



Social Support and Other Factors Associated with HIV Testing by Hispanic/Latino Gay, Bisexual, and Other Men Who Have Sex with Men in the U.S. South

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Abstract

Cognitive-psychosocial and other factors may affect participation in HIV testing, particularly by Hispanic/Latino gay, bisexual, and other men who have sex with men (MSM) in the U.S. South, a region hard-hit by HIV. We used univariate and multivariable logistic regression analyses to examine the association between social support and other cognitive-psychosocial factors; sociodemographic characteristics; risk behaviors; and self-reported HIV testing in a sample of 304 Hispanic/Latino MSM in North Carolina. In the multivariable logistic regression analysis, general and HIV-related social support and HIV-related knowledge were associated with greater odds of testing; speaking only Spanish was associated with reduced odds of testing. Social support and aspects of social connectedness may constitute community-based resources for use in HIV prevention efforts with Hispanic/Latino MSM. However, harnessing these resources for HIV prevention will require a better understanding of how social support relationships and processes shape HIV risks and protective actions by these vulnerable MSM.

Keywords Hispanics/Latinos · Men who have sex with men (MSM) · Social support · HIV testing · U.S. South

Resumen

Factores cognitivos y psicosociales y otros, pueden afectar participación en pruebas de VIH, particularmente por parte de Hispanos/Latinos gay, bisexuales y otros hombres que tienen sexo con hombres (HSH) en el sur de los EE. UU., una región duramente afectada por el VIH. Usamos análisis de regresión logística univariable y multivariable para examinar la asociación entre apoyo social y otros factores cognitivos y psicosociales; características demográficas; comportamientos de riesgo y autorreportes de pruebas de VIH en una muestra de 304 HSH Hispanos/Latinos en Carolina del Norte. En el análisis de regresión logística multivariable, el apoyo social general y aquél relacionado con VIH y conocimiento relacionado con VIH, fueron asociados con mayores probabilidades de pruebas de VIH realizadas; hablar español solamente fue asociado con probabilidades reducidas de pruebas realizadas. Apoyo social y aspectos de conectividad social pueden constituir recursos comunitarios para ser usados en esfuerzos de prevención de VIH con HSH Hispanos/Latinos. Sin embargo, aprovechar estos recursos para prevención de VIH requerirá una mejor comprensión de cómo las relaciones y los procesos de apoyo social condicionan los riesgos de infección por VIH y acciones de protección efectuadas por estos vulnerables HSH.

Palabras Claves Hispanos/Latinos · Hombres que tienen sexo con hombres (HSH) · Apoyo social · Pruebas de VIH · El sur de los EE. UU

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Introduction

HIV Infection Among Hispanic/Latino Men Who Have Sex with Men in the U.S. and the South

Gay, bisexual, and other men who have sex with men (referred to hereafter as MSM) of all races and ethnicities are estimated to number 1.5 million in the United States (U.S.) [1], representing approximately 4% of the country's adult male population [2]. However, the rate of new HIV diagnoses among MSM is more than 44 times that of other men [3]. Hispanics/Latinos accounted for 24% of all HIV diagnoses among MSM in 2015, compared to 39% and 31% for Non-Hispanic black and white MSM, respectively [4]. Hispanic/Latino MSM in the U.S. accounted for 85% of HIV diagnoses among Hispanic/Latino men in 2015 [5], and HIV infection trends among these MSM are cause for concern. HIV incidence among Hispanic/Latino MSM increased by 25.4% from 2008 to 2015 while it remained relatively stable among Non-Hispanic black MSM and decreased among white MSM [6]. If current HIV diagnosis rates persist, one in four Hispanic/Latino MSM may be diagnosed with HIV during his lifetime [7]. Because an undetermined proportion of Hispanic/Latino men who engage in male-to-male sex also have heterosexual partners, the implications of this behavior for potential HIV infection risks are not limited to the MSM and their male sex partners. Two studies are illustrative. More than one-fifth of 190 Hispanic/Latino MSM in a rural North Carolina study reported sex with a woman in the past three months [8]. Nearly one-fourth (24%) of 1482 Hispanic/Latino migrant and immigrant males in a five-state survey reported engaging in male-to-male sex during the previous 12 months. Nearly two-thirds (62%) of these men did not self-identify as homosexual or gay (42% self-identified as heterosexual and 20% as bisexual); 25% were married to a woman [9].

The burden of HIV is particularly heavy in the U.S. South, which accounted for more than half of new HIV diagnoses in the U.S. during 2016. That same year, HIV diagnosis rates per 100,000 population were 16.8 in the South, compared to 11.2 in the Northeast, 10.2 in the West, and 7.5 in the Midwest [10]. Southern states have also experienced large increases in Hispanic/Latino populations since the 1990s, increasing by nearly 700% between 1990 and 2015 [11]. These states are relatively recent Hispanic/Latino destinations [12–14] compared to California, Arizona, New Mexico, Florida, and Texas, which have a longer history of Hispanic/Latino immigration and settlement [15]. Hispanics/Latinos in southern states and Hispanic/Latino MSM among them are also vulnerable to HIV infection. More than one-third (37%) of Hispanic/Latino individuals diagnosed with

HIV in the U.S. during 2013 were living in the Deep South [16]. The proportion of total HIV diagnoses in this region represented by Hispanics/Latinos is increasing, particularly among Hispanic/Latino MSM [16].

HIV Prevention Resources for Potential Use with Hispanic/Latino MSM: Biomedical and Behavioral Interventions, Resilience, and Social Support

Biomedical and Behavioral Interventions

With the advent of efficacious biomedical approaches for preventing HIV, the range of effective HIV prevention strategies has increased for potential use with populations at elevated risk for HIV infection, including Hispanic/Latino MSM. The Centers for Disease Control and Prevention (CDC) refers to these as high-impact HIV prevention strategies because they are proven, cost-effective, and scalable [17]. They include HIV testing, which provides a potential gateway to other prevention options that include linkage to or re-engagement in care for those living with HIV, and pre-exposure prophylaxis (PrEP) and post-exposure prophylaxis (PEP) for those who are not HIV infected but who are at substantial behavioral risk for HIV [18]. Uptake by Hispanic/Latino MSM of the prevention strategies contained in the HIV continuum of care is suboptimal. Of all Hispanic/Latino MSM estimated to be living with HIV in 2014, 75% knew of their infection [19], well below the national HIV prevention goals of 90% for HIV serostatus awareness among persons living with HIV [20]. In 2015, 75% of Hispanic/Latino MSM aged ≥ 13 years in 38 U.S. jurisdictions who were diagnosed with HIV were linked to care within 1 month of their diagnosis (national prevention goal = 85%). Among those diagnosed by year-end 2013 and alive at year-end 2014, 58% were retained in care (national prevention goal = 90%) and 61% were virally suppressed (national prevention goal = 80%) [21].

The number of known efficacious behavioral HIV prevention interventions designed for use with Hispanic/Latino MSM is limited. CDC has identified two interventions [22, 23] that satisfy its criteria for being included as Best Evidence interventions in CDC's *Compendium of Evidence-Based Interventions and Best Practices for HIV Prevention* (https://www.cdc.gov/hiv/pdf/research/interventionresearch/compendium/rr/cdc-hiv-noexcuses_rr_best.pdf; <https://www.cdc.gov/hiv/pdf/research/interventionresearch/compendium/rr/cdc-hiv-hola-en-grupos-best-rr.pdf>). Given recent increases in HIV infection among Hispanic/Latino MSM, their possibly limited engagement with services described in the HIV continuum of care, and the limited number of efficacious behavioral interventions designed specifically for

them, greater efforts are needed to provide and engage these populations with options for HIV prevention.

HIV-Related Resilience

In the meantime, studies have described instances of positive adaptation by MSM in the context of the adversity that can result from the elevated HIV risks they face. The spontaneous adaptation that can result from HIV-protective and health-promoting actions has been referred to as HIV-related resilience, and can contribute to HIV risk-reducing outcomes [24–28]. HIV-related resilience among individuals who know from HIV testing that they are HIV uninfected, for example, can result from actions to protect their seronegativity through periodic HIV testing, consistent condom use and, as appropriate, PrEP or PEP when engaged in sexual behaviors that can increase their HIV infection risks [28, 29]. For those MSM who are living with HIV, resilience may result from consistent condom use; linkage to, retention, and re-engagement in HIV care to achieve and sustain viral suppression; and participation in supportive services and other health-promoting actions (e.g., leading healthy lifestyles) [30, 31].

Social Support and HIV-Protective Actions

Social support has been described as a key contributing factor to HIV-protective actions and HIV-related resilience among MSM of various races and ethnicities [28–30, 32–36]. It can be generated by social relationships with significant others (e.g., family members, close friends, partners, and spouses), peers, and community members, and the values and prescriptive and proscriptive social norms they share, which in turn can shape actions by persons in those relationships [29, 32, 34–38].

Findings from studies that have included both non-Hispanic black and Hispanic/Latino MSM illustrate the associations that can occur between access to social support or the lack thereof and HIV-related outcomes. MSM who received social support from peers have been found to be less likely than those who did not receive social support to engage in condomless anal intercourse with any male sex partner, more likely to have been tested recently for HIV, and less likely to be HIV infected when tested [32, 35]. Social support can buffer the potentially negative effects of racism and homophobia on participation by Non-Hispanic black and Hispanic/Latino MSM in earlier rather than delayed HIV testing and related services by contributing to a supportive environment for their participation [33, 36]. Social support has been found to moderate the relationship between co-occurring factors that can contribute to a synergistic epidemic (syndemic) that can create barriers to achieving viral suppression by HIV-positive MSM who are participating

in antiretroviral therapy [39]. Conversely, a lack of social support has been associated with an increased frequency of syndemic factors that can affect HIV risks, including depression, polydrug use, and condomless anal intercourse [39].

Studies that have included solely Hispanic/Latino MSM have identified access to social support from peers and others as potentially protective against HIV risks and other health threats. Social support has been associated with HIV testing among Hispanic/Latino immigrant MSM in Seattle, Washington [40], and has been found to be protective against depression among Hispanic/Latino MSM in North Carolina who had experienced ethnic/racial or sexual discrimination [41]. By contrast, low levels of social support have been identified as potentially associated with condomless anal sex by Hispanic/Latino MSM with persons of serodiscordant or unknown HIV status in New York City and Los Angeles County [42]. Social support has also been associated with HIV protective actions by Hispanic/Latino heterosexual male migrants. Participation in social relationships, including friends and family, and membership in organizations such as church-related groups, Alcoholics Anonymous, soccer clubs, journalism, and worker's rights clubs, has been associated with consistent condom use, having fewer sex partners, and abstinence from sex [43–46].

Community Attachment

HIV-protective actions by Hispanic/Latino MSM may also be shaped by the degree to which they are attached to communities that are important to them and that may be sources of social support. These communities may be defined by a sense of affiliation or membership based on various factors, including for example, country of origin, shared racial or ethnic minority status and identity, sexual orientation or gender identity [47]. This is illustrated by study findings that greater attachment by Hispanic/Latino MSM to their ethnic community, but not to the gay community, was associated with a reduced likelihood of recent condomless anal sex. Ethnic community attachment may have contributed to HIV-related resilience among these men [48]. In some instances, however, feelings of connectedness to both Hispanic/Latino ethnic and gay communities can contribute to stress due to the potential for conflicting values, norms, and expectations of the different communities [49]. Hispanic/Latino MSM who are connected with and receive social support from gay communities, for example, may encounter barriers to receiving social support from their ethnic communities due to negative sanctions concerning their same-sex behaviors [50].

Social Support, Social Connectedness, Community Attachment, and HIV Testing by Hispanic/Latino MSM in a Southern State

Given the burden of HIV in the South, particularly among Hispanic/Latino MSM, and the importance of HIV testing as a gateway to a range of HIV prevention options, we sought to clarify the state of research on the association between social support and HIV testing among Hispanic/Latino MSM in the South and to situate the potential value of our analysis. We searched the CDC HIV/AIDS Prevention Research Synthesis (PRS) database [51] to identify studies that addressed these points. The database contains more than 92,000 citations published from 1988 through 2018 and identified by systematic searches of databases, including MEDLINE, CINAHL, EMBASE, Global Health, PsycINFO, etc., and from reference list checks and hand searches (<https://www.cdc.gov/hiv/research/interventionresearch/compendium/rr/index.html>). We searched for citations from January 2000 to August 2018, cross referencing five search term areas: MSM, gay, or homosexual; social support, social connectedness, or community attachment; testing, condom use, or prevention; Hispanic or Latino; and twelve southern states, several of which have experienced large increases in Hispanic/Latino populations since the early 1990s [13, 15]. Sixteen citations described studies that included Hispanic/Latino MSM. Of these, four citations described HIV testing or testing intentions; however, none of the citations described social support in association with HIV testing among Hispanic/Latino MSM.

To address the dearth of information on the association between social support and HIV testing among Hispanic/Latino MSM in the South that we identified with our database search, we examined this association among Hispanic/Latino MSM in North Carolina. Hispanic/Latino populations in the state increased by more than 1000% between 1990 and 2015 [11, 52], accounting for 9% of the state's population by 2016 [53]. HIV has also disproportionately affected the state. In 2016, the rate of HIV diagnosis per 100,000 population in the state ranked 10th among the 50 contiguous states and the District of Columbia [54]. The rate of HIV diagnoses among Hispanics/Latinos in North Carolina in 2017 was 268 per 100,000, compared to 970 and 138 per 100,000 among Non-Hispanic black and white individuals, respectively. The HIV infection rate among Hispanic/Latino MSM in North Carolina has also increased, from 707 per 100,000 in 2013 to 830 per 100,000 in 2017. The HIV infection rates in 2017 for Non-Hispanic black and white MSM were 2,150 per 100,000 and 230 per 100,000, respectively [55]. We also assessed the association of social connectedness and community attachment with HIV testing among the MSM in North Carolina because of the potentially complementary relationship of

these factors with social support [39]. Social support, social connectedness, and community attachment may create conditions (e.g., social relationships; shared values, knowledge, information, understandings, prescriptive and proscriptive norms; and encouragement) that are supportive of HIV-protective actions, including HIV testing.

Methods

We analyzed baseline data from a sample of 304 Hispanic/Latino MSM in North Carolina who participated in a study from December 2012 to February 2015 to assess the efficacy of the Spanish-language *HOLA en Grupos* behavioral HIV prevention intervention to promote HIV testing and consistent condom use by Hispanic/Latino MSM. The intervention and randomized intervention study were developed and implemented by a community-based participatory research (CBPR) partnership with members of the Hispanic/Latino community in central North Carolina, including Hispanic/Latino MSM. Individuals who were 18 years of age or older who self-identified as a Hispanic/Latino male or transgender person, were fluent in spoken Spanish, reported sex with at least one man since age 18, had not participated in any other HIV prevention program in the previous 12 months, and provided informed consent were eligible to participate in the intervention study. The study was supported by CDC's Evaluating Locally-Developed (Homegrown) HIV Prevention Interventions for African-American and Hispanic/Latino Men Who Have Sex with Men Project, PA-09-007 [56] and approved by the Institutional Review Board of Wake Forest School of Medicine. The study's baseline assessments were administered to consenting participants before they were randomly assigned to receive *HOLA en Grupos* or a Spanish-language attention-equivalent general health education comparison intervention. Details on the development of the intervention, the study design, and the intervention outcomes have been reported elsewhere [23, 57]. CDC has determined that the intervention evaluation methodology and outcomes satisfy its criteria for classification as a Best Evidence behavioral intervention in the CDC *Compendium of Evidence-Based Interventions and Best Practices for HIV Prevention* (<https://www.cdc.gov/hiv/pdf/research/interventionresearch/compendium/rr/cdc-hiv-hola-en-grupos-best-rr.pdf>).

In this analysis, we examined the association between participants' self-reports of HIV testing during the previous 6 months and sociodemographic factors; cognitive-psychosocial factors, including social support, social connectedness, and community attachment; and behavioral risk behaviors.

Data Collection and Measures

Data were collected using a Spanish-language interviewer-administered baseline assessment questionnaire in a private, convenient, and safe location within the catchment community and took about 45 min to complete. Most questionnaire items had been validated in previous research with adult Hispanic/Latino populations in the U.S. South.

Sociodemographic Factors

The number of years foreign-born individuals had been living in the U.S was evaluated by the item, “How long have you lived in the US, total years and/or months?” Educational attainment was assessed by the item, “What is the highest level of education you reached?” and was dichotomized into participants who reported less than high school or GED and participants who reported high school, GED, or greater. Employment status was assessed by the item, “What best describes your current employment status?” and was dichotomized into participants who reported being employed year-round and those who reported working seasonally or were retired, unemployed, or not working due to disability. Language use was assessed by the item, “In which language do you feel most comfortable communicating?” Response options included Spanish only, more Spanish than English, both equally, more English than Spanish, and English only. We also collected information on participants’ age, country of birth, income, sexual orientation, and sex with women in the previous 3 months.

HIV Testing

We assessed HIV testing based on each participant’s yes or no response to the following question in the baseline questionnaire: “During the past 6 months, have you been to a clinic, hospital, health department, or doctor’s office to be tested for HIV?”

Cognitive-Psychosocial Factors

Social Support We used two measures of social support. The first measure was an adapted version of the Index of Sojourner Social Support (ISSS) Scale ($\alpha=0.83$) [58, 59] to assess general social support. The second measure was an adapted version of a scale ($\alpha=0.85$) developed by O’Donnell et al. [48] to measure HIV-related social support. The adapted ISSS Scale begins as follows: “I am going to read you a list of tasks or behaviors; tell me if you know persons in North Carolina or outside North Carolina with whom you are maintaining some form of regular contact,

who would perform each helpful behavior.” It includes 18 actions (e.g., “Comfort you when you feel homesick” and “Visit you to see how you are doing”) with response options ranging from “No one would do this” (0) to “Many would do this” (4). The adapted HIV-related social support scale asks: “In the past 6 months, how often has each of the following kinds of support been available to you if you needed it?” and included five scenarios: “Someone you could share your concerns about HIV/AIDS with;” “Someone you could talk to about your sexual fantasies;” “Someone you could talk to about safer sex;” “Someone you could talk to about getting tested for HIV;” and “Someone you could tell if you were having unsafe sex.” Response options range from “Never” (0) to “Always” (4).

Social Connectedness We assessed social connectedness using measures of ethnic identity, religiosity, and acculturation. The 12-item Multigroup Ethnic Identity Measure ($\alpha=0.80$ in this sample) [60] assessed connectedness with other Hispanics/Latinos. Scale items include “I have a clear sense of my ethnic background and what it means to me” and “I have a lot of pride in my ethnic group.” Items use a Likert scale that range from “Strongly disagree” (1) to “Strongly agree” (4). To measure connectedness to others based on shared religious values and beliefs and membership in a community based on these factors, we used two items from the 10-item Santa Clara Strength of Religious Faith Questionnaire. The scale items used were “I consider myself active in my faith or church” and “I enjoy being around others who share my faith.” Items also use a Likert scale with response options that range from “Strongly disagree” (1) to “Strongly agree” (4) and overall has demonstrated good reliability when used in English and Spanish ($\alpha=0.90$) [61]. We used the 12-item Short Acculturation Scale for Hispanics/Latinos ($\alpha=0.88$ in this sample) [62] to measure connectedness to Hispanic/Latino, compared to non-Hispanic/Latino values, beliefs, and language. Higher scores indicated greater identification with Hispanic/Latino ethnicity, a greater sense of connectedness with faith-related activities, and greater overall acculturation to non-Hispanic/Latino values.

Community Attachment We assessed community attachment with a measure adapted from previous research that focused on attachment to communities having one or more dimensions [48]. Thus, we assessed attachment to the gay community, the Hispanic/Latino community, the Hispanic/Latino gay community, the transgender community, and the Hispanic/Latino transgender community, using the following items: “Please indicate how much you feel a part of or connected to the gay community;” “Please indicate how much you feel a part of or connected to the Latino community;” “Please indicate how much you feel a part of or

connected to the Latino gay community”; “Please indicate how much you feel a part of or connected to the transgender community”; and “Please indicate how much you feel a part of or connected to the Latino transgender community,” respectively. Response options were “Not at all” (0), “Very little” (1), “A little” (2), “Somewhat” (3), “Moderately” (4), or “To a great extent” (5). Attachment items were recoded as “yes” if participants reported with a response of “Moderately, or “To a great extent” and “no” with a response of “Not at all,” “Very little,” “A little,” “Somewhat.”

Additional Cognitive-Psychosocial Factors We also measured the following cognitive-psychosocial factors: HIV and STD-related knowledge; adherence to traditional Hispanic/Latino notions of masculinity; and discrimination based on ethnicity and sexual orientation/gender identity. We measured HIV- and STD-related knowledge with an 18-item measure and a 15-item measure, respectively, using true–false items that covered types of diseases, modes of transmission, signs, symptoms, prevention strategies, and the magnitude of HIV and STDs in Hispanic/Latino communities and among Hispanic/Latino MSM. Examples of items include “Latinos in the US have higher rates of HIV infection than non-Hispanic/Latino whites” and “Syphilis infection in North Carolina is increasing among men who have sex with men.” We have successfully used these measures in studies with Spanish-speaking Hispanic/Latino men [63]. We assessed adherence to traditional Hispanic/Latino notions of masculinity with an adapted 26-item version of the Conformity to Masculine Norms Inventory ($\alpha=0.82$) [64]. Response options range from “Strongly disagree” (1) to “Strongly agree” (4). Perceived discrimination was measured using items that have been adapted from a study of unfairness [65]. Discrimination based on race/ethnicity was assessed by the three items that included, “Since coming to the United States, I often have the feeling that I am being treated unfairly because of my race/ethnicity.” Discrimination based on sexual orientation/gender identity was assessed by the three items that included, “Since coming to the United States, I often have the feeling that I am being treated unfairly because of my sexual orientation/gender identity.” Response options range from “Strongly disagree” (1) to “Strongly agree” (4). Higher scores indicated greater HIV/STD-related knowledge, greater adherence to traditional Hispanic/Latino notions of masculinity, and discrimination based on ethnicity and sexual orientation/gender identity.

Risk Behaviors

We assessed the following behaviors that can increase the risks of HIV infection: transactional sex in the past three months involving the exchange of money, drugs, alcohol,

and/or shelter; drunkenness during a typical week; past 12-month alcohol use; past 12 month drug use; drunkenness immediately before or during sex in the past 30 days; and being high on drugs immediately before or during sex in the past 30 days. The risk behavior measures have been used previously with Spanish-speaking populations in the U.S. South [8, 66].

Analysis

Descriptive statistics were calculated, including frequencies and percentages for categorical variables or means and standard deviations (SD) and ranges for continuous variables. Correlations between covariates were assessed to detect multicollinearity. No covariates were highly correlated (i.e., with $\rho \geq 0.70$). Logistic regression models were used to identify factors associated with HIV testing in the past 6 months. First, we fit univariate logistic regression models to examine the association between HIV testing and each sociodemographic characteristic, cognitive-psychosocial factor, social support, social connectedness, community attachment, and risk behaviors. Odds ratios (OR) and 95% confidence intervals (CI) were calculated for each univariate model. HIV testing correlates that were significant at $p \leq 0.05$ in the univariate logistic regression analyses were included in a multivariable model. Adjusted odds ratios (AOR) and 95% CI were calculated for the multivariable model to assess the magnitude of association between HIV testing and the other factors included in the analysis. All statistical analyses were performed using SAS version 9.4 (SAS Institute Inc, Cary, North Carolina).

Results

Participant Characteristics

Participants’ mean age was 30 years (SD = 8.9 years; range: 18–55 years). Most (91%) were foreign-born; 62% were born in Mexico; 6% in Honduras; 5% in El Salvador; 4% in Guatemala; and 13% in other Central American, South American, Caribbean, or European countries; 9% were born in the U.S. Foreign-born participants had been living in the U.S. for a mean of 13.5 years (SD = 8.2 years; range: 0.1–50.5 years). Nearly half (45%) had less than a high school education or GED equivalent; 74% were employed year-round, of whom 80% earned less than \$2000 per month. Nearly two-thirds (64%) spoke only or mostly Spanish. Most participants (66%) self-identified as gay, 23% as bisexual, 5% as heterosexual, and 6% as male-to-female transgender. Ten percent of participants reported sex with women in the past 3 months. Nearly one-third (32%) reported that they had been tested for HIV in the past 6 months (Table 1).

Univariate and Multivariable Logistic Regression Analyses Results

In univariate logistic regression analyses, completion of high school, GED or greater (OR = 2.82; 95% CI: 1.67, 4.76), and greater HIV (OR = 1.27; 95% CI: 1.11, 1.46) and STD-related (OR = 1.13; 95% CI: 1.01, 1.27) knowledge, general (OR = 1.04; 95% CI: 1.02, 1.05) and HIV-related social support (OR = 1.12; 95% CI: 1.08, 1.17), acculturation (OR = 1.05; 95% CI: 1.02, 1.08), and gay community attachment (OR = 1.73; 95% CI: 1.04, 2.87), were significantly associated with an increased odds of HIV testing in the past 6 months, while speaking only Spanish (OR = 0.31; 95% CI: 0.16, 0.57), and greater adherence to traditional Hispanic/Latino notions of masculinity (OR = 0.96; 95% CI: 0.93, 0.99) were associated with decreased odds of HIV testing in the past 6 months. In multivariable logistic regression analysis, general (AOR = 1.02; 95% CI: 1.00, 1.04) and HIV-related social support (AOR = 1.07; 95% CI: 1.01, 1.12) and greater HIV-related knowledge (AOR = 1.20; 95% CI: 1.01, 1.45) were significantly associated with an increased odds of HIV testing in the past 6 months; speaking only Spanish (AOR = 0.54; 95% CI: 0.22, 0.91) was associated with a decreased odds of HIV testing in the past 6 months.

Several characteristics were not significant in the univariate logistic regression analyses and thus were not included in the multivariable logistic regression analysis. These characteristics included sociodemographics such as age, number of years living in the U.S., and country of birth; psychosocial factors such as discrimination, ethnic identity, and religiosity; and risk behaviors such as transactional sex and alcohol and drug use (Table 2).

Discussion

We used univariate and multivariable logistic regression analyses to examine the association between independent variables that included social support, social connectedness, community attachment and other cognitive-psychosocial factors; sociodemographic characteristics; risk behaviors; and the dependent variable of self-reported HIV testing in the past 6 months by 304 Hispanic/Latino MSM in North Carolina. We selected HIV testing as a dependent variable because of its critical role as a first step toward potential participation in a range of HIV prevention strategies. In the univariate logistic regression analyses, general and HIV-related social support, acculturation, gay community attachment, HIV and STD-related knowledge, and greater education were associated with greater odds of HIV testing in the past 6 months; adherence to traditional Hispanic/Latino notions of masculinity and speaking only Spanish were associated

with reduced odds of HIV testing. In the multivariable logistic regression analysis, general and HIV-related social support and greater HIV-related knowledge were associated with HIV testing in the past 6 months, while speaking only Spanish was associated with not being tested for HIV. We believe that ours is the first study to examine the association of social support and related factors with HIV testing among Hispanic/Latino MSM in the South, a region where the burden of HIV is heavy and that has experienced large increases in Hispanic/Latino populations. Given the dearth of published research concerning the association of social support and HIV testing among Hispanic/Latino MSM in the South, particular attention is warranted concerning these issues in this region of the U.S.

The observed associations between general and HIV-related social support and HIV testing are consistent with findings from studies that have focused on related issues among MSM of color, including Hispanic/Latino MSM in areas outside the South: Philadelphia, New York City, Los Angeles County, and Seattle [32, 35, 40]. The uniqueness of social support (when it occurs) resides in its spontaneous occurrence within pre-existing social relationships. This contrasts with the effects of HIV prevention initiatives by researchers and practitioners who design interventions and prevention programs to introduce social support processes from outside the communities that are their focus. As Herrick et al. [25–27] have observed, these externally induced interventions may not draw from or build upon social strengths that can occur among communities of MSM, including Hispanic/Latino MSM, and that can contribute to HIV-related resilience.

The association between greater HIV-related knowledge and HIV testing is not surprising, considering the likelihood that such knowledge may include an awareness of the value of HIV testing for purposes of HIV prevention. Participants who reported speaking only Spanish were less likely to report having had an HIV test. This pattern of language use may create barriers to accessing information about HIV/STDs and HIV prevention options, resulting in a lack of accurate knowledge about HIV transmission, prevention, and how and where to access HIV-related services. With specific reference to North Carolina where we conducted our study, resources needed to address these barriers may be limited. Rhodes et al. [14] have identified a lack of bilingual and bicultural services for Hispanics/Latinos and limited expertise concerning MSM-related health issues among health care providers in the state as contributing to barriers to participation by Hispanic/Latino MSM in prevention programs.

In other instances, however, health care providers, particularly those who exhibit cultural sensitivity relative to Hispanic/Latino MSM and Hispanic/Latino values and social norms, may provide support for HIV testing and

Table 1 Selected sociodemographic characteristics of Hispanic/Latino MSM participants in HOLA en Grupos intervention study at baseline (N = 304), Central NC, 2012

Characteristics	N (%) or mean (SD)
Age (years)	30.4 (8.9)
Country of birth	
Mexico	186 (62.0)
United States	28 (9.3)
Honduras	19 (6.3)
El Salvador	16 (5.3)
Guatemala	13 (4.3)
Other*	38 (12.8)
Number of years foreign-born participants had been living in US	13.5 (8.2)
Less than high school education or GED equivalent	135 (44.9)
Employed year round	224 (74.4)
< \$2000 income/month	194 (80.2)
Language use	
Only Spanish	108 (35.5)
More Spanish than English	85 (28.0)
Both equally	111 (36.5)
Sexual orientation/Gender identity	
Gay	194 (65.8)
Bisexual	69 (23.4)
Heterosexual	15 (5.1)
Male-to-female transgender	17 (5.8)
Sex with women in past 3 months	29 (9.7)
HIV-related knowledge	13.1 (2.0)
STD-related knowledge	8.6 (2.1)
Adherence to traditional notions of masculinity	1.9 (0.32)
Discrimination based on ethnicity	2.3 (0.7)
Discrimination based on sexual orientation/gender identity	2.1 (0.86)
Social support	
General social support	1.9 (1.1)
HIV-related social support	1.5 (1.3)
Social connectedness	
Ethnic identity	2.95 (0.5)
Religiosity	2.38 (0.6)
Acculturation	2.3 (0.8)
Community attachment	
Gay community attachment	94 (30.9)
Latino community attachment	184 (60.5)
Latino gay community attachment	98 (32.3)
Transgender community attachment	40 (13.2)
Latino transgender community attachment	39 (12.8)
Transactional sex, past 3 months	49 (16.2)
Drug use, past 12 months	116 (38.4)
Typical week drunkenness	109 (37.7)
Alcohol use, past 12 months	261 (86.1)
Drunk immediately before or during sex, past 30 days	61 (21.3)
High on drugs immediately before or during sex, past 30 days	22 (7.6)
Tested for HIV in past 6 months	97 (32)

*Argentina, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Italy, Nicaragua, Panama, Puerto Rico, and Venezuela

Table 2 Univariate and multivariable logistic regression analyses: Associations of HIV testing among Hispanic/Latino MSM participants in HOLA en Grupos intervention study at baseline (N=304), Central NC, 2012

Characteristics	Univariate model OR (95% CI)	Multivariable model AOR (95% CI)
Age	0.99 (0.97, 1.02)	NI
Country of birth		
Mexico	0.69 (0.30, 1.56)	NI
Central or South American or Caribbean Countries ^a	0.75 (0.31, 1.80)	NI
USA or other countries ^b		
Increased number of years living in US	1.00 (1.00, 1.00)	NI
High school or above educational attainment	2.82 [†] (1.67, 4.76)	1.81 (0.95, 3.44)
Employed year round	1.38 (0.78, 2.45)	NI
Language use		
Only Spanish	0.31 [†] (0.16, 0.57)	0.54 [†] (0.22, 0.91)
More Spanish than English	0.85 (0.49, 1.52)	0.90 (0.47, 1.74)
Both equally ^b		
HIV-related knowledge	1.27 [†] (1.11, 1.46)	1.20 [†] (1.01, 1.45)
STD-related knowledge	1.13 [†] (1.01, 1.27)	0.98 (0.84, 1.13)
Adherence to traditional notions of masculinity	0.96 [†] (0.93, 0.99)	1.00 (0.96, 1.03)
Discrimination based on ethnicity	1.08 (0.97, 1.22)	NI
Discrimination based on sexual orientation/gender identity	1.04 (0.94, 1.14)	NI
Social support		
General social support	1.04 [†] (1.02, 1.05)	1.02 [†] (1.00, 1.04)
HIV-related social support	1.12 [†] (1.08, 1.17)	1.07 [†] (1.01, 1.12)
Social connectedness		
Ethnic identity	1.02 (0.97, 1.06)	NI
Religiosity	0.98 (0.95, 1.02)	NI
Acculturation	1.05 [†] (1.02, 1.08)	1.01 (0.97, 1.06)
Community attachment		
Gay community attachment	1.73 [†] (1.04, 2.87)	1.08 (0.58, 2.00)
Latino community attachment	0.78 (0.48, 1.28)	NI
Latino gay community attachment	1.36 (0.82, 2.26)	NI
Transgender community attachment	0.78 (0.37, 1.64)	NI
Latino transgender community attachment	0.70 (0.33, 1.51)	NI
Transactional sex, past 3 months	1.30 (0.69, 2.47)	NI
Drug use, past 12 months	1.56 (0.95, 2.56)	NI
Typical week drunkenness	1.31 (0.79, 2.18)	NI
Alcohol use, past 12 months	0.92 (0.46, 1.84)	NI
Drunk immediately before or during sex, past 30 days	0.85 (0.46, 1.57)	NI
High on drugs immediately before or during sex, past 30 days	1.25 (0.51, 3.10)	NI

OR odds ratio, CI confidence interval, AOR adjusted odds ratio, NI not included in multivariable modeling because not significant in univariate logistic regression analysis

[†]P ≤ 0.05

^aArgentina, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, El Salvador, Guatemala, Honduras, Nicaragua, Panama, Puerto Rico, Venezuela

^bReferent category

potential participation in other HIV-related services. Both Joseph et al. [67] and Oster et al. [68], for example, observed that Hispanic/Latino MSM who disclosed their sexual orientation and contacts with male sex partners to care providers were more likely to be tested for HIV than those who did not. Although these authors do not describe the content

of conversations between Hispanic/Latino MSM and care providers during and after these disclosures, providers may have been supportive once they understood the men's circumstances. Thus, providers may be able to do more than providing information to Hispanic/Latino MSM about HIV testing and options for engaging in HIV prevention and care.

They may also be able to support interest, intentions, a sense of self-efficacy, and actions by Hispanic/Latino MSM to be tested for HIV and engage in other HIV-related services in spite of concerns about stigma and the fear of receiving HIV positive test results. Both of these concerns have been described as barriers to HIV testing by Hispanic/Latino MSM and other MSM of color [67–69].

Counseling and HIV testing for Hispanic/Latino MSM and their sex partners within the context of ongoing couple relationships provide a unique opportunity for providers to deliver information and support to these MSM relative to ensuring the continued well-being of their relationships [69]. By promoting dialogue, HIV testing, and mutual disclosure by both partners in safe settings, providers of couples HIV counseling and testing can work with both members to identify cooperative, joint actions for protecting the seronegativity of one or both partners and, in the case of couples with HIV serodiscordant members, engage in protective actions and access HIV care. The result may be greater mutual social support for HIV-protective actions by couples that include Hispanic/Latino MSM [37].

We included the cognitive-psychosocial factors of social connectedness and community attachment in our analysis because of their potential contribution to or co-occurrence with social relationships that can produce social support for HIV-protective actions, including HIV testing. Neither of these factors was associated with HIV testing in the multivariable logistic regression analysis. We cannot explain the finding concerning the lack of associations. However, acculturation, a measure of social connectedness in our analysis, and gay community attachment, a measure of community attachment, were associated with HIV testing in univariate logistic regression analysis. Greater acculturation may contribute to and result in part from exposure to health-related information, including information about HIV prevention and the value of being tested for HIV. It is possible, however, that Spanish only language use, which was negatively associated with HIV testing in multivariable logistic regression analysis, creates barriers to accessing information about HIV prevention, and these may negatively affect the potentially positive effects of acculturation and assimilation relative to health-promoting values and social norms. Likewise, we would expect gay community attachment to be associated with HIV testing. The social relationships that can develop among Hispanic/Latino MSM and contribute to their attachments to members of the Hispanic/Latino gay community may also increase their access to and the sharing of information about HIV prevention and health-promotion. In these instances, the information may specifically address the needs and priorities of men who may be socially marginalized because of their ethnic minority status and their participation in male-to-male sex. Conversely, attachment to the gay community may not focus or not focus sufficiently,

on HIV-related issues and thereby may not be supportive of HIV-protective actions such as HIV testing. The lack of attachment to the broader gay community in the multivariable analysis and to the Hispanic/Latino gay community in both univariate and multivariable analyses may also reflect a distancing of the men in our study from communities of MSM due to the effects of Hispanic/Latino cultural norms concerning male gender roles, a rejection of homosexuality, and internalized homophobia [67, 68]. The connection between gay community attachment versus Hispanic/Latino gay community attachment and HIV-protective actions needs to be clarified.

Our analysis adds to evidence suggesting the potential contribution that social support and the social relationships or networks that provide it may make to HIV-protective actions by MSM of color and in particular, Hispanic/Latino MSM. However, just *how* these social relationships provide support and shape the HIV risks and protective actions of these MSM needs to be better understood. It is noteworthy that the lack of clarity concerning this issue affects multiple studies that describe an association of social support with HIV-protective actions by Hispanic/Latino heterosexual male migrants and immigrants [43–45] and by Hispanic/Latino MSM [35]. These studies do not describe how norms, values, and interpersonal supportive relationship processes that underlie and produce the observed associations, operate and shape HIV risks. Lauby et al. [35] note explicitly that their study of the association between supportive social relationships and HIV testing and HIV risk behaviors among Hispanic/Latino and black MSM does not address *how* the supportive relationships affected their HIV risks and testing behaviors, and they argue that research is needed on this point. Nevertheless, the authors suggest several possible explanations for their findings that merit further examination. Supportive individuals, for example, may influence the thoughts and actions of those they support by providing HIV-related information, encouraging HIV testing and protective actions, modeling actions to increase self-efficacy for engaging in HIV-protective actions, and providing emotional support. Furthermore, persons who benefit from strong supportive relationships may be less fearful of rejection due to disclosure of HIV-positive test results, and may be more “socially engaged, psychologically healthy, and happier with life” (p. 513), thereby more motivated to engage in HIV-protective actions.

In our analysis, we are primarily interested in how social support processes that can occur among Hispanic/Latino MSM may contribute to or be strengthened to promote their participation in HIV testing and other potentially HIV-protective actions. However, we need to acknowledge the possibility that social support processes may also contribute to negative health outcomes [70]. Research on the potential

negative effects of social support processes on HIV-related outcomes among Hispanic/Latino MSM appears to be limited. For example, a very detailed review of numerous studies that examine the association between alcohol use, particularly binge drinking, and HIV risk behaviors by MSM, including Hispanic/Latino MSM, does not provide information on situational group processes that may contribute to drinking and increased HIV risks [71]. Although not focused on Hispanic/Latino MSM, a study by Organista et al. [72] of heterosexual Hispanic/Latino migrant day laborers illustrates how group processes and situational social support can lead to potentially negative health outcomes. In this instance, heavy drinking by the men as a group led to unprotected sex with female sex partners.

Multiple factors can create barriers to access by Hispanic/Latino MSM to HIV prevention-related information and participation in HIV-related services. These factors may include being subject to social marginalization, stigmatization, and discrimination due to their ethnicity and sexual orientation/gender identity. For those who are in the U.S. without documentation, fear of disclosure, detention, and possible deportation may contribute to a reticence to interact with health care systems. Limited spoken or written English capacity and limited health literacy may also create barriers to their participation. The effects of these factors may be accentuated in southern states such as North Carolina that are relatively recent Hispanic/Latino destinations, and where the capacity of existing health infrastructure to provide services to Hispanic/Latino MSM in a manner that is linguistically and culturally competent and sensitive to their circumstances may be limited. Given the role of social support relationships as sources of, or as facilitating access to social-emotional and material resources that can assist Hispanic/Latino MSM efforts to cope with the challenges of everyday life, particularly in the South, building on these existing relationships may be useful for HIV prevention with these MSM in this region of the U.S. Adopting this approach may increase the likelihood that HIV prevention and health promotion-related values will develop and be sustained among the values and social norms currently shared by Hispanic/Latino MSM in social relationships that focus on the well-being of members and potentially, the larger community of Hispanic/Latino MSM [46].

Progress with understanding and potentially harnessing social support processes that occur among Hispanic/Latino MSM for purposes of HIV prevention will require improved understandings of how social support can shape HIV risks with positive or negative consequences for these MSM. Needed queries should move beyond analyses based on study findings that rely on cross-sectional, largely quantitative data to include analysis of in-depth qualitative data. In addition, studies are needed to examine the factors and broader circumstances that can promote or inhibit the

availability of social support among these MSM. The use of prospective study designs should provide useful data on factors that can affect social support and HIV-protective actions among Hispanic/Latino MSM over time. These factors may be similar to those that have been identified as potentially affecting social support among Hispanic/Latino migrants and immigrants in the U.S. Potential influencing factors include but are not limited to economic growth, resulting job opportunities and the growth of Hispanic/Latino communities, versus the negative effects of economic downturn resulting in job losses and disruption of extant Hispanic/Latino communities due to persons leaving to seek jobs in other cities and states [46].

Operational research [73] or community-based participatory research [74] may be useful for purposes of clarifying the potential for linking spontaneously occurring social support relationships and processes that can occur among Hispanic/Latino MSM with initiatives to promote their access to and participation in HIV testing, prevention, care, and related services. These approaches may be used to implement discovery-related studies to obtain basic information needed to characterize the forms, functions, and positive or negative effects of social support relationships and processes among Hispanic/Latino MSM; conduct pilot or proof-of-concept activities to incorporate or build on existing social support relationships and processes for purposes of promoting HIV testing and HIV prevention; and assess the effectiveness of implemented activities.

Researchers and/or prevention program staff in partnership with members of Hispanic/Latino MSM communities would first need to identify and characterize forms, circumstances, and functions of social support in a given community of Hispanic/Latino MSM or a community that includes these MSM. Queries could use evidence obtained from the MSM, from health care providers who serve them and, if available, research-based or epidemiologic evidence concerning particular problems related to the spread of HIV infection, the prevalence of HIV risk behaviors (e.g., condomless anal sex), or evidence concerning the existence of particularly effective forms of health-promoting social support among members of the MSM community. Prioritized social support relationships and processes would include those that lend themselves to increasing awareness and the sharing of information among Hispanic/Latino MSM about health promotion and potential participation in health promoting actions, including HIV testing and prevention. This information would be used by the researcher/prevention program/Hispanic/Latino MSM community partnership to develop strategies for incorporating or reinforcing the identified social support relationships and processes for purposes of promoting awareness and participation in HIV-protective actions. For example, Hispanic/Latino MSM who participate in recurring relationships that afford social support to

members, be it informational, emotional, or material support or some combination thereof, could be invited to participate in awareness-raising and informational or training activities concerning the value of and means of accessing HIV testing and other HIV-related services. They would then participate in the propagation of information about HIV testing and prevention-related topics to other Hispanic/Latino MSM in their social relationships and to persons (MSM and non-MSM) in the broader community who are not necessarily members of existing social support networks. They could engage in other activities identified by them and/or the partnership members identify as being particularly useful. These activities could include participation in events to increase awareness of and participation in HIV testing, distribution of informational handouts, and one-on-one and small group discussions with other Hispanic/Latino MSM and community members to actively promote and support participation in HIV testing and other HIV-protective actions. They would follow up with contacted persons to learn whether they were tested for HIV, learn why they were tested or not, and ascertain what measures may be taken to help individuals overcome the barriers they describe. This pilot activity could be assessed most simply for promising evidence of effectiveness through the collection of information from Hispanic/Latino MSM in the recurring support relationships to estimate the prevalence of HIV testing or testing rates before the activity started and after a period of time (e.g., 3 months) following the start of the activity.

The intervention study by Rhodes et al. [75] is of particular interest. Rhodes et al. and members of a CBPR partnership developed, implemented, and assessed a behavioral HIV prevention intervention for male heterosexual Hispanic/Latino immigrants in central, largely rural North Carolina. Members of soccer teams were trained as lay health advisors (*navegantes*) to promote condom use and HIV testing by fellow team members. At the follow-up assessment, more soccer team members who participated in the lay health advisors' activities reported consistent condom use and HIV testing than those who had not. The study provides limited details concerning the nature of the supportive relationship structures, processes, and shared values and norms that produced and reproduced the soccer team-related social networks they refer to, and that contributed in turn to the observed reductions in intervention participants' HIV/STD risk behaviors. The authors acknowledge the need for greater clarity on these issues. This intervention does not focus on Hispanic/Latino MSM; however, the design is unique and instructive in that it illustrates the use of pre-existing social relationships as the basis for activities by persons in those relationships to disseminate and reinforce HIV-prevention-related knowledge and self-efficacy by fellow soccer team members to engage in HIV protective actions.

Participation by Hispanic/Latino MSM in relationships that provide social support may constitute an underutilized resource for improving their participation in currently available biomedical and behavioral approaches to HIV prevention and for developing new prevention strategies for use with these MSM. The unique contribution to HIV prevention of focusing on social support relationships and processes that can occur among Hispanic/Latino MSM resides in its potential for building on and reinforcing community-based strengths (collective agency) that may already exist among them.

Limitations

Our study is subject to several limitations. The data used in this analysis were collected at a single time point; therefore, we are unable to describe changes over time in the association between the factors we examined and HIV testing. The data consisted of quantitative measures and do not make it possible to describe qualitatively and dynamically, the processes and factors that produce, sustain, or modify social support and how, and which types of social support may have contributed to HIV testing. Study participants were not selected from a random sample of Hispanic/Latino MSM; therefore, our findings may not be representative of these populations in other areas of North Carolina or the U.S. Finally, all data were self-reported by participants and may be subject to social desirability and/or recall bias.

Conclusions

Hispanic/Latino MSM are vulnerable to HIV infection and have experienced increasing rates of HIV relative to their non-Hispanic black and white counterparts in recent years. Their engagement in high-impact biomedical HIV prevention services and behavioral prevention interventions may be suboptimal. Hispanic/Latino MSM in the South are particularly vulnerable to the effects of HIV infection. The findings from our analysis of data from Hispanic/Latino MSM in North Carolina add to existing evidence suggesting that social support and the relationships that produce and sustain social support may be a resource to harness for HIV prevention with these populations. However, harnessing this potential resource requires improved understandings concerning how social support relationships and processes shape HIV risk and protective actions among Hispanic/Latino MSM. Furthermore, pilot efforts are needed to clarify the feasibility and potential effectiveness of linking HIV prevention and health promotion efforts with spontaneously occurring forms of social support that can occur among Hispanic/Latino gay, bisexual and men who have sex with men.

Disclaimer The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention (CDC).

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Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the Institutional Review Board of the Wake Forest School of Medicine and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This article does not contain any studies with animals performed by any of the authors.

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

References

- Bonacci RA, Holtgrave DR. Unmet HIV service needs among Hispanic men who have sex with men in the United States. *AIDS Behav.* 2016;20(10):2444–51.
- Purcell DW, Johnson CH, Lansky A, et al. Estimating the population size of men who have sex with men in the United States to obtain HIV and syphilis rates. *Open AIDS J.* 2012;6:98–107.
- Centers for Disease Control and Prevention (CDC). CDC fact sheet: HIV among gay and bisexual men. February 2017; <https://www.cdc.gov/nchhstp/newsroom/docs/factsheets/cdc-msm-508.pdf>. Accessed 1 Oct 2018.
- Centers for Disease Control and Prevention (CDC). HIV and gay and bisexual men. Updated September 26, 2018. <https://www.cdc.gov/hiv/group/msm/>. Accessed 2 Oct 2018.
- Centers for Disease Control and Prevention (CDC). HIV among Hispanics/Latinos. Division of HIV/AIDS Prevention, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention, Centers for Disease Control and Prevention. Updated October 3, 2018. <https://www.cdc.gov/hiv/group/racialethnic/hispaniclatinos/index.html>. Accessed 4 Oct 2018.
- Singh S, Song R, Johnson AS, McCray E, Hall HI. HIV incidence, prevalence, and undiagnosed infections in U.S. men who have sex with men. *Ann Intern Med.* 2018;168(10):685–94.
- Hess K. Estimating the lifetime risk of a diagnosis of HIV infection in the United States. Conference on Retroviruses and Opportunistic Infection (CROI). February 22–26, 2016; Abstract no. 52. <http://www.croiconference.org/sessions/estimating-lifetime-risk-diagnosis-hiv-infection-united-states>. Accessed 3 Oct 2018.
- Rhodes SD, McCoy TP, Hergenrather KC, et al. Prevalence estimates of health risk behaviors of immigrant Latino men who have sex with men. *J Rural Health.* 2012;28(1):73–83.
- Valverde EE, DiNenno EA, Schulden JD, Oster A, Painter T. Sexually transmitted infection diagnoses among Hispanic immigrant and migrant men who have sex with men in the United States. *Int J STD AIDS.* 2016;27(13):1162–9.
- Centers for Disease Control and Prevention (CDC). HIV in the United States by geography. Updated June 25, 2018. <https://www.cdc.gov/hiv/statistics/overview/geographicdistribution.html>. Accessed 13 Sep 2018.
- U. S. Census Bureau. Hispanic or Latino origin 2015 american community survey 1-year estimates 2015; http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_15_1YR_B03003&prodType=table. Accessed 28 Oct 2016.
- Massey D. *New faces in new places: the changing geography of american immigration.* New York: Russell Sage Found; 2008.
- Painter TM. Connecting the dots: when the risks of HIV/STD infection appear high but the burden of infection is not known—the case of male Latino migrants in the Southern United States. *AIDS Behav.* 2008;12(2):213–26.
- Rhodes SD, Hergenrather KC, Aronson RE, et al. Latino men who have sex with men and HIV in the rural south-eastern USA: findings from ethnographic in-depth interviews. *Cult Health Sex.* 2010;12(7):797–812.
- Kochar R, Suro R, Tafoya S. The new Latino south: the context and consequences of rapid population growth. Pew Research Center. July 26, 2005; <http://www.pewhispanic.org/2005/07/26/the-new-latino-south/>. Accessed 17 Feb 2018.
- Reif S, Safley D, McAllister C, Wilson E, Whetten K. State of HIV in the US deep south. *J Community Health.* 2017;42(5):844–53.
- Centers for Disease Control and Prevention (CDC). High-Impact Prevention (HIP). Updated February 22, 2018. <https://www.cdc.gov/nchhstp/highimpactprevention/index.html>. Accessed 24 Aug 2018.
- McCree DH, Walker T, DiNenno E, et al. A programmatic approach to address increasing HIV diagnoses among Hispanic/Latino MSM, 2010–2014. *Prev Med.* 2018;114:64–71.
- Centers for Disease Control and Prevention (CDC). HIV infection risk, prevention, and testing behaviors among men who have sex with men national HIV behavioral surveillance, 20 U. S. cities, 2014. HIV Surveillance Special Report 15. January 2016; <https://www.cdc.gov/hiv/pdf/library/reports/surveillance/cdc-hiv-hssr-nhbs-msm-2014.pdf>. Accessed 8 Aug 2018.
- Centers for Disease Control and Prevention (CDC). National HIV/AIDS strategy for the United States: Updated to 2020. July 30, 2015; <https://www.hiv.gov/federal-response/national-hiv-aids-strategy/nhas-update>. Accessed 1 Oct 2018.
- Singh S, Mitsch A, Wu B. HIV care outcomes among men who have sex with men with diagnosed HIV infection—United States, 2015. *MMWR Morb Mortal Wkly Rep.* 2017;66(37):969–74.
- O'Donnell L, Stueve A, Joseph HA, Flores S. Adapting the VOICES HIV behavioral intervention for Latino men who have sex with men. *AIDS Behav.* 2014;18(4):767–75.
- Rhodes SD, Alonzo J, Mann L, et al. Small-group randomized controlled trial to increase condom use and HIV testing among Hispanic/Latino gay, bisexual, and other men who have sex with men. *Am J Public Health.* 2017;107(6):969–76.
- Gwadz MV, Clatts MC, Yi H, Leonard NR, Goldsamt L, Lankenau S. Resilience among young men who have sex with men in New York City. *Sex Res Social Policy.* 2006;3(1):13–21.
- Herrick AL, Lim SH, Wei C, et al. Resilience as an untapped resource in behavioral intervention design for gay men. *AIDS Behav.* 2011;15(Suppl 1):S25–9.
- Herrick AL, Stall R, Chmiel JS, et al. It gets better: resolution of internalized homophobia over time and associations with positive health outcomes among MSM. *AIDS Behav.* 2013;17(4):1423–30.
- Herrick AL, Stall R, Goldhammer H, Egan JE, Mayer KH. Resilience as a research framework and as a cornerstone of prevention

- research for gay and bisexual men: theory and evidence. *AIDS Behav.* 2014;18(1):1–9.
28. Kubicek K, McNeely M, Holloway IW, Weiss G, Kipke MD. “It’s like our own little world”: resilience as a factor in participating in the ballroom community subculture. *AIDS Behav.* 2013;17(4):1524–39.
 29. Schrage SM, Latkin CA, Weiss G, Kubicek K, Kipke MD. High-risk sexual activity in the House and Ball community: influence of social networks. *Am J Public Health.* 2014;104(2):326–31.
 30. Harper GW, Bruce D, Hosek SG, Fernandez MI, Rood BA. Resilience processes demonstrated by young gay and bisexual men living with HIV: implications for intervention. *AIDS Patient Care STDS.* 2014;28(12):666–76.
 31. Kurtz SP, Buttram ME, Surratt HL, Stall RD. Resilience, syndemic factors, and serosorting behaviors among HIV-positive and HIV-negative substance-using MSM. *AIDS Educ Prev.* 2012;24(3):193–205.
 32. Carlos JA, Bingham TA, Stueve A, et al. The role of peer support on condom use among black and Latino MSM in three urban areas. *AIDS Educ Prev.* 2010;22(5):430–44.
 33. Jeffries WL 4th, Townsend ES, Gelaude DJ, Torrone EA, Gasiorowicz M, Bertolli J. HIV stigma experienced by young men who have sex with men (MSM) living with HIV infection. *AIDS Educ Prev.* 2015;27(1):58–71.
 34. Kapadia F, Siconolfi DE, Barton S, Olivieri B, Lombardo L, Halkitis PN. Social support network characteristics and sexual risk taking among a racially/ethnically diverse sample of young, urban men who have sex with men. *AIDS Behav.* 2013;17(5):1819–28.
 35. Lauby JL, Marks G, Bingham T, et al. Having supportive social relationships is associated with reduced risk of unrecognized HIV infection among black and Latino men who have sex with men. *AIDS Behav.* 2012;16(3):508–15.
 36. Scott HM, Pollack L, Rebchook GM, Huebner DM, Peterson J, Kegeles SM. Peer social support is associated with recent HIV testing among young black men who have sex with men. *AIDS Behav.* 2014;18(5):913–20.
 37. Beougher SC, Gomez W, Hoff CC. The couple as context: latino gay male couples and HIV. *Cult Health Sex.* 2011;13(3):299–312.
 38. Mitrani VB, De Santis JP, McCabe BE, Deleon DA, Gattamorta KA, Leblanc NM. The impact of parental reaction to sexual orientation on depressive symptoms and sexual risk behavior among Hispanic men who have sex with men. *Arch Psychiatr Nurs.* 2017;31(4):352–8.
 39. Friedman MR, Coulter RW, Silvestre AJ, et al. Someone to count on: social support as an effect modifier of viral load suppression in a prospective cohort study. *AIDS Care.* 2017;29(4):469–80.
 40. Solorio R, Forehand M, Simoni J. Attitudes towards and beliefs about HIV testing among Latino immigrant MSM: a comparison of testers and nontesters. *AIDS Res Treat.* 2013;2013:563537.
 41. Sun CJ, Ma A, Tanner AE, et al. Depressive symptoms among Latino sexual minority men and Latina transgender women in a new settlement state: the role of perceived discrimination. *Depress Res Treat.* 2016;2016:4972854.
 42. Mizuno Y, Borkowf CB, Ayala G, Carballo-Diequez A, Millett GA. Correlates of sexual risk for HIV among US-born and foreign-born Latino men who have sex with men (MSM): an analysis from the Brothers y Hermanos study. *J Immigr Minor Health.* 2015;17(1):47–55.
 43. Hirsch JS, Munoz-Laboy M, Nyhus CM, Yount KM, Bauermeister JA. They “miss more than anything their normal life back home”: masculinity and extramarital sex among Mexican migrants in Atlanta. *Perspect Sex Reprod Health.* 2009;41(1):23–32.
 44. Kissinger P, Kovacs S, Anderson-Smits C, et al. Patterns and predictors of HIV/STI risk among Latino migrant men in a new receiving community. *AIDS Behav.* 2012;16(1):199–213.
 45. Martinez-Donate A, Zhang X, Rangel G, Hovell M, Rhoads N. Discrimination, social support and stress: association with sexual risk behaviors and HIV testing rates among male Mexican migrants. Presentation at the 2015 National HIV Prevention Conference, Atlanta [abstract LB-17].
 46. Painter TM. Social support networks: an underutilized resource for the prevention of HIV and other sexually transmitted diseases among Hispanic/Latino migrants and immigrants. *J Health Care Poor Underserved.* 2018;29(1):44–57.
 47. Flores-Yeffal N. Migration-trust networks: social cohesion in Mexican U.S. bound emigration. College Station: Texas A&M University Press; 2013.
 48. O’Donnell L, Agronick G, San Doval A, Duran R, Myint UA, Stueve A. Ethnic and gay community attachments and sexual risk behaviors among urban Latino young men who have sex with men. *AIDS Educ Prev.* 2002;14(6):457–71.
 49. Gray NN, Mendelsohn DM, Omoto AM. Community connectedness, challenges, and resilience among gay Latino immigrants. *Am J Community Psychol.* 2015;55(1–2):202–14.
 50. Rhodes SD, Hergenrather KC, Vissman AT, et al. Boys must be men, and men must have sex with women: a qualitative CBPR study to explore sexual risk among African American, Latino, and White gay men and MSM. *Am J Mens Health.* 2011;5(2):140–51.
 51. DeLuca JB, Mullins MM, Lyles CM, Crepaz N, Kay L, Thadiparthi S. Developing a comprehensive search strategy for evidence based systematic reviews. *Evid Based Libr Inf Pract.* 2008;3:3–32.
 52. Pew Research Center. Demographic profile of Hispanics in North Carolina, 2014. Pew Research Center, Hispanic Trends. 2014; <http://www.pewhispanic.org/states/state/nc/>. Accessed 3 Oct 2018.
 53. Tippet R. The Hispanic/Latino community in North Carolina. UNC Carolina Population Center. <https://demography.cpc.unc.edu/2017/10/10/the-hispaniclatino-community-in-north-carolina/>. Accessed 4 Oct 2018.
 54. Centers for Disease Control and Prevention (CDC). Diagnoses of HIV infection in the United States and dependent areas, 2016. HIV Surveillance Report, 2016. November 2017;vol. 28. <https://www.cdc.gov/hiv/pdf/library/reports/surveillance/cdc-hiv-surveillance-report-2016-vol-28.pdf>. Accessed 19 Sep 2018.
 55. North Carolina HIV/STD/Hepatitis Surveillance Unit. 2017 North Carolina HIV/STD/Hepatitis surveillance report. North Carolina Department of Health and Human Services, Division of Public Health, Communicable Disease Branch. 2018; https://epi.publihealth.nc.gov/cd/stds/figures/std17rpt_rev2.pdf. Accessed 3 Oct 2018.
 56. Centers for Disease Control and Prevention (CDC). Evaluating locally-developed (homegrown) HIV prevention interventions for African-American and Hispanic/Latino men who have sex with men (MSM), funding opportunity announcement (FOA) number PA 09-007. Federal Register. 2009;74(58)13436. <https://www.gpo.gov/fdsys/pkg/FR-2009-03-27/pdf/E9-6854.pdf>. Accessed 1 Oct 2018.
 57. Rhodes SD, Alonzo J, Mann L, et al. Enhancement of a locally developed HIV prevention intervention for Hispanic/Latino MSM: a partnership of community-based organizations, a university, and the Centers for Disease Control and Prevention. *AIDS Educ Prev.* 2015;27(4):312–32.
 58. Gilbert P, Rhodes S. Psychometric performance of a novel measure of social support among Spanish-speaking immigrant Latino gay men. *Hisp J Behav Sci.* 2012;34(3):491–504.
 59. Ong ASJ, Ward C. The construction and validation of a social support measure for sojourners: the index of sojourner social support (ISSS) scale. *J Cross Cult Psychol.* 2005;36(6):637–61.
 60. Phinney J. The multigroup ethnic identity measure: a new scale for use with diverse groups. *J Adolesc Res.* 1992;7(2):156–76.

61. Plante TG, Boccaccini M. Reliability and validity of the Santa Clara strength of religious faith questionnaire. *Pastoral Psychol.* 1997;45(6):429–37.
62. Marin G, Sabogal F, Marin BV, Otero-Sabogal R, Perez-Stable EJ. Development of a short acculturation scale for Hispanics. *Hisp J Behav Sci.* 1987;9(2):183–205.
63. Rhodes SD, McCoy TP, Vissman AT, et al. A randomized controlled trial of a culturally congruent intervention to increase condom use and HIV testing among heterosexually active immigrant Latino men. *AIDS Behav.* 2011;15(8):1764–75.
64. Mahalik JR, Burns SM, Syzdek M. Masculinity and perceived normative health behaviors as predictors of men's health behaviors. *Soc Sci Med.* 2007;64(11):2201–9.
65. De Vogli R, Ferrie JE, Chandola T, Kivimaki M, Marmot MG. Unfairness and health: evidence from the Whitehall II Study. *J Epidemiol Community Health.* 2007;61(6):513–8.
66. Daniel-Ulloa J, Reboussin BA, Gilbert PA, et al. Predictors of heavy episodic drinking and weekly drunkenness among immigrant Latinos in North Carolina. *Am J Mens Health.* 2014;8(4):339–48.
67. Joseph HA, Belcher L, O'Donnell L, Fernandez MI, Spikes PS, Flores SA. HIV testing among sexually active Hispanic/Latino MSM in Miami-Dade County and New York City: opportunities for increasing acceptance and frequency of testing. *Health Promot Pract.* 2014;15(6):867–80.
68. Oster AM, Russell K, Wiegand RE, et al. HIV infection and testing among Latino men who have sex with men in the United States: the role of location of birth and other social determinants. *PLoS ONE.* 2013;8(9):e73779.
69. Neme S, Goldenberg T, Stekler JD, Sullivan PS, Stephenson R. Attitudes towards couples HIV testing and counseling among Latino men who have sex with men in the Seattle area. *AIDS Care.* 2015;27(10):1354–9.
70. Villalonga-Olives E, Kawachi I. The dark side of social capital: a systematic review of the negative health effects of social capital. *Soc Sci Med.* 2017;194:105–27.
71. Woolf SE, Maisto SA. Alcohol use and risk of HIV infection among men who have sex with men. *AIDS Behav.* 2009;13(4):757–82.
72. Organista KC, Worby PA, Quesada J, Arreola SG, Kral AH, Khoury S. Sexual health of Latino migrant day labourers under conditions of structural vulnerability. *Cult Health Sex.* 2013;15(1):58–72.
73. Herbst JH, Glassman M, Carey JW, et al. Operational research to improve HIV prevention in the United States. *J Acquir Immune Defic Syndr.* 2012;59(5):530–6.
74. Rhodes SD, Mann L, Alonzo J, et al. CBPR to prevent HIV within racial/ethnic, sexual, and gender minority communities: successes with long-term sustainability. In: Rhodes SD, editor. *Innovations in HIV prevention research and practice through community engagement.* New York: Springer; 2014. p. 135–60.
75. Rhodes SD, Hergenrather KC, Bloom FR, Leichter JS, Montano J. Outcomes from a community-based, participatory lay health adviser HIV/STD prevention intervention for recently arrived immigrant Latino men in rural North Carolina. *AIDS Educ Prev.* 2009;21(Suppl. 5):103–8.

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