

# Neighborhood-Level Correlates of Consistent Condom Use among Men Who have Sex with Men: A Multi-Level Analysis

Victoria Frye · Beryl Koblin · John Chin · John Beard · Shannon Blaney · Perry Halkitis · David Vlahov · Sandro Galea

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**Abstract** There is growing evidence that the neighborhood environment influences sexual behavior and related outcomes, but little work has focused specifically on men who have sex with men (MSM). Using interview data from a probability sample of 385 young MSM living in New York City, recruited at public venues in 1999 and 2000 as part of the Young Men's Survey-New York City, and data on neighborhood characteristics obtained from the U.S. Census 2000, we conducted multi-level analyses of the associations between neighborhood-level characteristics and consistent condom use during anal intercourse, while controlling for individual-level sociodemographic and other factors. After adjusting for individual-level factors, neighborhood-level gay presence remained significantly and positively associated with consistent condom use

during anal intercourse. This finding suggests that neighborhoods with a significant gay presence may have norms that act to discourage high risk sexual activity.

**Keywords** Sexual HIV risk behavior · MSM · Urban neighborhood · Multi-level analysis · Condom use · Neighborhood environment

## Introduction

Recent reports have noted increasing rates of sexual HIV risk behaviors in major urban areas and elsewhere (Chen et al. 2002; Geisler et al. 2002; Jaffe et al. 2007; Osmond et al. 2007) and national surveillance data show an increase in new HIV cases among men who have sex with men (MSM) as well (CDC 2003, 2005). Data from New York City (NYC) indicate that new HIV diagnoses are rising among young MSM (New York City Department of Health and Mental Hygiene 2007). Certain individual-level, such as condom use-related factors (Semple et al. 2003), and situational, such as circuit parties (Lee et al. 2003), risk factors for sexual HIV risk behavior are well-established (Mills et al. 2004; Stall et al. 2001), and novel ones, such as Viagra use and meeting sexual partners via the internet, have also been identified (Schwarcz et al. 2007). The recent increases in HIV diagnoses among MSM heighten the urgency of casting the net wider yet in order to identify novel environmental factors that influence risk behaviors in this population.

Evidence is mounting to demonstrate an influence of the neighborhood physical and social environment on a range of physical and mental health behaviors and outcomes (Browning and Cagney 2002; Kawachi and Kennedy 1997; Moore and Diez Roux 2006; Truong and Ma 2006).

V. Frye (✉)

Urban Public Health Program, Hunter College, City University of New York, New York, USA  
e-mail: vfrye@hunter.cuny.edu

B. Koblin

Laboratory of Infectious Disease Prevention, New York Blood Center, New York, NY, USA

J. Chin

Hunter College, City University of New York, New York, USA

J. Beard · S. Blaney · D. Vlahov

Center for Urban Epidemiologic Studies, New York Academy of Medicine, 1216 Fifth Avenue, New York, NY 10029, USA

P. Halkitis

Steinhardt School of Culture, Education and Human Development, New York University, New York, NY, USA

S. Galea

Department of Epidemiology, University of Michigan, Ann Arbor, MI, USA

Reports have noted this association with condom use (Kerrigan et al. 2006), sexual behavior (Brewster et al. 1993) sexual partnering patterns (Browning and Olinger-Wilbon 2003) and sexual transmitted infections (STI) (Cohen et al. 2000), among heterosexual populations. These investigations are situated within the larger body of social epidemiological (Kaplan 2004) and sociological research into social determinants of health, such as social structures and systems of inequality and social capital. This work reflects both the search for “independent” (Susser 1998) and acknowledgment of “fundamental” determinants of health (Link and Phelan 1995), and the growing appreciation of the complexity of causal pathways in health outcomes, with both fundamental and proximal determinants of health playing important roles (Boerma and Weir 2005). This research reflects as well the integration of the social sciences into public health research, with a focus on the roles of social capital and network factors in shaping health behaviors (Carpiano 2006).

While there are some data examining the relationship between social capital factors and HIV and related STI rates (Cohen et al. 2000; Holtgrave and Crosby 2003), To the best of our knowledge there are no such analogous data specific to men who have sex with men (MSM) or examining behavioral outcomes, such as unprotected anal intercourse, that are the proximate determinants of these population health outcomes. In an earlier paper, we described the complex pathways of influence that may be at work among MSM, linking the neighborhood environment to sexual behavior, but did not empirically test our models. This paper represents an effort to do this, using existing and archival data. Thus, whether and how urban neighborhood characteristics influence sexual risk behaviors among MSM is not known, but there are several unique aspects of the MSM and urban neighborhood experience that constitute important reasons to address this question.

First, the historical migration of MSM to urban areas from rural and suburban areas has resulted in the concentration of MSM in cities across the United States (Gates and Ost 2004; Kenney 1995; Weston 1995). Second, some research suggests that race-based health disparities are diminished when neighborhood-level factors are controlled (Browning et al. 2004; Subramanian et al. 2005). It is therefore worthwhile to investigate whether and how the neighborhood environment contributes to the growing concentration of HIV/AIDS among urban MSM of color (Torian et al. 2002), particularly since urban-dwelling gay men of color are more likely to have been born in the urban area, as compared with white men (Catania et al. 2006). Finally, basic research on how the neighborhood environment influences health behaviors among gay men is needed to inform contextual and structural interventions in urban settings (Kegeles et al. 2000; Parker et al. 2000), an

important goal as individual-level interventions have shown primarily short-term effectiveness among MSM (Johnson et al. 2002; Koblin et al. 2004).

The purpose of this paper is to examine associations among neighborhood-level characteristics and individual-level consistent condom use, while controlling for individual-level factors, among a sample of MSM living in New York City. The models tested reflect theoretical routes of influence between the urban neighborhood and sexual behavior set forth in a previous paper (Frye et al. 2006). Thus in this analysis, consistent with social disorganization theory (Sampson et al. 1997; Shaw and McKay 1947), we empirically assess the relationship between socioeconomic status, ethnic heterogeneity, concentrated poverty, and residential instability and consistent condom use during anal intercourse. Based on physical disorder or “broken windows” theory (Cohen et al. 2000; Wilson and Kelling 1982), we examine the association between neighborhood-level vacant housing and consistent condom use. Finally, from the perspective of social norms theory (Bandura 1977; Kelly et al. 1997; Latkin et al. 2003), we evaluate the impact of neighborhood gay presence on consistent condom use. Other neighborhood compositional factors (for example, age and race) are also evaluated.

## Methods

### Sample and Procedures

The Young Men’s Survey-New York City (YMS-NYC) is a part of national survey conducted in nine urban areas. The study was designed to estimate the prevalence of HIV-1 antibody, markers of hepatitis B virus infection and syphilis and the frequency of risk behaviors among MSM who attend public venues, such as bars, dance clubs, business establishments, social organizations, sex establishments and street locations. A multistage venue identification and sampling process was used, and has been described in detail previously (MacKellar et al. 1996). Potential venues were identified through community interviews, review of local gay publications and information obtained in focus groups of young MSM. The eligibility criteria were being 23–29 years of age and a resident of one of the five boroughs of New York City or specified contiguous counties in Long Island, New York State and New Jersey. In the present analysis, we used data from the Young Men’s Study 2 (YMS2), or the “older” cohort (aged 23–29) of the YMS-NYC data for both the outcome and individual-level covariate data.

Eligible and willing men were interviewed in a mobile van equipped with three interview rooms, where a trained interviewer/counselor obtained informed consent, administered a

standardized questionnaire, conducted HIV pre-test counseling, obtained a blood specimen and provided referrals for social and medical services as needed. The survey and HIV-1 antibody testing were anonymous; participant, interviews and specimens were identified by a survey identification number only. Sampling events occurred over the 16-month period between March 1999 and June 2000. During these events, 2,412 men were approached for a brief interview to determine eligibility and 2,078 (86%) completed their eligibility screening. Of the 778 men deemed eligible on interview, 571 (73%) agreed to participate in the survey. Participants were reimbursed \$50 for their time and effort. Men who refused to participate were more likely to be older (age >25 versus age 25 or under) and white (versus black or Hispanic). Of the 571 men who completed the interview, 87 were excluded from the present analysis because zip code data was either missing, invalid, or were from outside of the five boroughs of New York City. Sixty-six men were excluded because they did not report anal intercourse and another 33 were dropped because they were missing information on condom use during intercourse. Thus, the present analysis is based on the 385 enrolled men aged 23–29 who reported having had insertive and/or receptive anal intercourse in the past 6 months and living in NYC.

#### Individual-Level Measures

The study questionnaire collected data on demographics (age, race/ethnicity, education, employment, and income, living situation), zip code of residence, psychosocial factors (history of homelessness, sex trading), “outness” or whether the respondent was known to be gay (out to everyone, more than half, less than half or none at all), venue attendance (ever attended circuit parties and frequency of bar/club attendance), lifetime sexual behavior with males and females, sexual behavior over the previous 6 months, history of sexually transmitted diseases, history and most recent results of HIV-1 antibody testing, drug and alcohol use (use in the past 6 months and sex while “high or buzzed” on alcohol and/or drugs in the past 6 months).

#### Neighborhood-Level Measures

The neighborhood unit of analysis used was residential zip codes, which correspond generally to 40 to 45,000-person and 180-block neighborhoods in NYC. Out of 175 populated zip codes in New York City, 113 were represented; between 1 and 17 men lived in each of the 113 neighborhoods included at the neighborhood level of analysis. Data for the neighborhood-level variables were obtained from the year 2000 US Census (US Census Bureau 2000) and the NYC Housing and Vacancy Survey (US Census Bureau 1999). Neighborhood measures included age distribution

(% aged 18–24), racial composition (% African-American or Black, % Hispanic and % White), ethnic heterogeneity [ $1 - \sum p_i^2$  or  $1 - (\% \text{ white}^2 + \% \text{ Black}^2 + \% \text{ Hispanic}^2)$ ], foreign-born presence (% foreign born), concentrated poverty (% living below 100% of the poverty line), income (median household), education (% high school graduates), unemployment (% unemployed), residential instability (% moved in past 5 years), vacant housing (% of housing that is vacant), and neighborhood gay presence (% of households headed by same-sex partners). The values for each neighborhood factor assessed were assigned to each YMS participant based on their neighborhood of residence for use in this multi-level analysis.

#### Analysis

Standard bivariate statistical tests, *t*-tests and chi-square, were used to assess relationships between individual-level factors and consistent condom use, defined as reporting condom use “all of the time” during insertive anal intercourse (IAI) or receptive anal intercourse (RAI) in the past 6 months. Our multivariable model building approach included several steps. First, generalized estimating equations (GEE) accounting for intra-neighborhood clustering were used to measure bivariate relationships between neighborhood-level covariates and consistent condom use. Next, individual-level multivariable models were fit for each outcome, including a set of individual-level sociodemographic control factors (age, race, education, employment, and income) and the individual-level factors found to be significant in bivariate analyses at  $P < .10$ . In bivariate results, trends are reported for neighborhood-level associations. Finally, separate GEE multivariable multi-level models were fit for each neighborhood factor, controlling for individual-level covariates. In all models, odds ratios and confidence intervals were calculated to estimate the magnitude of the effect of each neighborhood factor on consistent condom use. SAS Version 9.0 software (Cary, NC) was used for all statistical analyses.

#### Results

Table 1 presents the characteristics of the study population and the bivariate relationships between the individual-level factors and consistent condom use during IAI and RAI. Of the 385 men in the sample, 335 engaged in IAI and 278 engaged in RAI. More than half of the sample’s respondents were consistent condom users during both IAI and RAI. Consistent with previous research, several individual-level factors were significantly associated with consistent condom use during IAI and RAI. Thus, living with a partner and sex while high or buzzed on drugs were

**Table 1** Sociodemographic characteristics, sexual behavior, drug use and consistent condom use during IAI and RAI among YMS sample, New York City, 1999–2000

	Total sample ( <i>N</i> = 385)	Consistent condom use					
		Insertive anal intercourse ( <i>N</i> = 335)			Receptive anal intercourse ( <i>N</i> = 278)		
		<i>N</i>	%	<i>P</i> -value	<i>N</i>	%	<i>P</i> -value
	<i>N</i> (%)	188	56%		145	52%	
<i>Sociodemographic characteristics</i>							
Age							
23–24	149 (39%)	67	52%	0.25	50	48%	0.32
25–26	111 (29%)	61	63%		45	51%	
27–29	125 (32%)	60	55%		50	59%	
Race							
Hispanic	121 (31%)	57	53%	0.88	45	47%	0.22
Black/African-American	114 (30%)	56	59%		39	53%	
White	82 (21%)	43	56%		40	63%	
Other	68 (18%)	32	57%		21	46%	
Education							
Less than HS	37 (10%)	22	67%	0.57	20	71%	0.05
HS graduate	76 (20%)	37	58%		19	41%	
Post-HS	103 (27%)	46	53%		37	47%	
College grad or more	169 (44%)	83	55%		69	55%	
Full time employment							
No	161 (42%)	78	58%	0.62	59	51%	0.81
Yes	224 (58%)	110	55%		86	53%	
Income							
Less than \$10,000/year	93 (24%)	43	58%	0.36	36	52%	0.57
\$10,000–\$19,999/year	77 (20%)	45	65%		24	48%	
\$20,000–\$29,999/year	84 (22%)	40	53%		28	46%	
\$30,000–\$39,999/year	68 (18%)	31	48%		28	56%	
\$40,000 or more	63 (16%)	29	56%		29	60%	
Sexual orientation							
Straight	7 (2%)	0	0%	0.14	3	60%	0.47
Bisexual	71 (19%)	40	59%		14	41%	
Gay	293 (79%)	140	55%		121	53%	
Lives with sexual partner/lover/spouse							
No	344 (89%)	177	58%	<0.01	135	55%	0.02
Yes	41 (11%)	11	34%		10	32%	
Any exchange sex partners in past 6 months							
No	332 (87%)	160	55%	0.51	124	52%	0.77
Yes	50 (13%)	26	60%		19	54%	
Sex with female in past 6 months							
No	329 (85%)	149	53%	<0.01	133	52%	1.00
Yes	56 (15%)	39	75%		12	52%	
Ever tested for HIV							
No	49 (13%)	20	53%	0.65	17	47%	0.53
Yes	336 (87%)	168	57%		128	53%	
HIV serostatus							
Negative	316 (83%)	155	56%	0.87	121	54%	0.21
Positive	63 (17%)	29	55%		21	44%	

**Table 1** continued

	Total sample ( <i>N</i> = 385)	Consistent condom use					
		Insertive anal intercourse ( <i>N</i> = 335)			Receptive anal intercourse ( <i>N</i> = 278)		
		<i>N</i>	%	<i>P</i> -value	<i>N</i>	%	<i>P</i> -value
	<i>N</i> (%)	188	56%		145	52%	
<b>Outness</b>							
Not out at all OR out to than less than half the people I know	75 (19%)	39	57%	0.96	25	54%	0.92
Out to more than half	176 (46%)	88	55%		64	52%	
Out to everyone	134 (35%)	61	56%		56	51%	
<b>Ever spent night in jail</b>							
No	248 (65%)	118	54%	0.28	99	52%	0.87
Yes	136 (35%)	70	60%		46	53%	
<b>Ever attend circuit party</b>							
No	315 (82%)	156	58%	0.10	117	52%	0.88
Yes	69 (18%)	31	47%		27	53%	
<b>Frequency of attendance at gay bars and dance clubs in NYC in past 6 months</b>							
Up to once a month	72 (19%)	39	65%	0.02	28	52%	0.26
Up to once a week	170 (44%)	74	48%		56	47%	
2–3 nights a week to every night	143 (37%)	75	62%		61	58%	
<b>Drank alcohol in past 6 months</b>							
No	35 (9%)	19	63%	0.40	16	67%	0.14
Yes	350 (91%)	169	55%		129	51%	
<b>Sex while high or buzzed on alcohol past 6 months</b>							
No	163 (42%)	85	63%	0.03	66	57%	0.14
Yes	221 (58%)	103	52%		79	48%	
<b>Sex while high or buzzed on drugs past 6 months</b>							
No	175 (45%)	92	62%	0.05	75	60%	0.01
Yes	210 (55%)	96	51%		70	45%	

negatively associated with consistent condom use during both IAI and RAI. Sex with a woman was positively associated with consistent condom use during IAI. Sex while high or buzzed on alcohol in the past 6 months, lifetime attendance of circuit parties and frequency of going to gay bars or clubbing in the past 6 months were negatively associated with consistent condom use during IAI. Possessing more than a high school degree was negatively associated with consistent condom use during RAI.

Table 2 depicts the median values and range of the neighborhood-level characteristics (*z*-scores) and both the unadjusted and adjusted odds ratios for the relations between neighborhood-level characteristics and the outcomes. Bivariate results indicated that of the neighborhood-level factors examined, neighborhood racial composition (percent Black) was positively and ethnic heterogeneity was negatively associated with consistent condom use during IAI. Neighborhood-level education, income, residential

instability, racial composition (percent white), and gay presence were positively associated with consistent condom use during RAI. Percent foreign born and percent Hispanic were negatively associated with consistent condom use during RAI. The adjusted models show that a few neighborhood-level factors remained statistically significantly associated with IAI, after adjusting for individual-level factors, with neighborhood gay presence emerging as significant, once individual-level factors are controlled. In models of RAI, residential instability remained associated at the  $P < .10$  level, and neighborhood gay presence at the  $P < .05$  level, while controlling for individual-level factors.

Table 3 shows four full multivariable models with consistent condom use during IAI as the outcome. First, the baseline model including only the sociodemographic control factors and the individual-level factors found to be associated with consistent condom use in bivariate analyses is depicted. Next, three models are shown adding to the

**Table 2** Unadjusted and adjusted associations among neighborhood characteristics (*z*-scores) and consistent condom use during IAI and RAI among YMS sample, New York City, 1999–2000

Neighborhood characteristics	Total sample		Unadjusted				Adjusted $\pm$				
	Median	Range	Insertive		Receptive		Insertive		Receptive		
			OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	
Age distribution											
% Aged 18–24	0.3	–3.5–3.9	1.1	0.9, 1.4	1.0	0.7, 1.3	1.2	0.9, 1.5	1.1	0.8, 1.5	
Racial composition											
% Black/African-American	–0.4	–0.9–2.5	1.2*	1.0, 1.5	1.0	0.8, 1.2	1.2	0.9, 1.6	1.0	0.8, 1.3	
% White	–0.5	–1.3–1.7	0.9	0.7, 1.2	1.2*	1.0, 1.5	1.0	0.7, 1.3	1.1	0.8, 1.4	
% Hispanic	0.0	–1.0–2.8	1.0	0.8, 1.3	0.8*	0.7, 1.0	1.0	0.8, 1.3	0.9	0.8, 1.2	
Ethnic heterogeneity <sup>a</sup>	0.0	–2.0–2.1	0.8*	0.6, 1.0	0.8	0.6, 1.0	0.8	0.6, 1.1	0.9	0.7, 1.1	
Foreign-born presence <sup>b</sup>	–0.4	–1.6–2.7	0.9	0.7, 1.2	0.8*	0.6, 1.0	0.9	0.7, 1.2	0.9	0.7, 1.1	
Median household income	–0.3	–1.6–2.0	1.0	0.7, 1.3	1.3*	1.0, 1.6	1.0	0.7, 1.4	1.2	0.9, 1.5	
Concentrated poverty <sup>c</sup>	0.2	–1.3–2.5	1.1	0.9, 1.4	0.9	0.7, 1.1	1.1	0.8, 1.4	0.9	0.7, 1.2	
Educational attainment <sup>d</sup>	–0.2	–2.5–1.8	1.0	0.8, 1.3	1.2**	1.0, 1.4	1.1	0.8, 1.4	1.1	0.9, 1.4	
Unemployment <sup>e</sup>	0.0	–1.1–2.6	1.2	0.9, 1.6	0.9	0.7, 1.1	1.2	0.8, 1.6	1.0	0.7, 1.3	
Residential instability <sup>f</sup>	0.1	–1.9–5.2	1.3	0.9, 1.9	1.4**	1.0, 2.0	1.4	0.9, 2.2	1.4*	1.0, 2.1	
Vacant housing	–0.2	–1.0–2.7	1.3	0.8, 1.9	0.9	0.6, 1.3	1.3	0.8, 1.9	0.9	0.6, 1.3	
Gay presence <sup>g</sup>	–0.1	–0.8–3.3	1.1	0.8, 1.4	1.3**	1.1, 1.5	1.3*	1.0, 1.6	1.4**	1.1, 1.6	

\*  $P < .10$ \*\*  $P < .05$ 

$\pm$ : Adjusted for individual-level age, race, education, employment, income, living situation, sex with women, gay bar attendance, and sex while high or buzzed

<sup>a</sup> Defined as—proportion white,<sup>2</sup> proportion black,<sup>2</sup> proportion hispanic<sup>2</sup>

<sup>b</sup> Defined as % foreign-born

<sup>c</sup> Defined as living below 100% of the poverty level

<sup>d</sup> Defined as percent high school graduates

<sup>e</sup> Defined as percent unemployed

<sup>f</sup> Defined as % of households having moved to the area in past 5 years

<sup>g</sup> Defined as % of households headed by same sex partners

baseline model the neighborhood-level characteristics, (percent Black/African-American, ethnic heterogeneity and neighborhood gay presence). In model 1 of Table 3, which includes only individual-level factors, men aged 25–26 were more likely to report consistent condom use during IAI (OR = 1.7; 95% CI = 1.0, 3.0), as compared with the youngest men in the sample (aged 23–24). Men who reported living with a lover, spouse or sex partner were less likely to report consistent condom use during IAI (OR = 0.4; 95% CI = 0.1, 1.0). Of the sexual behavior and related factors investigated, men who reported sex with a woman were nearly three times more likely to report consistent condom use during IAI (OR = 2.9; 95% CI = 1.4, 5.8). Men who attended gay bars or clubs up to once per week, as compared with up to once per month (OR = 0.5, 95% CI = 0.3, 1.0) and men who had sex while high or buzzed on drugs in the past 6 months (OR = 0.6; 95% CI = 0.4, 1.0) were less likely to report consistent condom use during IAI. These relations were not

appreciably altered by adding the neighborhood-level variable (% Black/African-American) to the baseline model. In model 2, when relevant individual-level factors were controlled, neighborhood-level percent Black/African-American is associated with consistent condom use (OR = 1.2; 95% CI = 0.9, 1.6), but the relationship is not statistically significant. Similarly, in the third model, adding neighborhood-level ethnic heterogeneity to the baseline model did not significantly change the estimates of association among the relevant individual-level factors and the outcome. When relevant individual-level factors were controlled, neighborhood-level ethnic heterogeneity was negatively associated with a decrease in consistent condom use (OR = 0.8; 95% CI = 0.6, 1.1); but, again, this relationship was not statistically significant in the multivariable, multi-level models. Finally, in model 4, neighborhood gay presence is added to the baseline model and exerts a significant positive effect on consistent condom use during IAI (OR = 1.3; 95% CI = 1.0, 1.6).

**Table 3** Adjusted associations among neighborhood characteristics (z-scores) and consistent condom use during IAI among YMS sample, New York City, 1999–2000

	Model 1			Model 2			Model 3			Model 4		
	OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI	
<i>Age (referent: 23–24)</i>												
25–26	1.7*	1.0	3.0	1.8**	1.0	3.1	1.7*	1.0	3.1	1.8*	1.0	3.2
27–29	1.2	0.7	2.2	1.2	0.7	2.2	1.2	0.7	2.2	1.3	0.7	2.4
<i>Race (referent: White)</i>												
Hispanic	0.9	0.4	1.8	0.8	0.4	1.7	0.9	0.4	1.8	1.0	0.5	2.0
Black/African-American	0.8	0.4	1.7	0.7	0.3	1.5	0.8	0.4	1.7	0.9	0.4	2.0
Other	1.0	0.5	2.1	0.9	0.4	2.0	1.0	0.5	2.1	1.0	0.5	2.1
<i>Education (referent: less than HS)</i>												
HS graduate	0.8	0.3	2.1	0.8	0.3	2.1	0.8	0.3	2.0	0.8	0.3	2.2
Post-HS	0.7	0.3	2.0	0.7	0.2	2.0	0.7	0.2	1.9	0.7	0.3	1.9
College grad or more	0.8	0.3	2.1	0.8	0.3	2.2	0.8	0.3	2.1	0.8	0.3	2.1
<i>Full-time employment</i>												
Yes	1.2	0.7	1.9	1.2	0.8	2.0	1.2	0.8	2.0	1.2	0.7	1.9
<i>Income (referent: less than \$10,000/year)</i>												
\$10,000–\$19,999/year	1.3	0.6	2.7	1.3	0.6	2.8	1.3	0.6	2.8	1.3	0.6	2.8
\$20,000–\$29,999/year	0.9	0.4	2.0	0.9	0.4	2.0	0.9	0.4	2.0	0.9	0.4	1.9
\$30,000–\$39,999/year	0.7	0.3	1.5	0.7	0.3	1.5	0.7	0.3	1.5	0.7	0.3	1.4
\$40,000 or more	0.8	0.3	1.9	0.8	0.3	2.0	0.8	0.3	1.9	0.7	0.3	1.8
<i>Lives with sexual partner/lover/spouse</i>												
Yes	0.4**	0.1	1.0	0.4**	0.2	1.0	0.4*	0.1	1.0	0.4**	0.1	1.0
<i>Sex with female in past 6 months</i>												
Yes	2.9**	1.4	5.8	2.9**	1.4	6.1	2.8**	1.4	5.7	3.0**	1.5	6.1
<i>Frequency of attendance at gay bars and dance clubs in NYC in past 6 months (referent: up to once a month)</i>												
Up to once a week	0.5**	0.3	1.0	0.5*	0.3	1.1	0.5*	0.3	1.0	0.5**	0.2	1.0
2–3 nights a week to every night	0.9	0.5	1.8	0.9	0.5	1.8	0.9	0.5	1.8	0.9	0.5	1.8
<i>Sex while high or buzzed on drugs past 6 months</i>												
Yes	0.6*	0.4	1.0	0.6**	0.4	1.0	0.6**	0.4	1.0	0.6**	0.4	1.0
<i>Neighborhood-level factors</i>												
Percent Black/African-American $P = .18$				1.2	0.9	1.6						
Ethnic heterogeneity $P = .17$							0.8	0.6	1.1			
Neighborhood gay presence										1.3**	1.0	1.6

\*  $P < .10$ \*\*  $P < .05$ 

Table 4 depicts three full multivariable models with consistent condom use during RAI as the outcome, using the same logic of Table 3. In the first or baseline model, only the sociodemographic control factors and the individual-level factors found both to be associated with consistent condom use in bivariate analyses are included. The second and third models add separately the neighborhood-level factors found to be significant in adjusted analyses (Table 2). Model 1 shows that as compared with white men, Hispanic (OR = 0.4; 95% CI = 0.2, 0.9), Black (OR = 0.5, 95% CI = 0.2, 1.0) and other (OR = 0.3; 95% CI = 0.1, 0.7) men were significantly less likely to practice consistent condom use during RAI. Similarly, men with greater than a

high school education were significantly less likely to engage in consistent condom use during RAI. Men who lived with a partner (OR = 0.4; 95% CI = 0.2, 0.8) and had sex while buzzed on drugs (OR = 0.5; 95% CI = 0.3, 0.8) were also less likely to use condoms consistently during RAI. In model 2 of Table 4, residential instability is added to the individual-level model, and is marginally associated with consistent condom use during RAI (OR = 1.4; 95% CI = 1.0, 2.1). When residential instability was added to the baseline model, none of the estimates of association changed appreciably, although the significance of the association between individual-level Black race and consistent condom use became marginally statistically significant. In model 3,

**Table 4** Adjusted associations among neighborhood characteristics (z-scores) and consistent condom use during RAI among YMS sample, New York City, 1999–2000

	Model 1			Model 2			Model 3			
	OR	95% CI		OR	95% CI		OR	95% CI		
<i>Individual-level factors</i>										
Age (referent: 23–24)										
25–26	0.8	0.4	1.5	0.8	0.4	1.6	0.8	0.4	1.5	
27–29	1.1	0.6	2.2	1.1	0.6	2.2	1.1	0.6	2.3	
Race (referent: White)										
Hispanic	0.4**	0.2	0.9	0.4**	0.2	0.9	0.5	0.2	1.2	
Black/African-American	0.5**	0.2	1.0	0.5*	0.2	1.1	0.6	0.3	1.2	
Other	0.3**	0.1	0.7	0.3**	0.1	0.8	0.4**	0.2	0.8	
Education (referent: less than HS)										
HS graduate	0.2**	0.1	0.7	0.2**	0.1	0.7	0.2**	0.1	0.7	
Post-HS	0.3**	0.1	0.9	0.3**	0.1	0.9	0.3**	0.1	0.9	
College grad or more	0.3**	0.1	0.8	0.3**	0.1	0.9	0.3**	0.1	0.8	
Full-time employment										
Yes	0.9	0.5	1.6	0.9	0.5	1.7	0.9	0.5	1.6	
Income (referent: Less than \$10,000/year)										
\$10,000–\$19,999/year	0.7	0.3	1.6	0.7	0.3	1.6	0.7	0.3	1.7	
\$20,000–\$29,999/year	0.8	0.3	1.9	0.8	0.3	2.0	0.8	0.3	1.8	
\$30,000–\$39,999/year	1.4	0.5	3.5	1.3	0.5	3.4	1.3	0.5	3.3	
\$40,000 or more	1.5	0.7	3.6	1.4	0.5	3.3	1.3	0.6	3.2	
Lives with sexual partner/lover/spouse										
Yes	0.4**	0.2	0.8	0.3**	0.2	0.8	0.3**	0.1	0.8	
Sex while high or buzzed on drugs past 6 months										
Yes	0.5**	0.3	0.8	0.5**	0.3	0.8	0.4**	0.2	0.8	
Neighborhood-level factors										
Residential instability				1.4*	1.0	2.1				
Neighborhood gay presence							1.4***	1.1	1.6	

\*  $P < .10$ \*\*  $P < .05$ \*\*\*  $P < .001$ 

neighborhood gay presence is added to the baseline model and is significantly and positively associated with consistent condom use during RAI (OR = 1.4; 95% CI = 1.1, 1.6). Further, when neighborhood gay presence is added, the association between individual-level Black and Hispanic race diminished such that the associations became non-significant. When both residential instability and gay presence were included in the models, only gay presence remained significant and the effect of gay presence on individual-level race was the same (results not shown, but available upon request).

## Discussion

The major finding from this analysis is evidence to suggest that key neighborhood characteristics are associated with

protective sexual behaviors among MSM. This paper is one of the first of which we are aware to use multi-level methods to examine relations between the neighborhood environment and sexual HIV risk behavior among MSM. In analyses guided by three theoretical mechanisms of influence, social disorganization, physical disorder and social norms, results showed that only the variable used as a proxy for safer sex social norms (neighborhood “gay presence”) was associated with reduced risk. This result is all the more striking because the analytic approach identified neighborhood gay presence as important to consistent condom use after accounting for individual-level factors. Whether neighborhood gay presence is an indicator of safer sex social norms or of the effect of safer-sex media and other HIV prevention messages, which have been found to influence safer sex behavior among gay men (Leaver et al. 2004), within certain



neighborhoods in New York City, is unclear. Alternatively, it is possible that men who live in neighborhoods with a large gay presence may perceive greater risk and take protective measures in response to this perception of their neighborhood environment.

Neighborhood gay presence also affected the influence of Black race on consistent condom use during RAI. This is an intriguing finding suggesting that, in this sample, the finding that non-white men engaged in higher risk behavior may be confounded by neighborhood factors. Thus, because the majority of men living in neighborhoods with a large gay presence are white, it appeared in individual-level analyses that white men were safer. However, when neighborhood factors were entered into the equation, neighborhood gay presence slightly diminished the relationship between individual-level race and consistent condom use during RAI. Further, the racial composition of the neighborhood did not explain the influence of individual-level race on consistent condom use during RAI, as percent white, while significant during bivariate analysis, was not significantly associated with the outcome in multivariable, multi-level models. Thus, neighborhood gay presence was not simply a proxy for the racial composition of the neighborhood. To explore this finding further, we created a cross-level interaction term to assess the interaction between individual-level race and neighborhood gay presence and found that Black/African-American men living in neighborhoods with a large neighborhood gay presence were more likely to report consistent condom use as compared with white men living in such neighborhoods (OR = 1.9; 95% CI = 0.8, 4.3), but the association was not statistically significant ( $P = .13$ ).

The notion that living in a gay neighborhood might influence sexual behavior has been examined before. Mills et al. (2001) evaluated the potential influence of living in a “gay ghetto” (or an area with significant numbers of gay and lesbian people and commercial and other gay venues) on sexual behavior. Using data from four major urban areas, they described men who lived in such areas and found that they tended to be higher income, more involved in the gay community and more “out” than non-ghetto dwelling gay men. Further, they found that men who lived in gay ghettos were less likely to report sex with a woman in the previous year and were more likely to have been tested for HIV, but they found no differences in sexual risk behaviors between the two groups of men. In contrast, we found a persistent effect of neighborhood-level gay presence on safe sex, after controlling for relevant individual-level factors, including age, race and socioeconomic status, factors that potentially inform where a gay man might live in NYC.

It is possible that the neighborhood effect may represent a positive influence of safer sex norms in high gay presence neighborhoods in NYC. Considerable evidence suggests that both actual and perceived social norms of behavior affect sexual behaviors, including condom use (Albarracín et al. 2004; Fishbein et al. 1993), sexual debut (Kinsman et al. 1998; O’Donnell et al. 2003a) and other sexual risk behaviors among heterosexual populations (Latkin et al. 2003; O’Donnell et al. 2003b; Shoveller et al. 2004) A recent experimental study found that perceived negative community norms toward condom use predicted high risk sex among gay male college students, but that other contextual factors, such as work or school attitudes towards homosexuality, did not (Ross et al. 2004). Research linking neighborhood attachment to risk suggests that assessing the attachment to and perceived norms of geographic and other communities within which MSM live, meet sexual partners, and have sex may be critical to understanding MSM’s sexual behavior and risk construction. (Finlinson et al. 2006; Ramirez-Valles 2002) Future research should focus on identifying the unique influence of characteristics of the neighborhood environment, independent of gay and racial/ethnic identity attachment, outness, and length of time exposed to the neighborhood/dominant culture, on sexual HIV risk behavior. This is perhaps particularly important in cities like New York with large populations of gay, immigrant men, and MSM of color who were born and remain in the city.

Finally, one other finding merits discussion. The neighborhood-level characteristic percent Black/African-American was found to be marginally and positively associated with consistent condom use during IAI in bivariate analyses. Whether this represents the positive influence of living in a Black neighborhood specific to Black men is unclear. Some recent research has found racial or ethnic identification, at the individual level, to be associated with safer sexual behaviors among minority MSM. Black or African-American MSM who live in neighborhoods with a large proportion of African-Americans may also be more strongly identified with the community leading to safer sexual behavior. Alternatively, Black MSM who live among (predominantly heterosexual) family and friends in African-American neighborhoods may feel more constrained in their sexual behavior and less likely to take risks. Recent analyses of data collected in the 1990s found that non-white men are less likely to be completely out to friends, family, neighbors and co-workers (Catania et al. 2006). Whether and how the urban environment might uniquely contribute to the high prevalence of HIV in the Black gay community of NYC, in light of the suggestive finding that neighborhood racial composition might be protective, is an important research question.

## Limitations

This analysis has some limitations, some of which are intrinsic to place-based research. First, although the outcome and neighborhood covariate data were collected at roughly the same time (1999–2000), they are now many years old and may not reflect the current conditions in the neighborhoods assessed. Future research should be timed to coincide with the upcoming census and should also possess a longitudinal component to capture changes in NYC neighborhoods that may be relevant to the sexual and other health behaviors of MSM. In addition, the geographic boundaries that we used were zip or postal codes which imperfectly correlate with the boundaries of perhaps more meaningful neighborhoods in New York City. Future research should utilize geographic boundaries based on ethnographic or other mapping approaches that may better reflect residents' definitions of and exposure to neighborhood boundaries. Further, these neighborhood boundaries do not mirror "community" boundaries which are not necessarily geographic. To the extent that we were able in this analysis, we assessed certain aspects of "gay community" membership ("outness" and venue attendance); future research should use more comprehensive measures of both gay and other community attachment and affiliation to assess the relative importance of both geographic and identity-based community membership to sexual behavior. In addition, because this analysis used data originally collected as part of a sera and behavioral survey of young MSM, the dataset available did not contain all of the potentially relevant factors, such as ethnic/racial identity, length of time living in (or "exposed") to the neighborhood environment or perceptions of risk of the neighborhood environment. Exposure to a neighborhood environment merits specific comment, as gay men, perhaps more than other population subgroups, are likely to have greater exposure to neighborhoods other than their residential ones (i.e., the major gay enclave), something this analysis was unable to assess.

Because we did not have data on the neighborhood social environment (e.g., social norms, level of homophobia, intensity of HIV prevention messages) and were limited to archival data, it is impossible to draw any firm conclusions as to what the influence of the neighborhood gay presence finding actually meant. Thus, a study designed specifically to examine the influence of the neighborhood environment would capture a range of neighborhood social environment characteristics and individuals' subjective perceptions of the social environment. In addition, our power to detect neighborhood effects was limited by our relatively small (for a multi-level analysis) sample size. The statistically significant associations found at the neighborhood level in this study were not especially large,

relative to known individual-level risk factors, but are suggestive given the sample size. Finally, our outcome measure, consistent condom use, was not specific to a certain partner type or partner HIV status. Future multi-level studies should attempt to integrate this level of detail into analyses.

## Conclusions

This study is one of a very few to examine the influence of the neighborhood environment using multivariable, multi-level techniques. The finding that, above and beyond the influence of relevant individual-level factors, neighborhood gay presence has a significant and positive impact on consistent condom use during anal intercourse is a novel and important finding. What precisely this represents requires further study. Promising possibilities include the influence of targeted HIV prevention messages that have been absorbed most strongly by men living in gay neighborhoods. Alternatively, safer sex normative behavior may be more prevalent in such neighborhoods for reasons related to risk perceptions or due to the informal social controls and influence. Gaining a better understanding of this could inform future community- and neighborhood-based prevention efforts for the growing number of gay men who choose not to or cannot afford to live in the gay enclaves of New York City and other urban areas with similarly high housing costs. Further research into the role of the neighborhood environment could feed into structural and environmental interventions to reduce sexual HIV risk behavior among MSM.

Environmental interventions have been shown to be effective in reducing risky drug use behavior, but have been imperfectly evaluated in terms of sexual risk behavior among MSM (Parker et al. 2000). Such interventions might be similar to recently developed research and intervention programs aimed at ameliorating racial disparities based on an "undoing racism" approach (Barnes-Josiah 2004). Some environmental interventions may transcend neighborhood, but information about neighborhoods can help with implementation of such interventions if there are access issues or particular areas where the need is greatest. Our work suggests that future intervention strategies may focus on social norms (e.g., attitudinal/homophobia or behavioral/condom use), social structures (e.g., racial segregation) or programs of social change (e.g., multiple identity group-based social justice campaigns).

Although advances have been made, the HIV epidemic continues to ravage the gay community in New York City. With vaccines many years away and individual-level behavioral interventions showing modest and short-term effectiveness at best, we must begin to look "upstream"

and around at the social and physical context that constitutes the risk environment for MSM. Multi-level studies of the neighborhood environment are crucial to these efforts, as are qualitative inquiries into the lived experience of the neighborhood and how this relates to sexual behavior. Such efforts will tell us what factors are important and why they are important to the sexual behavior of gay men and MSM who remain such a high risk and vulnerable group.

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## References

- Albarracin, D., Kumkale, G. T., & Johnson, B. T. (2004). Influences of social power and normative support on condom use decisions: A research synthesis. *AIDS Care, 16*, 700–723. doi:10.1080/09540120412331269558.
- Bandura, A. (1977). *Social Learning Theory*. Englewood Cliffs, NJ: Prentice-Hall.
- Barnes-Josiah, D. L. (2004). *Undoing racism in public health: A blueprint for action in urban MCH*. Omaha, NE: Kellogg Foundation.
- Boerma, J. T., & Weir, S. S. (2005). Integrating demographic and epidemiological approaches to research on HIV/AIDS: The proximate-determinants framework. *The Journal of Infectious Diseases, 191*(Suppl), S61–S67. doi:10.1086/425282.
- Brewster, K. L., Billy, J. O. G., & Grady, W. R. (1993). Social context and adolescent behavior: The impact of community on the transition to sexual activity. *Social Forces, 71*, 713–740. doi:10.2307/2579892.
- Browning, C. R., & Cagney, K. A. (2002). Neighborhood structural disadvantage, collective efficacy, and self-rated physical health in an urban setting. *Journal of Health and Social Behavior, 43*, 383–399. doi:10.2307/3090233.
- Browning, C. R., Leventhal, T., & Brooks-Gunn, J. (2004). Neighborhood context and racial differences in early adolescent sexual activity. *Demography, 41*, 697–720. doi:10.1353/dem.2004.0029.
- Browning, C. R., & Olinger-Wilbon, M. (2003). Neighborhood structure, social organization, and number of short-term sexual partnerships. *Journal of Marriage and the Family, 65*, 730–745. doi:10.1111/j.1741-3737.2003.00730.x.
- Carpiano, R. (2006). Toward a neighborhood resource-based theory of social capital for health: Can Bourdieu and sociology help? *Social Science and Medicine, 62*, 165–175. doi:10.1016/j.socscimed.2005.05.020.
- Catania, J. A., Canchola, J., Pollack, L., & Chang, J. (2006). Understanding the demographic characteristics of urban men who have sex with men. *Journal of Homosexuality, 51*(3), 33–51. doi:10.1300/J082v51n03\_03.
- CDC. (2003). Increases in HIV diagnoses—29 states, 1999–2002. *MMWR, 52*, 1145–1148.
- CDC. (2005). Trends in HIV/AIDS diagnoses—33 states, 2001–2004. *MMWR, 54*, 1149–1153.
- Chen, S. Y., Gibson, S., Katz, M. H., Klausner, J. D., Dilley, J. W., Schwarcz, S. K., et al. (2002). Continuing increases in sexual risk behavior and sexually transmitted diseases among men who have sex with men: San Francisco, Calif, 1999–2001, USA. *American Journal of Public Health, 92*, 1387–1388.
- Cohen, D., Spear, S., Scribner, R., Kissinger, P., Mason, K., & Wildgen, J. (2000). “Broken windows” and the risk of gonorrhea. *American Journal of Public Health, 90*, 230–236.
- Finlinson, H. A., Colón, H. M., Robles, R. R., & Soto, M. (2006). Sexual identity formation and AIDS prevention: An exploratory study of non-gay-identified Puerto Rican MSM from working class neighborhoods. *AIDS and Behavior, 10*(5), 531–539. doi:10.1007/s10461-006-9107-5.
- Fishbein, M., Middlestadt, S. E., & Trafimow, D. (1993). Social norms for condom use: Implications for HIV prevention interventions of a KABP survey with heterosexuals in the Eastern Caribbean. *Advances in Consumer Research, 20*, 292–296.
- Frye, V., Latka, M. H., Koblin, B., Halkitis, P. N., Putnam, S., Galea, S., et al. (2006). The urban environment and sexual risk behavior among men who have sex with men. *Journal of Urban Health, 83*(2), 308–324. doi:10.1007/s11524-006-9033-x.
- Gates, G., & Ost, J. (2004). *The Gay and Lesbian Atlas*. Washington, D.C: Urban Institute Press.
- Geisler, W. M., Whittington, W. L., Suchland, R. J., & Stamm, W. E. (2002). Epidemiology of anorectal chlamydial and gonococcal infections among men having sex with men in Seattle: Utilizing serovar and auxotype strain typing. *Sexually Transmitted Diseases, 29*, 189–195. doi:10.1097/00007435-200204000-00001.
- Holtgrave, D. R., & Crosby, R. A. (2003). Social capital, poverty, and income inequality as predictors of gonorrhoea, syphilis, Chlamydia, and AIDS case rates in the United States. *Sexually Transmitted Infections, 79*, 62–64. doi:10.1136/sti.79.1.62.
- Jaffe, H. W., Valdiserri, R. O., & De Cock, K. M. (2007). The reemerging HIV/AIDS epidemic in men who have sex with men. *JAMA, 28*,298(20), 2412–4.
- Johnson, R. A., Gerstein, D. R., Pach, A., III, Cerbone, F. G., & Brown, J. (2002). HIV risk behaviors in African-American drug injector networks: Implications of injection-partner mixing and partnership characteristics. *Addiction (Abingdon, England), 97*, 1011–1024. doi:10.1046/j.1360-0443.2002.00165.x.
- Kaplan, G. A. (2004). What’s wrong with social epidemiology, and how can we make it better. *Epidemiologic Reviews, 26*, 124–135. doi:10.1093/epirev/mxh010.
- Kawachi, I., & Kennedy, B. P. (1997). The relationship of income inequality to mortality: Does the choice of indicator matter? *Social Science and Medicine, 45*, 1121–1127. doi:10.1016/S0277-9536(97)00044-0.
- Kegeles, S. M., Rebchook, G. M., Hays, R. B., Terry, M. A., O’Donnell, L., Leonard, N. R., et al. (2000). From science to application: The development of an intervention package. *AIDS Education and Prevention, 12*, 62–74.
- Kelly, J. A., Murphy, D. A., Sikkema, K. J., McAuliffe, T. L., Roffman, R. A., Solomon, L. J., et al. (1997). Randomised, controlled, community-level HIV-prevention intervention for sexual-risk behaviour among homosexual men in US cities. Community HIV Prevention Research Collaborative. *Lancet, 350*(9090), 1500–1505. doi:10.1016/S0140-6736(97)07439-4.
- Kenney, M. (1995). Remember, Stonewall was a riot: Understanding gay and lesbian experience in the city. *Planning Theory, 13*, 73–87.

- Kerrigan, D., Witt, S., Glass, B., Chung, S. E., & Ellen, J. (2006). Perceived neighborhood social cohesion and condom use among adolescents vulnerable to HIV/STI. *AIDS and Behavior*, *10*(6), 723–729. doi:10.1007/s10461-006-9075-9.
- Kinsman, S. B., Romer, D., Furstenberg, F. F., & Schwarz, D. F. (1998). Early sexual initiation: The role of peer norms. *Pediatrics*, *102*, 1185–1192. doi:10.1542/peds.102.5.1185.
- Koblin, B., Chesney, M., & Coates, T. (2004). Effects of a behavioural intervention to reduce acquisition of HIV infection among men who have sex with men: The EXPLORE randomised controlled study. *Lancet*, *364*, 41–50. doi:10.1016/S0140-6736(04)16588-4.
- Latkin, C. A., Forman, V., Knowlton, A., & Sherman, S. (2003). Norms, social networks, and HIV-related risk behaviors among urban disadvantaged drug users. *Social Science and Medicine*, *56*, 465–476. doi:10.1016/S0277-9536(02)00047-3.
- Leaver, C. A., Allman, D., Meyers, T., & Veugelers, P. J. (2004). Effectiveness of HIV prevention in Ontario, Canada: A multi-level comparison of bisexual men. *American Journal of Public Health*, *94*(7), 1181–1185.
- Lee, S. J., Galanter, M., Dermatis, H., & McDowell, D. (2003). Circuit parties and patterns of drug use in a subset of gay men. *Journal of Addictive Diseases*, *22*, 47–60. doi:10.1300/J069v22n04\_05.
- Link, B. G., & Phelan, J. (1995). Social conditions as fundamental causes of disease. *Journal of Health and Social Behavior*, Spec No: 80–94.
- MacKellar, D., Valleroy, L., Karon, J., Lemp, G., & Janssen, R. (1996). The Young Men's Survey: Methods for estimating HIV seroprevalence and risk factors among young men who have sex with men. *Public Health Reports*, *111*(Suppl 1), 138–144.
- Mills, T. C., Paul, J., Stall, R., Pollack, L., Canchola, J., Chang, Y. J., et al. (2004). Distress and depression in men who have sex with men: The Urban Men's Health Study. *The American Journal of Psychiatry*, *161*(2), 278–285. doi:10.1176/appi.ajp.161.2.278.
- Mills, T. C., Stall, R., Pollack, L., Paul, J. P., Binson, D., Canchola, J., et al. (2001). Health-related characteristics of men who have sex with men: A comparison of those living in "gay ghettos" with those living elsewhere. *American Journal of Public Health*, *91*(6), 980–983.
- Moore, L. V., & Diez Roux, A. V. (2006). Associations of neighborhood characteristics with the location and type of food stores. *American Journal of Public Health*, *96*(2), 325–331. doi:10.2105/AJPH.2004.058040.
- New York City Department of Health and Mental Hygiene. (2007). New HIV diagnoses rising in New York City among young men who have sex with men (Accessed 09/11/2007).
- O'Donnell, L., Myint, U., O'Donnell, C. R., & Stueve, A. (2003a). Long-term influence of sexual norms and attitudes on timing of sexual initiation among urban minority youth. *The Journal of School Health*, *73*, 68–75.
- O'Donnell, L., Myint, U., O'Donnell, C. R., & Stueve, A. (2003b). Long-term influence of sexual norms and attitudes on timing of sexual initiation among urban minority youth. *The Journal of School Health*, *73*, 68–75.
- Osmond, D. H., Pollack, L. M., Paul, J. P., & Catania, J. A. (2007). Changes in prevalence of HIV infection and sexual risk behavior in men who have sex with men in San Francisco: 1997–2002. *American Journal of Public Health*, *97*(9), 1677–1683. doi:10.2105/AJPH.2005.062851.
- Parker, R. G., Easton, D., & Klein, C. H. (2000). Structural barriers and facilitators in HIV prevention: A review of international research. *AIDS*, *14*(Suppl 1), S22–S32.
- Ramirez-Valles, J. (2002). The protective effects of community involvement for HIV risk behavior: A conceptual framework. *Health Education Research*, *17*, 389–403. doi:10.1093/her/17.4.389.
- Ross, M. W., Henry, D., Freeman, A., Caughy, M., & Dawson, A. G., Jr. (2004). Environmental influences on safer sex in young gay men: A situational presentation approach to measuring influences on sexual health. *Archives of Sexual Behavior*, *33*, 249–257. doi:10.1023/B:ASEB.0000026624.69223.5f.
- Sampson, R. J., Raudenbusch, S., & Earls, F. (1997). Neighborhoods and violent crime: A multi-level study of collective efficacy. *Science*, *277*, 918–924. doi:10.1126/science.277.5328.918.
- Schwarz, S., Scheer, S., McFarland, W., Katz, M., Valleroy, L., Chen, S., et al. (2007). Prevalence of HIV infection and predictors of high-transmission sexual risk behaviors among men who have sex with men. *American Journal of Public Health*, *97*(6), 1067–1075. doi:10.2105/AJPH.2005.072249.
- Semple, S. J., Patterson, T. L., & Grant, I. (2003). HIV-positive gay and bisexual men: Predictors of unsafe sex. *AIDS Care*, *15*, 3–15.
- Shaw, C. R., & McKay, H. D. (1947). *Juvenile Delinquency and Urban Areas*. Chicago: University of Chicago Press.
- Shoveller, J. A., Johnson, J. L., Langille, D. B., & Mitchell, T. (2004). Socio-cultural influences on young people's sexual development. *Social Science and Medicine*, *59*, 473–487. doi:10.1016/j.socscimed.2003.11.017.
- Stall, R., Paul, J. P., Greenwood, G., et al. (2001). Alcohol use, drug use and alcohol-related problems among men who have sex with men: The Urban Men's Health Study. *Addiction (Abingdon, England)*, *96*(11), 1589–1601. doi:10.1046/j.1360-0443.2001.961115896.x.
- Subramanian, S. V., Chen, J. T., Rehkopf, D. H., Waterman, P. D., & Krieger, N. (2005). Racial disparities in context: A multilevel analysis of neighborhood variations in poverty and excess mortality among black populations in Massachusetts. *American Journal of Public Health*, *95*, 260–265. doi:10.2105/AJPH.2003.034132.
- Susser, M. (1998). Does risk factor epidemiology put epidemiology at risk? Peering into the future. *Journal of Epidemiology and Community Health*, *52*, 608–611.
- Torian, L. V., Makki, H. A., Menzies, I. B., Murrill, C. S., & Weisfuse, I. B. (2002). HIV infection in men who have sex with men, New York City Department of Health sexually transmitted disease clinics, 1990–1999: A decade of serosurveillance finds that racial disparities and associations between HIV and gonorrhea persist. *Sexually Transmitted Diseases*, *29*, 73–78. doi:10.1097/00007435-200202000-00002.
- Truong, K. D., & Ma, S. (2006). A systematic review of relations between neighborhoods and mental health. *The Journal of Mental Health Policy and Economics*, *9*(3), 137–154.
- US Census Bureau. (2000). Census summary file tape, file 3A (STF3A). Washington, DC: US Department of Commerce.
- US Census Bureau. (1999). New York City Housing and Vacancy Survey. Available at: <http://landview.census.gov/hhes/www/nycchvs.html>. New York City Mayor's Office of Operations. Mayors Management Report. 2002. Available at: <http://www.nyc.gov/mmr>.
- Weston, K. (1995). Get thee to a big city: Sexual imagery and the great gay migration. *Gay Lesbian Q*, *2*, 253–277.
- Wilson, J. Q., & Kelling, G. L. (1982). Broken Windows. *The Atlantic Monthly*, *249*(3), 29–38.