0.003
Yes	199	58	144	57	5	33	50	67	
No response	3	1	2	1	0	0	1	1	
HIV/STI risk									
Concern for acquiring HIV									
A little worried	238	70	179	71	11	73	48	65	0.493
Very worried	100	29	70	28	4	27	26	35	
Unknown/no response	3	1	3	1	0	0	0	0	
Prior HIV test									
No	104	31	73	29	4	27	27	37	0.494
Yes	233	68	176	70	10	67	47	64	
Unknown/no response	4	1	3	1	1	6	0	0	
Number of sex partners									
≤ 10	331	97	244	97	15	100	72	97	0.818
> 10	8	2	6	2	0	0	2	3	
Unknown/no response	2	1	2	1	0	0	0	0	
HIV tested in main partner									
No, HIV test not done	167	49	122	48	11	73.3	34	46	0.274
Yes, HIV test done	132	39	101	40	2	13.3	29	39	
Unknown	42	12	29	12	2	13.3	11	15	
History of IDU in main sex partner									
Never injected drugs	335	98	246	98	15	100	74	100	0.835
Injected drugs	1	0	1	0	0	0	0	0	
Unknown/no response	5	2	5	2	0	0	0	0	
Sex without a condom in main or casual partner									
Use condom	305	89	226	90	13	87	66	89	0.839
No condom use	31	9	22	9	2	13	7	10	
Unknown/no response	5	2	4	1	0	0	1	1	
Anal sex without a condom in main or casual partner									
Use condom	282	83	207	82	15	100	60	81	0.216
No condom use	53	16	40	16	0	0	13	18	
Unknown/no response	6	2	5	2	0	0	1	1	

Table 1 (continued)

	N	%	N	%	N	%	N	%	p value
Sex with a commercial sex worker									
No	278	81	204	81	14	93	60	81	0.212
Yes	58	17	44	18	0	0	14	19	
Unknown/no response	5	2	4	1	1	7	0	0	
History of IDU									
No	330	97	244	97	15	100	71	96	0.597
Yes	9	3	6	3	0	0	3	4	
Unknown/no response	2	0	2	0	0	0	0	0	
History of STI									
No	279	82	206	82	11	73	62	84	0.632
Yes	62	18	46	18	4	27	12	16	

For continuous variables, mean and SD are reported. For categorical variables, absolute and percentage for each category is reported

STI sexually transmitted infection, SD standard deviation, PHQ Patient Health Questionnaire, GAD Generalized Anxiety Disorder, PTSD post-traumatic stress disorder, PCL PTSD checklist, DAST Drug Abuse Screening Test, AUDIT Alcohol Use Disorders Identification Test, BDEPQ Benzodiazepene Dependence Questionnaire, IDU injection drug use

the majority ($n=61$, 82%) were from South America. There were also significant differences in test acceptance, decline, and LTFU by study site (Boston, Madrid and Barcelona) ($p=0.003$). Of the 74 participants who were LTFU, 70% ($n=52$) were recruited in Barcelona. In those who accepted testing, 24% ($n=61$) had a college degree or higher, compared with 7% ($n=1$) of those who declined, and 5% ($n=4$) of those LTFU ($p=0.006$) (Table 2).

There was no statistically significant difference in access to services or mental health outcomes between groups.

In the univariate analysis, we found significant differences in test acceptance by sense of belonging, everyday discrimination, and acculturative stress. A report of no sense of belonging to either the Latin country of origin or the US/Spain was less common in those who accepted testing ($n=106$, 42%) and those LTFU ($n=23$, 31%) compared with those who declined ($n=10$, 67%) ($p=0.003$). Those who were LTFU reported a lower mean discrimination score, 15.88 ($SD \pm 6.90$), compared with those who accepted testing, 18.51 ($SD \pm 8.10$), and those who declined testing, 18.47 ($SD \pm 9.44$), ($p=0.042$). Acculturative stress was also higher in those who accepted testing, 2.55 ($SD \pm 2.22$), compared with 1.60 ($SD \pm 1.80$) in those who declined and 1.86 ($SD \pm 2.07$) in those LTFU ($p=0.023$).

We did not find a statistically significant difference in HIV/STI risk factors based on variables that assessed knowledge and behavior between these groups.

In the multivariable model, the odds of test decline were lower when recruitment occurred from participants in a community agency or personal referral compared with a primary care site or emergency room (OR 0.49 [95% CI 0.26–0.92]) and when the participant reported that the main sex partner had an HIV test in the past year compared with when the partner did not (OR 0.14 [95% CI 0.04–0.57]). A

history of a STI increased the odds of test decline (OR 2.12 [95% CI 1.20–3.76]) when contrasted with those without a history of STI. Composite substance use score was lower (OR 0.99 [95% CI 0.98–0.99]) in those who declined testing, but the difference was minimal. Higher health literacy score increased the odds of test decline (OR 1.10 [95% CI 1.00–1.21]). Participants recruited in Madrid were associated with lower odds of test decline as compared to those from Boston. There was no statistically significant difference in those who declined compared with those who accepted HIV/STI testing by participant's age, gender, educational status, citizenship status, intervention assignment, composite mental health score, everyday discrimination, family conflict, or concern for acquiring HIV.

The odds of being LTFU were lower in those age 35 years and older compared with participants ages 18–34 years (OR 0.37 [95% CI 0.18–0.74]), females compared with males (OR 0.70 [95% CI 0.63–0.77]), and those with a college degree or higher compared with less than high school diploma (OR 0.13 [95% CI 0.10–0.17]). Higher reported everyday discrimination scores lowered the odds of LTFU (OR = 0.94 [95% CI 0.88–0.99]). An increased odds of LTFU were found in those who reported being very or extremely concerned about acquiring HIV compared with those who reported no concern (OR 1.53 [95% CI 1.25–1.87]). Participants who reported that their main sex partner had an HIV test in the past year had a higher odds of LTFU than those whose partners did not (OR 1.28 [95% CI 1.21–1.36]). The association was similar in those who reported that the HIV testing status of their sex partner was unknown. Finally, compared to Boston, participants recruited from Madrid had lower odds of being LTFU (OR 0.78 [95% CI 0.62–0.98]) whereas those from Barcelona were more likely to be LTFU (OR 2.56 [95% CI 1.56–4.19]).

Table 2 Odds ratios and 95% confidence intervals from a multinomial logistic regression for the association between the covariates and HIV/STI test acceptance in a multi-site cohort of Latino immigrants with co-occurring substance use and mental health problems

Characteristic	Declined	Lost to follow-up
Age (years)		
18–34	1.00	1.00
35+	0.61 (0.30, 1.23)	0.37 (0.18, 0.74)**
Gender		
Male	1.00	1.00
Female	0.9 (0.26, 3.09)	0.70 (0.63, 0.77)***
Education status		
Less than high school	1.00	1.00
High school diploma and vocational	0.98 (0.49, 1.94)	0.96 (0.46, 1.99)
College degree and higher	0.24 (0.01, 6.65)	0.13 (0.10, 0.17)***
Citizenship status		
Citizen	1.00	1.00
Non-citizen	1.38 (0.90, 2.14)	1.23 (0.93, 1.64)
Recruitment agency		
Primary care/emergency room	1.00	1.00
Community agency/referral	0.49 (0.26, 0.92)*	0.74 (0.45, 1.20)
Intervention indicator	1.17 (0.52, 2.62)	1.3 (0.61, 2.75)
Composite mental health score (PHQ, GAD, PCL)	1.00 (0.95, 1.05)	1.01 (0.98, 1.03)
Composite substance use score (DAST, AUDIT, BD)	0.99 (0.98, 0.99)**	1.01 (1.00, 1.02)
Health literacy scale	1.10 (1.00, 1.21)*	0.96 (0.78, 1.17)
Discrimination scale	0.99 (0.97, 1.01)	0.94 (0.88, 0.99)*
Family conflict scale	1.12 (0.77, 1.62)	1.05 (0.80, 1.37)
Concern for HIV		
Not at all	1.00	1.00
Very/extremely worried	0.93 (0.13, 6.44)	1.53 (1.25, 1.87)***
Main partner had HIV test		
No	1.00	1.00
Yes	0.14 (0.04, 0.57)**	1.28 (1.21, 1.36)***
Unknown	0.75 (0.26, 2.14)	1.65 (1.16, 2.33)**
History of STI		
No	1.00	1.00
Yes	2.12 (1.20, 3.76)*	0.88 (0.68, 1.15)
Study site		
Boston	1.00	1.00
Madrid	0.15 (0.13, 0.18)***	0.78 (0.62, 0.98)*
Barcelona	0.46 (0.20, 1.03)	2.56 (1.56, 4.19)***

BD benzodiazepine scale

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$ (2-tailed tests)

Discussion

International goals to reduce HIV transmission and improve treatment outcomes hinge upon the engagement of key populations. For Latino immigrants in Spain and the US with co-occurring substance use and mental health problems, we found that HIV/STI test acceptance was high, as 74% accepted testing through a behavioral health study and only 4% declined. Approximately one-fifth of the cohort dropped out or were LTFU before HIV/STI testing was offered. Given the acceptability of HIV/STI testing, these data suggest the

importance of integrating HIV/STI testing in routine health or outreach visits, including behavioral health encounters.

Individuals recruited from community settings had a 51% reduction in the odds of HIV/STI test decline and individuals whose main sex partner had a prior HIV test had a 86% lower odds of test refusal. A possible explanation for greater test acceptance in these scenarios may relate to a number of psychological factors, such as participants' lower expectation for a positive test result, decreased perceptions of HIV-related stigma, and a positive perception of the benefits of testing [1, 70, 71]. The fact that those participants

reporting a higher concern for having HIV were more likely to be LTFU and did not receive HIV/STI testing may imply greater ambivalence towards a positive test result in this group [72, 73].

LTFU was more likely in those who were younger age, males, less educated and extremely worried about acquiring HIV. These data characterize a potential vulnerable pool not willing to engage in HIV/STI testing. This group may require tailored interventions, such as through youth friendly internet-based formats, to successfully promote HIV testing [74]. HIV self-testing may improve testing acceptability compared to community or health facility-based testing by addressing concerns about privacy, stigma, and access to health services [75–78]. LTFU was also more substantial in the Barcelona site, which had twice the number of participants as Madrid and Boston. This finding emphasizes the challenge of tracking patients as the population for follow-up increases and resources are limited. The higher attrition in Barcelona, as compared to other sites, was not due to the random assignment of the study condition as assignment of the study condition did not predict LTFU.

Higher everyday discrimination decreased the odds of LTFU. This finding may have occurred because of how the study was designed and delivered specifically to Latino immigrants. Study visits were conducted by Spanish-speaking program staff. Participants selected the timing and location, in person or by telephone, of study visits. Missed visits were followed up by phone calls, letters, and home visits. Based on our findings, addressing perceived discrimination may be a key component in retaining Latino immigrants in services such that individuals can access HIV/STI testing. Interventions in Latino churches and with community health workers has shown promise in reducing HIV-related stigma and improving intention for HIV testing [79]. Furthermore, increased social support and knowing others with HIV predicted HIV/STI test acceptance in Colombian men who have sex with men [80].

This study had several limitations. Despite substantial efforts to track patients and the options for home-based and telephone study visits, 22% of the cohort was LTFU and their HIV/STI testing responses are unknown. Participants may not have reported the accurate status of the main sex partner's HIV testing history due to social desirability or reluctance in disclosing this information [81]. Participants agreed to take part in a behavioral counseling intervention for mental health and substance use. Therefore, the rate of HIV/STI test acceptance may not generalize to individuals who refused study participation.

Addressing determinants of HIV test acceptance as well as attrition from services for Latino immigrants with co-occurring substance use and mental health problems may help close the gap in key disparities in HIV outcomes for

Latinos. Prior evidence suggests that once diagnosed, response to HIV treatment and viral suppression for HIV-infected Latinos may be no different than their native-born counterparts in the US and Europe [82–84]. The opportunity for HIV treatment success in Latinos further underscores the importance of prompt HIV diagnosis and linkage to care. Delivery of HIV testing in routine settings, including mental health, may improve attainment of national guidelines to integrate HIV testing in preventative health care [85, 86], and lessen ambivalence to HIV testing in Latino immigrants, a growing population for whom there are limited tailored HIV interventions.

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Compliance with Ethical Standards

Conflict of interest All authors have declared that no competing interests exist.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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