Sociodemographic Characteristics Explain Differences in Unprotected Sexual Behavior Among Young HIV-Negative Gay, Bisexual, and Other YMSM in New York City

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Abstract

Young gay, bisexual, and other men who have sex with men (YMSM) under age 30 in New York City are at high risk for acquiring HIV. Using the theoretical framing of fundamental causes, this analysis examined the extent to which sociodemographic factors (race/ethnicity, perceived familial socioeconomic status [SES], U.S.-born status, and sexual orientation) explain the likelihood that HIV-negative YMSM ages 18 and 19 engage in unprotected sexual behavior, which may place them at risk for serconversion. Data were drawn from the baseline (Wave 1) assessment of a cohort study (N = 592) collected between July 2009 and May 2011. The sample consisted predominantly of racial/ethnic minority YMSM (70.8%). A high level of association was demonstrated for each of the demographic factors with unprotected sexual behaviors. Multinomial logistic regression analyses were undertaken to examine associations between demographic covariates with the likelihood of engaging in unprotected sexual behaviors with male partners (any unprotected anal intercourse, as well as unprotected receptive anal, insertive anal, and receptive oral intercourse) irrespective of partner serostatus, in the month prior to assessment. U.S-born status and perceived socioeconomic status consistently were significant in differentiating risk behaviors. Being born outside the U.S. and perceiving a lower SES was associated with greater levels of risk. These findings suggest that efforts to address the disproportionate burden of HIV disease among YMSM in the United States must not focus solely on issues of race/ethnicity, but must be tailored and targeted to low SES and foreign-born young gay and bisexual men. It is posited that these demographic factors may lead to disproportionate levels of psychosocial burdens, which engender risk.

Introduction

YOUNG GAY, BISEXUAL, AND OTHER MEN who have sex with men (YMSM) under age 30 are at an increased risk for acquiring HIV in the United States.[1] Young adults represent one-third of the new HIV infections, and more than half of these infections are among YMSM ages 13–29 years. These health disparities are evident predominantly in urban centers such as New York City (NYC).[2,3] The proportion of cases among YMSM younger than 30 years increased from 29% of all new diagnoses in 2001 to 47% in 2009. Similarly, in a sample of YMSM in Chicago, a 14% prevalence rate of HIV was detected among men ages 16–24.[4] If unchecked, the proportion of these men who are infected will exponentially rise, as suggested in mathematical modeling.[5] Specifically, an HIV incidence rate of approximately 2–3% in the U.S. among YMSM would yield an approximate 40% HIV prevalence in the population by age 40.[5]

In the population of gay, bisexual, and other men who have sex with men (MSM), sexual behavior is the primary transmission mode for HIV. Unprotected anal intercourse is a highly efficient route for transmission of the pathogen.[6] This risk for seroconversion is highest for receptive partners but is also a risk behavior for insertive partners, albeit at a somewhat lower levels.[7] Oral intercourse as transmission modality is much more contentious,[8] although evidence suggest that performing oral intercourse may lead to the acquisition of HIV, despite the fact that this behavior is much lower risk than unprotected receptive anal intercourse.[7] Thus understanding the behaviors of YMSM provides a lens through which to understand the HIV patterns within the population.

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Throughout the last 4 decades, the extant behavioral research has identified numerous factors associated with unprotected anal intercourse and in turn HIV acquisition in YMSM.[9] Much of the behavioral research has focused on models of risk based on psychosocial states.[10] In recent years, syndemics theory as posited by Merrill Singer[11] to explain the health burdens experiences by inner city women and extended throughout the last 2 decades to the study of HIV in MSM generally,[12,13] and in YMSM specifically,[4] has gained much momentum. Syndemics theory and other psychosocial approaches to understanding both individual and population health are based on the assumptions that higher levels of psychosocial vulnerabilities lead to greater health disparities.

Another manner in which to understand HIV risk in the YMSM population is along the line of fundamental causes[14] and the extent to which demographic states may create social conditions that precede these psychosocial vulnerabilities and in turn heighten risk profiles. Given the extant literature and with regard to YMSM in the United States, such demographic states include race/ethnicity, socioeconomic status, country of birth (i.e., born in the U.S. versus not being born in the U.S.), and sexual orientation. In such a framing, it is proposed that demographic states predispose psychosocial vulnerabilities, which in turn heighten unprotected sexual behavior and increase the likelihood of HIV acquisition.

It is through the lenses of fundamental causes and syndemics theory that the following analyses were conceptualized. Specifically, the demographic states of race/ethnicity, socioeconomic status, country of birth, and sexual orientation are conceived as fundamental causes. These fundamental causes may, in turn, lead to heightened psychosocial burdens because of social and structural inequities, and, in turn, facilitate higher rates of unprotected sexual behavior, and ultimately the acquisition of HIV.

Racial and ethnic disparities in HIV rates are pronounced among YMSM.[15,16] Early work examining racial/ethnic disparities in HIV infections, such as the Young Men's Survey (1994 to 1998), found that 14% of African Americans and 7% of Hispanics were HIV-positive, compared with 3% of White YMSM.[17] In the second phase of this survey (from 1998 to 2000), racial/ethnic disparities in HIV prevalence persisted, with 32% of African Americans, 14% of Hispanic, and 7% of Whites testing HIV-positive.[18] These disparities continue to exist on the national level. For example, the Centers for Disease Control and Prevention found that in 2008, 63% of African Americans and 17% of Hispanics were HIV-positive, compared with 18% of White YMSM.[15] Furthermore, these disparities are evident in New York City, where new HIV infections among YMSM have been noted more prominently among African Americans and Hispanic men.[2,3] The proportion of cases among YMSM younger than 30 years increased from 29% of all new diagnoses in 2001 to 47% in 2009. Additionally, 77% of the YMSM in these cases were African American or Hispanic.

With regard to socioeconomic status, several studies have linked poverty as a socially produced factor with sexual risk-taking in men who have sex with men (MSM).[19–23] Rosario and colleagues[24] found that YMSM of lower socioeconomic status (SES) were more likely to engage in unprotected receptive anal intercourse than YMSM of higher SES. These associations may be even more pronounced for those with higher levels of residential instability, as these men may turn to transactional sex in order to secure essential material resources.[25,26] Moreover, men who are economically disadvantaged may have less access to gay health-related resources.[19] However, SES must be considered beyond simply being defined as income since income alone has not been found to be a significant predictor of unprotected sexual behavior in YMSM[27] or associated behaviors of illicit drug use.[28] For YMSM, issues of perceived access and inequality may be more powerful predicting unprotected sexual behavior and health. Such conceptions align with the ideas posited by Wilkinson,[29,] which suggest that greater income inequality is associated with a higher prevalence of health problems.

A growing base of literature documents HIV disparities among those born outside the United States.[30–32] In New York City, foreign-born individuals accounted for 24% of the new HIV infections among MSM of all ages, with the large majority of these men being born in the Caribbean, Central, and South America.[33] Despite this trend, little research has focused on the sexual behaviors and related predictors for HIV transmission among foreign-born YMSM.

By mid to late adolescence, many homosexual youth are likely to be aware of their attractions to other males, others will have initiated sex with other males, and some may even have reached the developmental benchmark of telling others that they are gay.[12] Depending on the social cultural context, identifying with a gay sexual orientation may be perceived as a deficiency of masculinity, socially reprehensible, or even worthy of violence, and may diminish self-concept, in turn heightening substance abuse and unprotected sexual behavior. Research suggests that the realization and disclosure of sexual identity at a younger age among YMSM may lead to an increased likelihood of depressive symptoms and a higher likelihood HIV-positive serostatus later in life.[34] Conversely, not being able to talk openly about one's sexuality or social life may lead to social alienation, low self esteem, and symptoms of psychological distress, and these stressors have been associated with unprotected sexual behaviors and difficulties negotiating safer sex, such as condom use with partners.[4] In a sample of Latino YMSM, no effects have been noted between gay identity and unprotected sexual behavior.[35] But in an ethnically and racially diverse sample of emerging adult YMSM (i.e., those transitioning between adolescence and adulthood, generally between the ages of 18–25), gay community affinity was found to be related to unprotected sexual behavior.[36] Thus, the relationship between a fully-formed gay sexual orientation on HIV transmission in YMSM requires further attention and investigation.

The overriding goal of the ensuing analyses was to examine the extent to which key sociodemographic factors, conceptualized as fundamental causes, explain the likelihood that YMSM engage in unprotected sexual behavior. Specifically, we (1) describe the unprotected anal and oral sexual behaviors with same sex partners in a new generation of YMSM who are at the onset of young adulthood, ages 18–19, and (2) examine through multivariable models the combined effects of race/ethnicity, perceived SES, U.S.-born status, and sexual orientation in explaining unprotected anal and oral intercourse.

Methods

Project 18 (P18) is a cohort study of YMSM who are first assessed at ages 18–19. Quantitative data are collected at each

assessment and HIV status is conformed through an oral antibody test. Data for the ensuing analyses were drawn from the baseline assessment.

Potential participants were recruited through both active (e.g., approaching individuals to solicit study participation) and passive (e.g., flyer posting, website advertisements) methods from June 2009 to May 2011. Eligibility criteria included being 18–19 years old at time of baseline assessment, being biologically male, residing in the New York City metropolitan area, having sex (any physical contact that could lead to orgasm) with a man in the 6 months prior to screening, and reporting a seronegative or unknown HIV status at baseline. We specifically targeted non-white racial/ethnic groups, such that African Americans, Hispanics (across race), Asian-Pacific Islanders, and mixed race men comprised the majority of the sample. All participants provided consent before data were collected and they received $35 upon completion of the baseline assessment. New York University's Institutional Review Board approved all study protocol and a federal Certificate of Confidentiality protects the data. The present analyses are restricted to the baseline data of the study.

The baseline data were collected via detailed, structured interviews by trained personnel using standardized methods. First, participants provide information on individual-level sociodemographics, global drug use behaviors, psychosocial characteristics and social factors, via audio-computer assisted self-interview. Next, data on recent sexual behaviors, detailed drug use, overlap of sexual activity and drug use, sexual partner characteristics, and context for meeting partners are obtained using a calendar-based described below. All participants were tested for the presence of HIV-antibodies using the OraQuick® Advance rapid HIV1/2 antibody test. The baseline sessions including consent procedures lasted, on average, approximately 2 h.

A total of 2,068 participants were screened for eligibility to participate in the study, and 602 participants completed the baseline assessment. The majority of the participants who were ineligible did not meet the age criterion. Two of those individuals were later identified as duplicates and eliminated yielding 600. Of these 600 who constitute the study sample, two did not provide full baseline data, and 6 participants tested HIV-positive at baseline. Thus, the sample for the ensuing analyses consisted of 592 confirmed HIV-negative YMSM.

Study measures

The baseline assessment of this study (i.e., Wave 1) ascertained data on the sociodemographic indicators. Self-reported race/ethnicity was categorized as Black non-Hispanic, Hispanic, and White-non Hispanic. A fourth group mixed race/other non-Hispanic, consisted of those who identified as Asian Pacific Islander (API) or mixed race, given the small number in each of these categories. The variable for perceived familial SES (lower, lower middle, middle, upper middle, upper) was collapsed into a trichotomy (lower, middle, upper) for analytic purposes. Participants indicated whether they were born in the United States or were foreign born. Sexual orientation was assessed via the 7-point Kinsey scale,[37] which ranges from "exclusively heterosexual" (0) to "exclusively homosexual" (6). For analytic purposes, sexual orientation was dichotomized into "exclusively homosexual" or "not exclusively homosexual" for scores of 6 versus scores of less than 6, respectively.

For the dependent variables, participants completed a 30-day calendar of their sexual behavior over the prior month with the guidance of an interviewer using the Timeline Followback method.[38] Data were collected on the frequency of unprotected sexual behaviors in the 30 days prior to the baseline assessment. Given the non-normal Poisson distribution for reported frequencies of unprotected sexual behavior, responses to these items were divided into three potential outcomes for analytic purposes: (0) no instances in the last 30 days, (1) one instance in the last 30 days, and (2) 2 or more instances in the last 30 days. These trichotomies were created for each of the following sexual behaviors: any unprotected anal intercourse (UAI), unprotected insertive anal intercourse (UIAI), unprotected receptive anal intercourse (URAI), and unprotected receptive oral intercourse (UROI, performing fellatio).

Analytic plan

We undertook a descriptive analysis to characterize the sample and assess the four sexual behavior variables. The associations between the sociodemographic characteristics were examined using chi-square tests of independence. Trichotomous versions of the unprotected sexual behavior variables were computed and the associations were tested between these variables, again through the use of chi-square tests of independence. Crude odds ratios were also computed for each of the sociodemographic variables with each of the four outcomes (i.e., the four sexual behaviors). Finally, separate polytomous (multinomial) logistic regression models were examined to determine the extent to which the demographic variables explained the likelihood each of the four self-reported unprotected sexual behaviors. Separate models were tested for anal insertive versus receptive acts, as well as oral sex, given the differential level of HIV-risk associated with each type of behavior.[7,8]

Results

Sample characteristics

Table 1 provides a summary of the sample ($n = 592$) by race/ethnicity along the three other demographic factors (i.e., perceived familial SES, nation of birth, sexual orientation). Overall, the sample consists of predominantly racial/ethnic minority YMSM ($n = 419$, 70.8%). Of the 106 participants who were classified as mixed/other other race, the profile was as follows: 27% Asian-Pacific Islander, 52% mixed race, and 21% other races, all non-Hispanic.

Differences were detected in perceived SES by race/ethnicity ($\chi2$ (6) = 86.90, $p < 0.01$). Within the overall sample, 33.4% of the YMSM identified as lower SES ($n = 198$). Hispanics (41.3%, $n = 93$) and Black non-Hispanics (53.4%, $n = 47$) indicated a higher proportion of lower SES than Whites. Differences were also detected with regard to place of birth (United States versus foreign born) ($\chi2$ (3) = 9.47, $p = 0.02$), with 11.0% indicating birth outside the United States ($n = 65$); the smallest proportion of non-U.S. births was among White YMSM (5.2%, $n = 9$). In terms of sexual orientation, 41.4% ($n = 245$) identified as exclusively homosexual but no difference existed across race/ethnicity.

Sexual behavior

Table 2 provides estimates of the frequencies for the four risk behaviors (UAI, URAI, UIAI, and UROI). As is shown, a

Table 1. Distribution of Sample Characteristics by Race/Ethnicity Among 592 YMSM, Baseline Data P18 Study, 2009–2011

	Black non-Hispanic % (n)	White non-Hispanic % (n)	Hispanic % (n)	Mixed/other race % (n)	Total % (n)	p
Perceived familial SES						<0.01
Lower (0)	53.4 (47)	14.5 (25)	41.3 (93)	31.1 (33)	33.4 (198)	
Middle	34.1 (30)	32.9 (57)	41.3 (93)	35.8 (38)	36.8 (218)	
Upper	12.5 (11)	52.6 (91)	17.3 (39)	33.0 (35)	29.7 (176)	
Sexual orientation						0.12
Not exclusively homosexual (0)	64.8 (57)	51.4 (89)	60.0 (135)	62.3 (66)	58.6 (347)	
Exclusively homosexual	35.2 (31)	48.6 (84)	40.0 (90)	37.7 (40)	41.4 (245)	
Nation of birth						0.02
Foreign-born (0)	10.2 (9)	5.2 (9)	14.2 (32)	14.2 (15)	11.0 (65)	
U.S.-born	89.8 (79)	94.8 (164)	85.8 (193)	85.8 (91)	89.0 (527)	
Total	14.9 (88)	29.2 (173)	38.0 (225)	17.9 (106)	100 (592)	

SES, socioeconomic status; US, United States.

greater proportion of the participants reported engaging in UROI in the 30 days prior to assessment than either URAI or UIAI. Specifically, 54.2% ($n=321$) of the YMSM reported engaging in at least one instance of UROI in the month prior to assessment, as compared to 11.0% ($n=65$) reporting at least one instance of UIAI, 13.7% ($n=81$) reporting at least one instance of URAI, and 19.5% ($n=115$) indicating at least one instance of either insertive or receptive anal intercourse (UAI).

We also examined the associations between the four unprotected sexual behavior variables and detected high levels of association across risk behaviors: UROI and UIAI (χ^2 (4)=46.74, $p<0.001$), UROI and URAI (χ^2 (4)=78.28, $p<0.001$), and UIAI and URAI (χ^2 (4)=116.70, $p<0.001$), and UROI with UAI (χ^2 (4)=100.63, $p<0.001$). Similarly, high levels of association were noted for binary versions of the variables: UROI and UIAI (OR=4.27; 95% CI=2.23, 8.17), UROI and URAI (OR=6.59; 95% CI=3.41, 12.74), and UIAI and URAI (OR=8.70; 95% CI=4.93, 15.34), and UROI with UAI (OR=6.09; 95% CI=3.57, 10.38). Despite these high levels of association, each trichotomous version of the sexual behavior variables was retained for multivariable modeling. given the differential HIV-risk related to each of the unprotected sexual behaviors.[7,8]

Table 2. Frequencies of Unprotected Sexual Behaviors 30 Days Prior to Assessment Among 592 YMSM, Baseline Data P18 Study, 2009–2011

	0 instances % (n)	1 instance % (n)	2+ instances % (n)
Any unprotected anal intercourse (UAI)	80.57 (477)	8.95 (53)	10.47 (62)
Unprotected receptive anal intercourse (URAI)	86.32 (511)	5.74 (34)	7.93 (47)
Unprotected insertive anal intercourse (UIAI)	89.02 (527)	5.57 (33)	5.41 (32)
Unprotected receptive oral intercourse (UROI)	45.77 (271)	20.78 (123)	33.45 (198)

Multivariable modeling

As an initial step, the associations of each of the demographic factors (sexual orientation, U.S. born status, race/ethnicity, and perceived SES) with each of the four sexual behaviors (any UAI, UIAI, URAI, UROI) were assessed. These unadjusted odds ratios are shown in Table 3 and indicate a high level of association of each of the demographic factors with the likelihood of engaging in unprotected sexual behavior. Across almost all four sexual behavior variables, identifying exclusively homosexual and being born in the U.S. was associated with lower odds of engaging in both 1 and 2 or more instances of unprotected acts as compared to no instances of unprotected acts. For race/ethnicity, compared to Black YMSM, all other YMSM indicated lower odds of the behaviors; a similar pattern emerges for those of perceived high or medium SES as compared to lower SES.

Thereafter, applying polytomous logistic regression, we examined the extent to which the demographic factors (sexual orientation, foreign-born status, race/ethnicity, perceived familial SES) explained the differences in sexual risk behavior categories [e.g., no instances, 1 instance, and 2 or more (2+) instances of unprotected sexual behavior with another man in the previous 30 days]. Separate models were tested for each UAI, URAI, UIAI, and UROI outcomes. In each model, U.S. born, not exclusively homosexual, Black non-Hispanic, and lower perceived familial SES were set as the criterion groups, and in each multinomial model, no instances of the sexual behavior was set as the reference group for the dependent variable. Individual variable fit indices are shown in Table 4. To further characterize the findings so to compare factors that differentiate 1 instance to 2+ instances of each behavior, the regressions were rerun setting 1 instance of the behavior as the reference group. These latter analyses are described but not shown in Table 4.

Unprotected anal intercourse (UAI). The model differentiating levels of UAI achieved significant ($\chi^2(14)=538.41$, $p<0.001$; Nagelkerke $R^2=67.2\%$). In this model, US-born YMSM indicated lower odds of engaging in 1 instance as compared to no instances of UAI (AOR=0.31), as well as lower odds of reporting 2 or more instances as compared to no instances (AOR=0.28). Compared to lower SES YMSM, those

TABLE 3. Unadjusted OR (95% CI)[a] of Demographic Factors with Unprotected Sexual Behavior Among 592 YMSM, Baseline Data P18 Study, 2009–2011

	UA 1 instance	UA 2+ instances	URAI 1 instance	URAI 2+ instances	UIAI 1 instance	UIAI 2+ instances	UROI 1 instance	UROI 2+ instances
Exclusively homosexual	0.10[d] (0.07, 0.17)	0.17[d] (0.12, 0.25)	0.05[d] (0.03, 0.10)	0.13[d] (0.08, 0.19)	0.07[d] (0.04,0.12)	0.06[d] (0.03, 0.10)	0.43[d] (0.30,0.60)	0.89 (0.67, 1.17)
U.S-born	0.12[d] (0.09. 0.16)	0.13[d] (0.10, 0.17)	0.07[d] (0.05, 0.10)	0.09[d] (0.07, 0.13)	0.06[d] (0.04, 0.09)	0.06[d] (0.04, 0.09)	0.44[d] (0.35, 0.66)	0.74[c] (0.61, 0.89)
Black, non-Hispanic	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hispanic	0.09[d] (0.06, 0.15)	0.14[d] (0.10, 0.22)	0.06[d] (0.03, 0.11)	0.12[d] (0.07, 0.18)	0.07[d] (0.04, 0.12)	0.05[d] (0.02, 0.09)	0.48[d] (0.34, 0.68)	0.72[b] (0.54, 0.98)
White, non-Hispanic	0.11[d] (0.07, 0.19)	0.16[d] (0.10, 0.25)	0.06[d] (0.03, 0.12)	0.11[d] (0.07, 0.18)	0.06[d] (0.03, 0.12)	0.09[d] (0.05, 0.16)	0.48[c] (0.31, 0.74)	1.19 (0.85, 1.65)
Mixed/other race	0.17[d] (0.09, 0.29)	0.08[d] (0.04, 0.18)	0.12[d] (0.07,0.23)	0.06[d] (0.02, 0.14)	0.05[d] (0.02, 0.13)	0.03[d] (0.01, 0.10)	0.38[d] (0.23,0.63)	0.55[c] (0.35, 0.85)
Low SES	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Medium SES	0.12[d] (0.08, 0.19)	0.11[d] (0.07, 0.18)	0.07[d] (0.04, 0.12)	0.07[d] (0.04, 0.13)	0.07[d] (0.04, 0.13)	0.06[d] (0.03, 0.11)	0.38[d] (0.27, 0.55)	0.65[c] (0.48, 0.88)
High SES	0.13[d] (0.08, 0.21)	0.10[d] (0.06, 0.17)	0.08[d] (0.04, 0.14)	0.08[d] (0.04, 0.14)	0.05[d] (0.02, 0.10)	0.004[c] (0.02, 0.08)	0.49[d] (0.33, 0.75)	1.06 (0.76, 1,47)

[a]0 instances is reference category. [b]$p \leq 0.05$; [c]$p \leq 0.01$; [d]$p \leq 0.001$.
UA, unprotected anal; UAI, any unprotected anal intercourse; UIAI, unprotected insertive anal intercourse; URAI, unprotected receptive anal intercourse; UROI, unprotected receptive oral intercourse.

TABLE 4. Parameter Estimates [Adjusted OR (AOR), 95% CI] from Polytomous Regressions[a] of Demographic Factors on Unprotected Sexual Behavior Among 592 YMSM, Baseline Data P18 Study, 2009–2011

	UA 1 instance	UA 2+ instances	URAI 1 instance	URAI 2+ instances	UIAI 1 instance	UIAI 2+ instances	UROI 1 instance	UROI 2+ instances
Exclusively homosexual	0.69 (0.39, 1.21)	1.32 (0.79, 2.21)	0.51 (0.25, 1.04)	1.27 (0.72, 2.24)	0.83 (0.43, 1.62)	0.66 (0.32, 1.36)	0.86 (0.56, 1.34)	1.20 (0.83, 1.73)
U.S-born	0.31[d] (0.19. 0.51)	0.28[d] (0.17, 0.47)	0.20[d] (0.11, 0.25)	0.22[d] (0.13, 0.38)	0.21[d] (0.12, 0.37)	0.24[d] (0.13, 0.44)	0.59[b] (0.37, 0.94)	0.52[b] (0.34, 0.80)
Black, non-Hispanic	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hispanic	0.32[c] (0.17, 0.62)	0.58 (0.32, 1.07)	0.31[c] (0.14, 0.68)	0.59 (0.31, 1.11)	0.33[c] (0.16, 0.68)	0.27[c] (0.12, 0.62)	0.94 (0.55, 1.62)	1.23 (0.75, 2.01)
White, non-Hispanic	0.46 (0.21, 1.03)	1.08 (0.50, 2.31)	0.45 (0.17, 1.21)	0.89 (0.38, 2.05)	0.46 (0.17, 1.21)	1.18 (0.47, 2.96)	0.99 (0.51, 1.95)	1.92[b] (1.07, 3.45)
Mixed/other race	0.57 (0.27, 1.20)	0.37[b] (0.15, 0.92)	0.68 (0.29, 1.57)	0.31[b] (0.11, 0.86)	0.26[b] (0.09, 0.72)	0.21[b] (0.06, 0.73)	0.74 (0.38, 1.44)	0.88 (0.48, 1.62)
Low SES	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Medium SES	0.77 (0.41, 1.43)	0.40[c] (0.22, 0.72)	0.65 (0.31, 1.39)	0.34[c] (0.17, 0.66)	0.64 (0.31, 1.32)	0.41[b] (0.19, 0.90)	0.70 (0.43, 1.15)	0.83 (0.54, 1.29)
High SES	0.65 (0.42,1.73)	0.32[c] (0.15, 0.66)	0.81 (0.35, 1.89)	0.37[b] (0.17, 0.81)	0.48 (0.19, 1.23)	0.20[c] (0.07, 0.57)	0.93 (0.52, 1.65)	1.23 (0.75, 2.02)

[a]0 instances is reference category; [b]$p \leq 0.05$; [c]$p \leq 0.01$; [d]$p \leq 0.001$.
UA, unprotected anal; UAI, any unprotected anal intercourse; UIAI, unprotected insertive anal intercourse; URAI, unprotected receptive anal intercourse; UROI, unprotected receptive oral intercourse.

reporting a medium and higher SES demonstrated lower odds of 2 or more instances of UAI than no instances. (AOR = 0.40 and AOR = 0.31, respectively). Finally, compared to Black non-Hispanics, mixed/other race YMSM indicated lower odds of engaging in 2 or more instances than in no instances of UAI (AOR = 0.37), and Hispanics indicated lower odds of 1 instance than no instances (AOR = 0.32). The analyses were also undertaken setting 1 instance as the reference group and indicated that compared to lower SES men, high SES YMSM are less likely to engage in 2 or more instances of UAI than 1 instances of UAI (AOR = 0.37, 95% CI = 0.14, 0.97, $p = 0.04$).

Unprotected receptive anal intercourse (URAI). Next we fit separate models for URAI and UIAI. The model for URAI was significant ($\chi^2(14) = 691.24$, $p < 0.001$; Nagelkerke $R^2 = 77.5\%$). The parameter estimates indicate that those born in the U.S. indicated lower odds of reporting 1 instance of URAI (AOR = 0.20) and lower odds of 2 or more instances of URAI (AOR = 0.22) than no instances of URAI. In addition, compared to Black non-Hispanics, Hispanic YMSM were less likely to report 1 instance than no instances of URAI, while those of mixed/other race indicated lower odds of 2 or more instances than of no instances of URAI in the previous 30 days. Both medium and higher SES YMSM indicated lower odds of 2 or more instances of URAI than no instances (AOR = 0.34 and AOR = 0.37, respectively). Analyses undertaken setting 1 instance as the reference group indicated men identifying as exclusively homosexual were more likely to engage in 2 instances or more of URAI than in one instance of URAI in the period of the assessment than men identifying as not exclusively homosexual (AOR = 2.51, 95% CI = 1.06, 5.97, $p = 0.04$).

Unprotected insertive anal intercourse (UIAI). For UIAI, the model also achieved significance ($\chi^2(14) = 785.43$, $p < 0.001$; Nagelkerke $R^2 = 82.6\%$). In this model, those born in the US were again less likely to report 1 instance and 2 instances of the behavior than no instances of the behavior in the previous 30 days (AOR = 0.21 and AOR = 0.24, respectively). As compared to Black non-Hispanics, Hispanic YMSM also indicated lower odds of 1 instance and 2 or more instances of UIAI than of no instances of the behavior (AOR = 0.33 and AOR = 0.27, respectively). A similar pattern was detected for mixed/other race YMSM (AOR = 0.26 and AOR = 0.21, respectively). Compared to lower SES YMSM, those reporting a medium and higher SES demonstrated lower odds of 2 or more instances of URAI than of no instances of URAI (AOR = 0.41, and AOR = 0.20, respectively). No demographic factors differentiated the 1 instance group from the 2 or more instances group.

Unprotected receptive oral intercourse (UROI). The model for UROI was significant albeit with less predictive power ($\chi^2(14) = 76.36$, $p < 0.001$; Nagelkerke $R^2 = 13.6\%$). Again, U.S.-born YMSM indicated lower odds of engaging in both one instance of UROI (AOR = 0.59) and in 2 or more instances of UROI (AOR = 0.52) than no instances of the behavior. In addition, compared to Black non-Hispanics, White non-Hispanic men were more likely to engage in 2 or more instances than in no instances of the behavior (OR = 1.92). When setting 1 instance as the reference group, no demo-

graphic factors differentiated the 1 instance from the 2 or more instances group.

Discussion

The HIV/AIDS epidemic is affecting a new generation of MSM. Epidemiological trends over the last decade have demonstrated heightened burden of infection for YMSM ages 13–29 in large metropolitan areas such as New York City,[33] as well as nationally,[1] However, such patterns are not confined solely to metropolitan areas.[39–41]

Existing data indicate HIV disparities among racial and ethnic minorities.[15,17,18,] Nationally, Black MSM and YMSM are disproportionately affected by HIV as compared to other YMSM,[18] and within New York City, Black and Hispanic YMSM experience disparities compared to White or other YMSM.[2,3,42] Such patterns are not attributable to a greater number of risk acts among these men.[43,44] Rather, rates of seroconversion are higher among African American and Hispanic men due to same race/ethnicity sexual partnering; there are higher levels of HIV viremia within these minority populations as compared to the sexual partner pool of White YMSM.[44]

This is all to say race and ethnicity are constructs that may insufficiently explain the sexual risk behaviors and HIV prevalence rates of YMSM. While the unadjusted associations indicated that race/ethnicity is related to unprotected sex risk behavior, these associations are not robust in the mutivariable models. As the present analyses support, race and ethnicity overlap with other sociodemographic factors that help us understand risk. In fact, findings with regard to race/ethnicity were inconsistent in our multivariable models and may be a product of spuriousness or chance. However, we must not neglect the role or race/ethnicity, especially since a subset of the findings relating to race/ethnicity in the present study align with studies previously published that support the use of oral intercourse as a harm reduction strategy by emerging adult White YMSM.[44] In our investigation, White non-Hispanic YMSM reported a 2 times greater odds of engaging in UROI than Black non-Hispanic men. And with regard to HIV acquisition, this behavior represents the lowest risk of all the behaviors we examined.[7] It is important to remember that race/ethnicity is an individual-level construct, and there likely are partner and network level factors that are partially, but not completely, captured by race/ethnicity in our analyses. This is particularly important given the "racial-sorting" of sexual partners that occurs among YMSM, whereby these young men tend to choose sexual partners of comparable race, and thus behaviors may be influenced by cultural norms, and seroconversion by levels of untreated HIV viremia within that racial subpopulation.[44]

Foreign-born status and perceived socioeconomic status proved to be more robust indicators of unprotected sexual behaviors while controlling for race/ethnicity and sexual orientation. Across sexual behaviors, foreign-born status was significant in differentiating those who did not engage in unprotected acts as compared to those who engage in either one instance or in 2 or more instances of the act in the 30 days prior to the assessment, with those YMSM born in the U.S. indicating lower odds of engaging in risk behaviors. This finding aligns with previous research documenting foreign born status as a risk factor for unprotected sexual behaviors in

MSM generally[30–32] and YMSM specifically.[45–47] Moreover, it is posited that the protections afforded by foreign-born residential communities, in which some of these foreign-born YMSM likely reside or in which they were raised, may be insufficient buffers to the stigma and discrimination experienced by immigrant groups, especially those immigrant groups of color. In fact, it may be residence in such ethnic communities that subject some YMSM to discrimination and stigma. However, the role of foreign-born status and the migration process, in particular, are poorly understood. Future research programs should seek to further delineate the role of the migration process with regard to sexual risk taking in YMSM.

With regard to perceived SES, our findings suggest that those YMSM with perceived middle and upper SES are less likely to engage in 2 or more instances of risk behaviors in the prior 30 days than in no instances in that time frame as compared to YMSM of perceived lower socioeconomic status. This finding is supported by previous research examining HIV risk in MSM in general[19–23] and YMSM in particular.[24] Lack of socioeconomic resources is associated with earlier initiation of sexual activity and less frequent condom use,[48] which can result in HIV infection. Furthermore, SES is a key factor in quality of life and health outcomes for HIV-positive individuals, including the progression to AIDS.[49] The role of SES in explaining sexual risk-taking among YMSM may be understood in terms of the association of socioeconomic status with factors such as familial material resources, a proxy of SES that is related to education, income, and occupation.[50,51] Additionally, the relationship of SES and unprotected sexual behaviors may be mediated by healthcare utilization. Adolescents are among the least likely to have access to healthcare and they have the lowest rates of primary care utilization of any age group in the United States.[52,53] Rhodes and colleagues[54] found that YMSM of color with limited access to healthcare were more likely to engage in sexual risk-taking and to be unvaccinated for viral pathogens.

Also critical to our findings is the fact that sexual orientation failed to predict unprotected sexual acts. Previous research yielded mixed results on this relationship, suggesting that fully gay identified young men are both at higher risk[55] as well as lower risk[56] for HIV infection. Some authors suggest that the timing of sexual orientation identification in terms of age may be a critical consideration when assessing the effect of sexual orientation on risk.[57,58] Furthermore, the relationship between pubertal timing and sexual onset among gay and bisexual adolescents has been theorized to be a contributing factor of the HIV epidemic in this population.[59,60] More recently, we have documented the multidimensional nature of sexual behaviors among Black MSM, indicating that risk varies depending on developmental stage/age as well as sexual identification.[42]

Limitations

The findings of our investigation are based solely on baseline data, and while findings are robust, they must be considered with regard to the cross-sectional nature of the data. Second, the dependent variables of unprotected sexual behavior are based on recall data; our findings perhaps would have been more powerful had we used a biological outcome such as HIV incidence or presence of sexually transmitted

infections. Both these limitations will be addressed in future analyses when the data from all waves of the cohort study are available. However, the Timeline Followback method strengthened our measurement of the sex behaviors; this calendar-based approach has been shown to enhance the collection of data regarding high-risk behaviors such as illicit drug use.[36,61–63] Such an approach within a fixed period of time (i.e., 30 days) enhances the recall of sexual acts by tying behaviors to specific days as compared to gross estimates of risk.

Additionally, in our analyses we have utilized a trichotomous outcome variable, defined as no instances, 1 instance, or 2 or more instances of each unprotected sexual behavior in the month prior to the assessment. We came to this approach with a full understanding that the measurement of sexual behaviors is fraught with complexities, and that various approaches for the parsing of the data are associated with their own limitations.[64] In this case, the inordinate number of zeroes in our data yielded a distribution not amenable to an ordinary least square regression. In addition, the use of a trichotomous outcome allowed us to differentiate between qualitatively different groups (i.e., no risk, 1 instance potentially conceived as "a slip," and 2 or more instances–consistent risk). Ultimately the nature of this outcome variable provides for easier interpretation and potentially easier translation to those providing HIV prevention services.

As this case with many epidemiological studies, it is important to keep in mind the issues of selection bias, misclassification, and confounding in the interpretation of the results in the present study in so much as these conditions may introduce systematic bias. These biases may be of more concern in the analyses, which have been presented, since these are based only on one wave (i.e., the baseline data) of a cohort study. With regard to the issue of selection bias, we note that the study results are based on data drawn from a convenience sample, thus potentially introducing sampling bias in the results. It should be noted, however, that we implemented wide varied sets of recruitment strategies to enhance the quality of our sample. Also, the vast majority of those who were not selected for study participation were excluded because they did not meet the strict age requirement. With regard to misclassification, we recognize the potential for information bias in the study. Capturing data on sexual behaviors is complex and methodologically challenging and there is no gold-standard.[64,65] Still the use of calendar-based methods such as the one we have employed is more desirable then simple recall of aggregate values in surveys (e.g., How many times did you have unprotected oral sex in the last 30 days?). The Timeline Followback enhances recall by focusing on calendar dates and building the data on a day-to-day basis. Still, recall is a limitation that must be kept in mind, although the effect of this condition likely results in nondifferential misclassification. Finally, issues of confounding must be kept in mind when considering the results, in so much as the associations between the demographic states and sex behaviors are likely confounded by contextual, environment, and network variables, which are not included in our analyses.

Finally, given the small sample sixes of API and mixed race men, we collapsed these two groups into a category, mixed race/other. We recognize this as a limitation and caution any interpretation on findings relating specially to this racial grouping.

Our work builds on current epidemiological literature examining fundamental causes of disease, in particular sexual behaviors among YMSM, that in turn place these men at risk for HIV infection. This approach aligns with the ideas of Link and Phelan[14] whose work on socio-epidemiology attempts to delineate the role of fundamental causes, such as SES and foreign-born status, explaining different health conditions. Such scope allows us to direct our attention to social and structural factors in explaining risk behaviors and health outcomes including, but not limited to, health inequities. We examined four fundamental causes: race/ethnicity, sexual orientation, SES, and foreign-born status, the last two of which proved to be significant in explaining unprotected sexual behaviors and, in turn, sexual risk for HIV transmission among YMSM.

However, these demographic states conceived as fundamental causes should not be construed as directly causal in their relation to the outcome variables. Instead, these factors can be viewed as part of a causal path in so much as these states are likely associated with higher levels of psychosocial burdens which in turn heighten sex risk behaviors. From the perspective of syndemics theory,[4,11–13] it is posted that individuals with higher burdens also demonstrate more risk or have higher levels of vulnerability that predispose to risk. In relation to the study findings, it is proposed that those born outside the U.S., those of lower SES, and to some extent those who are members of racial/ethnic minority groups, experience greater burdens, and in turn these burdens heighten the likelihood of sexual risk behavior. Said differently, the psychosocial burdens, which are central to syndemics theory likely mediate the relations between demographics states and risk behaviors. Such an understanding also aligns with the idea of fundamental causes, and provides an avenue for further analysis of the data.

Future endeavors should seek to document and understand the role of fundamental causes and seek to further establish causal pathways between these causes, psychosocial burdens, and risk behaviors. In addition, HIV prevention efforts must continue to attend to the burdens that increase the vulnerabilities of YMSM but must be cognizant of the fact that these vulnerabilities are highly variable and likely directed by the demographic characteristics of YMSM. Comprehensive and holistic approaches to HIV prevention as posted by Halkitis[13] in effect must attend to who the person is and how who the person is impacts the vulnerabilities he experiences, and in turn the sexual risk behaviors he enacts. Based on the aforementioned results and the epidemiological patterns related to HIV acquisition in YMSM, these interventions must consider more than race/ethnicity, which is often the case in HIV prevention and reserach,[66] and specifically must be tailored to foreign born and low SES young gay and bisexual men. This will require recognition that there are differential risk patterns within racial groups that may be explained by SES and country of birth. This is all to say, HIV prevention efforts should not perceive nor treat young gay and bisexual men as a monolith even if men are of the same race or ethnicity. Moreover, as stigma and discrimination may be the result of more than just race or sexual orientation singly,[67] the interactive effects of race, culture, sexual orientation, SES and foreign-born status must be considered in tandem when developing prevention programming and polices that protect sexual minority men

Such an approach to HIV prevention requires an agenda directed by social justice. This agenda must seek to eliminate and reduce vulnerabilities, discrimination, inequalities in opportunity, access, and health in YMSM, particularly those of lower SES and foreign-born status who likely experience these vulnerabilities and inequalities at higher levels, in effect heightening their susceptibility to the acquisition of HIV.

Author Disclosure Statement

No competing financial interests exist.

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