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ORIGINAL PAPER

Social Determinants of Sexual Behavior and Awareness of Sexually Transmitted Infections (STI) Among Low-Income HIV+ or STI At-Risk Hispanic Residents Receiving Care at the U.S.–Mexico Border

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Abstract

U.S.–Mexico border communities are uniquely vulnerable to sexually transmitted infection (STI) transmission given the economic and social challenges these communities face. This study examines how marginalized statuses of U.S. border residents are associated with STI awareness and sexual behaviors. We surveyed low-income residents receiving STI testing and/or HIV/AIDS care in the lower Rio Grande Valley of southernmost Texas. Respondents aged 18+ took a self-administered survey available in English or Spanish in a clinic waiting room ($N = 282$). Approximately 52% of respondents reported being HIV+, and 32% of respondents reported having a prior STI other than HIV. Although most respondents had heard of HPV (72%), awareness of the HPV vaccine was low across all subgroups (28%), including women (< 35%), reflecting previous findings that border residents are less knowledgeable about the HPV vaccine. Almost half of respondents reported always using a condom (45%), which is higher than elsewhere in the U.S. Male and non-Hispanic respondents had higher estimated prevalence ratios (PR) of lifetime partners [PR 1.39 (95% confidence interval 1.43–3.68), PR 1.88 (1.04–3.41), respectively] and sexual partners met online [PR 3.73 (1.00–14.06), PR 19.98 (5.70–70.10), respectively]. Sexual minority, non-Hispanic, and male respondents had higher adjusted odds ratios (AOR) of utilizing the internet to find sexual partners than their peers [AOR 2.45 (1.60–3.87), AOR 1.52 (1.11–2.07), AOR 1.97 (1.20–3.24), respectively], placing them at greater STI-transmission risk. We found diversity in dimensions of STI awareness and sexual behaviors in our sample. Results can help tailor public health interventions to the unique STI risks of marginalized groups in border communities.

Keywords STI · HIV/AIDS · HPV · Sexual behavior · STI knowledge · Border community · Hispanic health

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Low-income, sexual minority, Hispanic, and immigrant communities are at the greatest risk of HIV and other STI transmission [1, 61], and likely experience heightened vulnerability due to "multiple marginalization" [66]. Multiple marginalization refers to the social disadvantage and exclusion that results when individuals occupy numerous minority identities [45]. This perspective argues that inhabiting more than one minority status results in additional, and more acute, inequality than the disadvantage attributable to each individual minority status [63]. Certain groups are at increased risk of experiencing multiple marginalization; for example, Hispanics, including Hispanic immigrants and/or sexual minorities (e.g., gay, lesbian, or bisexual individuals), residing on the U.S.-Mexico border navigate multiple sources of marginalization, and are at increased risk of poverty and social discrimination [11, 55, 64].

Increased health risks surrounding HIV/STI transmission related to multiple marginalization arguably operate through several mutually reinforcing pathways, including (1) reduced *access* to health care and STI-related resources, (2) limited STI *knowledge*, and (3) increased high-risk sexual *behavior*. These pathways—access, knowledge, and behavior—have been widely targeted by public health interventions to reduce rates of HIV/STI transmission among high-risk groups, including sexual minorities and Hispanics [30, 31]. However, multiply marginalized groups may experience interlocking disadvantages in access, knowledge, and behavior that can make targeting their unique health needs more challenging [26].

Access to HIV/STI Resources and Care

Low-income Hispanics are one of the most marginalized groups in the U.S. in terms of healthcare access, especially those residing in border communities [3]. Most prior studies examining healthcare access, particularly HIV/STI resources, at the US–Mexico border have focused on the California–Mexico border. In their study of HIV care access at the California–Mexico border, Zúñiga et al. [67] found that border residents of Mexican-origin, and those who cross the border frequently, experienced more barriers to access than their peers, including inconsistent access to care and reduced likelihood of a having a usual source of care [67]. In addition, social biases present within predominantly Hispanic communities, such as those found at the border, may hinder, or even prohibit, utilization of effective HIV/STI prevention programs [6, 21].

Many Hispanic border residents are immigrants, and Hispanic immigrants experience multiple sources of vulnerability, including housing instability, food insecurity, and lack of insurance, which can impact their likelihood of identifying and utilizing usual sources of care [38]. Hispanic immigrants often receive lower quality care than non-immigrant peers [19]. Research indicates HIV and STI-specific stigma may disproportionately discourage low-income Hispanics from utilizing STI testing [21, 41]. For example, Hispanics are more likely to report negative intentions for future HIV/STI testing relative to non-Hispanic peers [41].

Many low-income Hispanics who are HIV+ are sexual minorities, and experience the unique, simultaneous effects of HIV-related stigma, ethnic discrimination, *and* homophobia. Sexual minorities, particularly Hispanic sexual minorities, are less likely to have health insurance coverage and report lower healthcare utilization than heterosexual peers [7, 37]. Sexual minority Hispanics who are also HIV+ report high rates of perceived stigma from healthcare providers, reducing access and utilization of necessary health care services [36].

In light of these challenges to access, programs now exist to increase HIV/STI resource access within multiply marginalized border communities. For example, The Valley AIDS Council (VAC) provides resources to several border cities in the lower Rio Grande Valley (RGV) of Texas, and relies on grant funding to target the HIV/STI needs of transgender, sexual minority, undocumented, commercial sex workers, substance users, and low-income Hispanics at greatest risk for STI transmission [60]. Despite these efforts, little is known about access and resources available to at-risk communities in the lower Rio Grande Valley. The lower Rio Grande Valley is the most economically disadvantaged region in Texas, home to the five counties with the highest poverty rates in the state [59]. We know more about access and resources of at-risk communities at the California (San Diego/Tijuana)–Mexico border, than other border regions. In Texas, more research is available regarding west Texas (El Paso/Ciudad Juarez) than the lower Rio Grande Valley [48]. Additional research on border communities is needed to fully account for the diversity of these populations. This study examines STI awareness and sexual behaviors of individuals receiving HIV/STI resources from VAC in the lower Rio Grande Valley of south Texas.

STI Awareness

Increased awareness of HIV/STI knowledge and awareness among Hispanics residing at the U.S.–Mexico border has become a targeted area for public health. For example, a social marketing campaign to promote testing, "Tú No Me Conoces" (You Don't Know Me), was implemented at the California–Mexico border, and increased HIV testing in the sampled community [50]. Health organizations often proactively work to increase HIV/STI knowledge in their communities. For example, the VAC in the Rio Grande Valley (Texas–Mexico border) collaborates with local organizations, including the South Texas Equality Project (STEP), the Department of State Health Services, secondary schools, and local universities, to increase awareness of HIV/STI and available resources through community outreach [10, 56, 60].

Nationally, HPV is the most common and rapidly spreading STI [13]. U.S.–Mexico border communities may be particularly susceptible to HPV transmission, as Mexico has one of the highest rates of invasive cervical cancer, attributable to high-risk forms of HPV [29]. U.S. Hispanic women have higher cervical cancer incidence rates than White and African-American women, likely due to elevated rates of HPV infection [13, 42]. Hispanic *men* are also diagnosed with more HPV-related cancers (e.g., oropharyngeal), and at later stages compared to most other racial/ethnic groups [8, 33]. Finally, those who are HIV+ are at increased risk of

HPV-related cancer, likely due to *both* greater exposures to HPV *and* HIV-mediated immunosuppression [24].

Substantial outreach and education has been implemented federally and in border communities to prevent HPV transmission [28, 57, 62]. This includes both educational outreach and financial subsidies supporting high-risk HPV vaccinations [17]. While initially recommended for pre-teen girls, the HPV vaccination is encouraged for both males and females before becoming sexually active and targets HPV forms that are high-risk for cervical cancers [44]. Studies of youth vaccinated for HPV indicate reduced prevalence of high-risk forms of HPV among those who are vaccinated [44].

Research indicates that Hispanics, particularly border-residing Hispanics, may be less knowledgeable about HPV and its role in cervical or other forms of cancer [21, 46]. However, research indicates female border-residents have high willingness to receive the HPV vaccine or administer the vaccine to daughters despite their limited knowledge and reported barriers to access [46]. It is unclear whether low income Hispanics with access to STI testing and health services are being exposed to information regarding HPV and the HPV vaccine, especially when HIV may be the primary focus of community health programs. Examining HPV and HPV vaccine-related awareness among HIV+ and/or Hispanics at-risk of HIV or other STIs receiving services from a community health program with integrated health resources at the U.S.–Mexico border can provide unique insight into the extent of HPV awareness within multiply marginalized Hispanic communities.

Sexual Health Behaviors and Safe-Sex Practices

In addition to examining STI awareness, identifying the diversity of sexual health behaviors and safe-sex practices among marginalized groups is critical for identifying and addressing their unique health needs. Inconsistency of condom use during sexual intercourse, including unprotected insertive or receptive anal or vaginal intercourse, as well as unprotected oral sex, significantly increase the risk of HIV/STI transmission [43]. Behavioral interventions targeting Hispanic STI clinic patients show reduced rates of high-risk sexual behaviors, and subsequently reduced STI incidence [16]. HIV/STI programs often target sexual minorities, particularly gay men, given that HIV is commonly transmitted between men who have sex with men. Individuals are more likely to reduce their high-risk sexual behaviors after they are aware that they are HIV+ or have an STI [43], thus underscoring the importance of public health initiatives promoting STI-testing.

Relatedly, status disclosure is another important aspect of safe-sex practices; HIV/STI disclosure significantly increases condom usage during sexual interactions [9]. Meeting sexual partners online is a rapidly growing area of interpersonal connection that may distinctively shape both disclosure and condom usage. For example, HIV+ gay or bisexual Hispanic men engaging in sexual activity with individuals they met online report they are less likely to disclose their status and/or use a condom [9]. Fear of rejection may drive desires not to disclose, and these fears may be heightened in the online environment [9, 58]. Findings regarding safe-sex practices and internet use are mixed; many studies indicate unprotected sex is not significantly different for partners met on-line versus off-line [4, 15].

However, before clinicians can begin to address the importance of the internet in sexual health behaviors, more information is necessary regarding which groups may be likely to utilize the internet for sexual partner seeking. Although there is some indication that gay men are more likely to go online to find a sexual partner [39], very little research has examined similar internet use among the multiply marginalized within border communities. This study compares subgroup differences in sexual activity with online partners, total number of partners, and condom usage to delineate which social statuses (i.e., immigrant, sexual minority) influence the sexual practices of a low income, predominantly Hispanic sample of men and women.

The Current Study

While prior research has primarily focused on HIV over other types of STIs, and men over women, this study examines men and women, heterosexuals and sexual minorities (those who self-identify as lesbian, gay, or bisexual, and/or past sexual activity with a partner of the same sex), and considers awareness of an STI other than HIV/AIDS. This study examines a low-income predominantly Hispanic population with *access to health resources* and information, including STI testing and treatment, and HIV/AIDS resources, who are at potentially elevated risk of HIV/STI transmission given their past histories of HIV/STI diagnosis and marginalized identities. Understanding the sexual health knowledge and sexual behavior of multiply marginalized groups is important for addressing their unique sexual health needs. This information also provides insight into the potential efficacy of local community health efforts to address the distinctive sexual health barriers of low-income, predominantly Hispanic border-residing populations, and suggest fruitful areas for intervention.

Method

Location

This study took place in the lower Rio Grande Valley, comprising the U.S. border in southernmost Texas. The RGV is a predominantly Hispanic-identifying region (estimated at 91% Hispanic) [59] and is particularly vulnerable to STI transmission given the high volume of traffic at its border crossing locations and the financial deprivation facing individuals and communities. There are approximately 2000 known cases of HIV/AIDS in the Rio Grande Valley area based on statewide estimates [13]. Texas ranked third among the fifty U.S. states in HIV diagnoses in 2015 [12].

The service site of this study was the Valley AIDS Council, the primary source of STI screening and HIV/AIDS medical care in the lower RGV, and a Hispanic-serving institution (90% of the client population identifies as Hispanic). Although addressing the health needs of individuals infected with or at-risk of HIV/AIDS and related co-morbidities is their primary focus, VAC provides additional integrated health services and is structured as a Patient Centered Medical Home (PCMH) [60]. VAC provided approximately 2700 HIV tests in 2016 and manages a stable client population of approximately 1200 HIV/AIDS positive residents. VAC is supported by grant funding, followed by insurance claims, and donations. VAC has 3 full-time medical providers, 1 part-time psychologist, 1 part-time dentist, and 58 full-time staff members.

Research was conducted during the summer of 2017 at all three VAC sites in the lower RGV region (McAllen, Harlingen, and Brownsville, Texas). All sites provide STI-testing, however only two (McAllen and Harlingen) are designated clinics with other integrated health services. Approximately 75% of surveys were collected at the Harlingen location, which serves the highest volume of VAC clients. VAC administrative staff assisted with the development of the survey, which helped establish survey face validity. This project was reviewed and approved by the University of Texas Rio Grande Institutional Review Board. Authors report no potential conflicts of interest.

Survey Method

Self-administered surveys were available in English and Spanish. We selected pre-validated measures with Spanish translations when possible. All survey items without available Spanish translations were translated into Spanish by a native Spanish speaker and verified by back translating into English by a different native Spanish speaker. Five surveys were piloted with bilingual respondents before full administration. Four Spanish-speaking research assistants were available for assistance and question clarification, and alternated shifts at the three VAC locations, typically in 3–4 h blocks. Although technically a convenience sample, surveys were administered every weekday and some Saturdays, and during both morning/evening hours, to attempt a representative sample of the patient population. Surveys were self-administered in the main waiting rooms of testing/clinic sites while clients waited to see a care provider. Administering surveys in free or reduced-fee clinic waiting rooms is a novel way of collecting information on marginalized groups, as it does not require individuals to deviate from their day-to-day routine [34].

Surveys included a consent cover letter informing respondents that their participation was voluntary, and that completing the survey signified their consent to participate. Consent was obtained from each participant. Surveys were anonymous, so no potentially identifying information was collected. Respondents were given a small prize (free toothbrush) and the option to enter their name directly to the front desk for an ongoing monthly raffle organized and ran by VAC (raffle prizes average value was $20–30) as an incentive. Surveys were only administered to VAC clients identifying as age 18 or older. We experienced a 78% response rate, as common reasons for declining the survey included perception that survey was too long, needing to monitor a child, and disinterest. Surveys took approximately 15 min on average to complete.

Sample

Our original sample included 333 respondents; however, many had missing data on key covariates, including identity demographics such as sex ($n=25$), immigrant status ($n=26$), age ($n=31$), and sexual orientation ($n=29$). After list-wise deletion, 282 respondents remained. Our analytic sample ($N=282$) is 29% female ($n=82$) and 71% male ($n=200$) (the stable client population of the clinic was approximately 21% female, 79% male, and 0.5% transgender in 2016). Because only one person identified as transgender, we were unable to include trans-identifying individuals in our final analytic sample. Also, our sample reflects the ethnic composition of VAC; 90% of our sample self-identified as Hispanic ($n=255$) and 10% identified as non-Hispanic ($n=27$). The average age of our sample is 37 years, and 29% of the sample ($n=81$) is older than 45 (43% of the stable client population was over age 45 in 2016). In addition, 47% of our sample is uninsured ($n=131$) (compared to 65% of *new* clients in 2016) (see Table 1). Depending on the service, the clinic does not collect income information, although 52% of our sample report an annual household income below $30,000.

Table 1 Unadjusted associations between key covariates and dependent variables

	HPV awareness (%)	HPV vaccine (%)	STI (%)	Condom use (%)	Internet use (%)	Online partners (range 0–101) Mean (SD)	Total partners (range 0–120) Mean (SD)
Everyone ($N=282$)	71.4	28.0	37.6	43.5	41.1	4.0 (14.2)	16.2 (26.5)
HIV+/AIDS ($n=151$)	76.0+	24.4	41.1	42.9	37.8	2.4 (7.1)*	17.8 (29.6)
HIV negative ($n=131$)	66.2+	30.7	33.6	44.2	45.0	5.9 (19.3)*	14.5 (22.4)
Sexual Minority ($n=163$)	78.9***	26.9	38.0	40.3	60.7***	6.3 (16.9)	21.5 (31.0)***
Heterosexual ($n=119$)	61.3***	29.5	37.0	47.9	14.3***	1.3 (9.4)	9.1 (16.3)***
Male ($n=200$)	72.0	25.1	36.5	42.1	52.5***	5.7 (16.8)***	16.7 (24.5)***
Female ($n=82$)	71.2	34.6	40.2	46.9	13.4	0.4 (1.6)***	6.4 (9.2)***
Born Citizen ($n=193$)	70.7	30.4	38.2	42.8	45.1*	4.1 (13.5)	14.9 (22.8)
Immigrant ($n=89$)	73.0	22.9	37.3	44.9	32.6*	3.8 (15.6)	10.1 (17.7)
Hispanic ($n=255$)	70.0+	29.5+	38.4	44.8	39.2*	3.5 (13.2)+	13.6 (22.0)***
Non-Hispanic ($n=27$)	85.2+	12.5+	29.6	29.6	59.3*	9.3 (21.5)+	39.5 (45.5)***
Employed ($n=174$)	76.3*	28.6	35.1	40.1	48.9***	5.1 (16.0)	16.0 (25.0)
Unemployed ($n=108$)	63.6*	27.0	41.7	49.0	28.7***	2.5 (10.8)	16.7 (26.5)

Client data collected at *Valley AIDS Council* in Southernmost Texas. Percent differences (across subgroups, male vs. female, immigrant vs. citizen, etc.) tested using chi-squared tests. Means differences across subgroups tested using two-tailed two-sample *t* tests

STI sexually transmitted infection, *HIV* human immunodeficiency virus, *AIDS* acquired immune deficiency syndrome, *HPV* human papillomavirus, *SD* standard deviation

***$p<0.001$; *$p<0.05$; +$p<0.10$

Measures

Dependent Variables

We examine three dichotomous measures of STI awareness, comparing those who have heard of HPV to those who have not (*HPV awareness*), and comparing those who have heard of the HPV vaccine to those who have not (*HPV vaccine awareness*) [18]. We also asked about prior STI diagnoses, comparing those who identified at least one prior STI diagnosis (excluding HIV) to those who report no past STIs [14].

Sexual Behavior We examine multiple measures of sexual behavior, including a dichotomous measure of *condom use*, comparing those who always use a condom to those who report never, mostly never, sometimes, or almost always use a condom [22], lifetime *number of sexual partners* (male or female) [14], and lifetime *number of sexual partners met online* (e.g., through dating websites, smartphone-based applications, chatrooms, or other online platforms). We also compare those who have used the internet to find a sexual partner to those who have not (*internet use*).

Covariates

We also consider several sociodemographic variables, including biological *sex* (male/female), *age* (continuous), *employment status* (unemployed/employed), and *marital status* (unmarried/married), which are known to influence health knowledge and behaviors [5].

Due to the high percentage of immigrants and those who report being Hispanic in the region, we also examine *immigrant status*, comparing those who report being a U.S. born citizen to those who immigrated to the U.S. (e.g., naturalized citizens, documented or undocumented immigrants), and compare those who identify as *non-Hispanic* to those who report Hispanic ethnicity.

Finally, given the client population and services provided by VAC, we compare heterosexuals to individuals who identified as lesbian, gay, or bisexual (LGB) or report having had same-sex partners (*sexual minority status*), and consider *HIV/AIDS status* (HIV/AIDS diagnosis versus no HIV/AIDS diagnosis).

Analytic Approach

Using Stata 14 software, we examined the unadjusted correlation between key covariates and our dependent variables using chi-squared and two-tailed, two-sample *t* tests. We then utilized logistic regression and calculated adjusted odds ratios to assess relationships between independent variables and dichotomous dependent variables. Finally, we used negative binomial regression to assess the relationships between independent variables and count outcomes. Results are presented as prevalence ratios. Negative binomial regression is more appropriate for count outcomes with over-dispersion

and when the conditional variance is higher than the conditional mean [40].

Results

Key social statuses examined in this study include sexual minorities, individuals who are HIV/AIDS positive, and/or immigrants. Approximately 58% of respondents ($n = 163$) self-identified as gay or bisexual or report engaging in sexual activity with same-sex partners. Also, 54% of respondents ($n = 151$) self-report an HIV+ or AIDS diagnosis. Finally, 32% of respondents are immigrants ($n = 89$; $n = 41$ are undocumented) (see Table 1).

Results from unadjusted analyses between dependent variables and key covariates (Table 1) indicate that while most respondents report having heard of HPV (71%), sexual minorities (vs. heterosexuals) and the employed (vs. unemployed) are more likely to have heard of HPV ($p < 0.05$). Fewer respondents report having heard of the HPV vaccine (28%), and HPV vaccine awareness did not vary by sexual orientation, sex, employment, immigrant, or HIV status. Sexual minorities, males, U.S. born citizens, and the employed are more likely to report having had sex with a partner met online ($p < 0.05$) (everyone = 41%). Those who are HIV+ (vs. not HIV+) report fewer total partners met online ($p < 0.05$). Sexual minorities and males report more *total* partners (male or female) relative to heterosexuals or females ($p < 0.05$). While 37.6% of the sample report an STI other than HIV, and 43.5% of the sample report always using a condom during sex, these variables did not vary based on any of our key covariates in unadjusted analyses.

Logistic regression results suggest that females [adjusted odds ratio (*AOR*) 1.24 (95% Confidence Interval 1.06–1.46)], sexual minorities [*AOR* 1.24 (1.01–1.53)], HIV+ [*AOR* 1.20 (1.02–1.41)], non-Hispanics [*AOR* 1.29 (1.12–1.49)], and those employed [*AOR* 1.21 (1.44)] are more likely to have *heard of HPV*, when adjusting for all covariates (Table 2, model 1). Those who are older [*AOR* 0.99 (0.98–0.99)] or who have been married [*AOR* 0.57 (0.38–0.85)] are less likely to report having heard of the HPV vaccine, *ceteris paribus* (model 2). Those who have been married have higher relative risk [*AOR* 1.45 (1.03–2.05)] of reporting being diagnosed with an *STI other than HIV* (model 3). Little predicts *always using a condom* (model 4). Age [*AOR* 0.989 (0.987–0.992)] and being female [*AOR* 0.51 (0.31–0.83)] is associated with lower relative risk of having had *sex with someone met online*, while sexual minorities [*AOR* 2.45 (1.60–3.87)] and those who are non-Hispanic [*AOR* 1.52 (1.11–2.07)] have higher relative risk of having had sex with someone met online (model 5), adjusting for other covariates.

Negative binomial regression results suggest that non-Hispanic ethnicity [prevalence ratio (*PR*) 19.98 (5.70–70.10)] and being employed [*PR* 2.31 (1.21–4.39)] are associated with a higher count of *online sex partners*, when adjusting for all else (Table 3, model 1). Increased age in years [*PR* 0.94 (0.91–0.98)], being female [*PR* 0.27 (0.07–1.00)], and reporting HIV+ [*PR* 0.46 (0.23–0.92)], are associated with a lower count of online sex partners, when adjusting for all else (model 1). Being female is associated with a lower count [*PR* 0.44 (0.27–0.70)], and being non-Hispanic is associated with a higher count, of *total partners* [*PR* 1.88 (1.04–3.41)] (model 2), *ceteris paribus*.

Table 2 Logistic regression estimates of reported STI awareness and sexual behaviors

	HPV awareness Model 1	HPV vaccine Model 2	STI Model 3	Condom use Model 4	Internet use Model 5
Age	0.99 [0.98–1.00]**	0.99 [0.98–0.99]***	1.00 [0.99–1.02]	1.00 [0.99–1.02]	0.99 [0.99–0.99]***
Female	1.24 [1.06–1.46]**	1.41 [0.89–2.24]	1.07 [0.72–1.58]	0.98 [0.69–1.40]	0.51 [0.31–0.83]***
Sexual minority	1.24 [1.01–1.53]*	0.88 [0.56–1.39]	1.23 [0.84–1.82]	0.89 [0.64–1.24]	2.45 [1.60–3.87]***
HIV+/AIDS	1.20 [1.02–1.41]*	1.15 [0.77–1.71]	1.11 [0.79–1.55]	0.95 [0.71–1.27]	0.90 [0.70–1.61]
Citizen	0.92 [0.79–1.07]	1.20 [0.78–1.84]	1.07 [0.76–1.50]	1.00 [0.75–1.34]	1.18 [0.92–1.51]
Non-Hispanic	1.29 [1.12–1.49]***	1.20 [0.78–1.84]	0.65 [0.34–1.22]	0.62 [0.32–1.18]	1.52 [1.11–2.07]*
Employed	1.21 [1.02–1.44]*	0.66 [0.25–1.72]	0.84 [0.61–1.15]	0.82 [0.62–1.09]	1.13 [0.88–1.45]
Married	0.86 [0.74–0.99]*	0.57 [0.38–0.85]**	1.45 [1.03–2.05]*	0.94 [0.70–1.26]	0.97 [0.79–1.25]
Constant	1.95 [0.47–8.15]	1.42 [0.41–4.93]	0.29 [0.08–0.98]*	1.05 [0.32–3.39]	3.14 [0.73–13.45]
N	279	261	282	275	282
R-Squared	0.10	0.08	0.03	0.02	0.32

Client data collected at *Valley AIDS Council* in Southernmost Texas. Logistic regression results presented as adjusted odds ratios for covariates (constant is presented as unadjusted odds ratio). Confidence intervals in brackets. All models are estimated using robust standard errors

STI sexually transmitted infection, *HIV* human immunodeficiency virus, *AIDS* acquired immune deficiency syndrome

***$p < 0.001$; **$p < 0.01$; *$p < 0.05$

Table 3 Negative binomial regression results of reported count of sexual partners

	Online partners Model 1	All partners Model 2
Age	0.94 [0.91–0.98]**	1.01 [0.99–1.02]
Female	0.27 [0.07–1.00]*	0.44 [0.27–0.70]**
Sexual minority	2.92 [0.23–0.92]*	1.39 [0.86–2.23]
HIV+/AIDS	0.46 [0.20–1.08]	0.94 [0.64–1.39]
Citizen	0.95 [0.49–1.84]	1.38 [0.92–2.07]
Non-Hispanic	19.98 [5.70–70.10]***	1.88 [1.04–3.41]*
Employed	2.31 [1.21–4.39]**	0.96 [0.68–1.37]
Married	1.09 [0.60–2.00]	0.95 [0.66–1.37]
Constant	5.41 [0.65–45.00]	9.20 [3.67–23.02]
N	260	253
R-Squared	0.09	0.03

Client data collected at *Valley AIDS Council* in Southernmost Texas. Negative binomial regression results presented as prevalence ratios. Confidence intervals in brackets. All models are estimated using robust standard errors. Sensitivity analyses using bootstrapping were conducted (not shown); results did not differ substantively

STI sexually transmitted infection, *HIV* human immunodeficiency virus, *AIDS* acquired immune deficiency syndrome

***$p < 0.001$, **$p < 0.01$, *$p < 0.05$

Discussion

Individuals who are multiply marginalized are at the greatest risk of HIV/STI transmission. This study examined a low-income predominantly Hispanic population seeking HIV care or STI testing who had access to health resources. We examined the association between various social statuses, STI awareness, and sexual behaviors to assess which groups, and what types of interventions, may be targeted to improve community health outcomes.

Many community health education interventions target marginalized groups who are at greatest risk of STI transmission, such as Hispanics [50] and sexual minorities [14], to improve their STI knowledge and awareness. For HPV specifically, women's health knowledge is often targeted due to the role of HPV in cervical cancer risk [42], however increasing awareness of men's HPV-related cancer risk has become an important prevention area [18]. Regarding HPV awareness, this study found that most respondents had heard of HPV (~ 72%). Respondents in this region are potentially more knowledgeable about HPV than elsewhere, with 72% of our sample reporting having heard of HPV. In their study of U.S. adult males, Cooper et al. [18] found that 50% of respondents had heard of HPV. We also found that women were more likely to have heard of HPV than men in our adjusted models. These findings may be reflective of both national and local HPV prevention efforts targeting women and Hispanics [25, 57], and may indicate that these programs have been successful in reaching certain vulnerable groups.

In addition, sexual minorities and those who report being HIV+ were more likely to have heard of HPV. These findings have important implications for the wellbeing and health empowerment of HIV+ adults in particular, given their elevated HPV-related cancer risk relative to peers who are not HIV+ [24]. Relative to peers, those who are HIV+ may have had more contact with health care professionals due to their diagnosis, are more likely to be exposed to targeted initiatives aimed at improving STI knowledge, and thus may receive more information on STIs and HPV during these interactions.

In addition, these findings indicate that either local programs targeting the STI awareness of sexual minorities are working, or that sexual minorities are more personally motivated to educate themselves on potential sexual health risks [54]. Research indicates that sexual minorities will proactively seek internet resources to improve their knowledge on safe sexual practices [27]. Therefore, community health stakeholders should emphasize inclusivity across sexual and gender identity to enhance the efficacy of sexual health awareness campaigns, both online and offline [49].

The extent of HPV awareness is perhaps limited in the Rio Grande Valley, given that very few respondents had heard about the HPV vaccine (28%). Our findings are reflective of national studies indicating low HPV vaccine awareness among Hispanics, such as the work of Cooper et al. [18] who report that only 34% of U.S. male Hispanics had heard of the HPV vaccine. These finding are important in light of research highlighting a lack of knowledge as a key barrier to vaccine administration among Hispanics [35]. We did not find awareness of the HPV vaccine to vary based on sexuality, gender, ethnicity, employment, or immigrant status. In addition, Hispanics, the unemployed, and those who were married were less likely to have heard of HPV in general; therefore, health professionals should be more attentive to the HPV knowledge of these groups. Hispanics and the unemployed in particular may face persistent barriers due to their multiple marginalization that significantly reduce their access to health information [32, 37].

We also examined sexual *behaviors* and found that nearly half of the sample report always using a condom. This is higher than reported in other studies of STI clinic patients. For example, only 24.1% of Peterman et al. [52] sample report always using a condom, although they examined condom usage at multiple time points, whereas we examined condom use cross-sectionally. These results are encouraging, and may suggest that program efforts to increase condom-use among those who are HIV+ or at-risk of STI transmission (e.g., Hispanics and sexual minorities) have benefitted the RGV.

In addition, we found that women and Hispanics report fewer *total* partners, which may be protective for their overall sexual health and HIV/STI transmission risk. Furthermore, we found that women and Hispanics are less likely to meet and engage in sexual intercourse with individuals they have met online, and report fewer sexual partners from the internet. We found that men, sexual minorities, and non-Hispanics might be more likely to use the internet to find a sexual partner. In our study, 60% of sexual minorities reported having had sex with a partner met online, which is similar to other studies reporting that gay or bisexual men frequently use the internet to look for sex partners [39]. Research indicates that, among sexual minorities, condom use is lower when online partners are involved [39, 65]. Finding sexual partners online may result in greater frequency of "casual" sex. Casual sex refers to sex with acquaintances, someone the person has just met, or in some cases, an anonymous partner. Research also suggests that individuals may be less likely to disclose an STI to casual sex partners relative to a main or steady partner [53].

Recent trends in the past decade toward engaging in sexual activities facilitated by online applications, may pose a unique public health challenge for encouraging condom use and HIV/STI status disclosure. STI-related stigma could also hinder disclosure among already disadvantaged groups who simultaneously manage multiple sources of marginalization in their lives [47]. Health professionals should be aware of how the internet may shape sexual behaviors, particularly for men and sexual minorities [65]. Public health initiatives must underscore the importance of discussing HIV/STI status with partners met online, particularly since individuals who are HIV+ may be equally likely to use the internet to find a sexual partner [39]. The development of health-related online and smartphone-based resources may be a promising way for public health to adapt to these challenges [2, 20, 23].

While this cross-sectional study illustrates diversity in the knowledge and sexual behavior of subgroups at elevated risk of HIV/STI transmission, particularly those who are multiply marginalized, we were unable to examine differences across intersecting identities due to sample size limitations. For example, we were unable to compare experiences between gay, lesbian, transgender or bisexual identities, or across a greater variety of citizenship and documentation statuses (undocumented, naturalized citizen, etc.). In addition, female sex workers are a marginalized group that we were unable to examine in this study [51]; only a small proportion ($n = 18$) of our sample reported exchanging sex for housing, food or drugs. Future research should examine how access, knowledge, and behavior may vary based on intersecting identities and examine different regions of the US border.

Conclusion

Important areas for improving the health knowledge of low-income border residents remain, particularly increasing awareness for the HPV vaccine. While multiple marginalization may result in greater HIV/STI risk for those who occupy more than one minority status by shaping their health care access, STI knowledge, and sexual behavior, the experiences of low-income border residents with access to HIV/STI resources are not clearly delineated based on marginalized status. For example, we found that Hispanic and unemployed respondents had lower STI awareness relative to peers, while other marginalized groups were aware of their risk for HIV/STI transmission, including sexual minorities or those who are HIV+. In addition, nearly half of respondents reported a high likelihood of always using a condom during sexual activities. These findings suggest at-risk groups may be benefiting from ongoing community health efforts to improve their health, particularly once they have access to health resources. We found that nearly half of respondents, notably sexual minorities, are using the internet to find sexual partners. Addressing the growing use of the internet for finding sexual partners is an important future intervention area for practitioners and community health workers looking to reduce HIV/STI transmission given the potential implications internet use has for safe-sex practices and status disclosure.

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