Extended Abstract

Title: Racial differences in concurrent heterosexual partnering among sexually active young adult women: The role of neighborhood structural conditions.

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Background:

Concurrent heterosexual partnerships (heterosexual relationships that overlap in time) increase the risk for sexually transmitted infections (STI) and HIV due to exposure to a greater number of partners and the lack of a time delay between partners that could allow for early detection and treatment of infection.[1-4] Studies have found that these high-risk sexual partnerships are more likely to occur among non-Hispanic Black women[5-6] and they are thought to be a significant contributing factor to the pervasive racial disparities in STI/HIV observed in the U.S. today.[2,7,8] Current hypotheses suggest structural factors, such as residential segregation, concentrated poverty, lower male: female sex ratios, incarceration and gender inequality in women's ability to refuse relationships with non-monogamous partners may account for the racial differences in concurrent sexual partnering. [2,5,6] However, these theories have not been adequately tested as most studies have focused on individual levels of analyses. Consequently, our understanding of the role that the broader social structure plays in shaping racial differences in concurrent heterosexual partnering is limited. Therefore, the purpose of this study was to apply social disorganization theory to examine the associations between neighborhood structural conditions and concurrent heterosexual partnerships among sexually active young adult women in the U.S., including the extent to which exposure to structurally disadvantaged neighborhoods explains the racial differences in concurrent heterosexual partnering.

METHODS

Study Design and Sample

We used cross-sectional data from Add Health, Wave III (2001-2002)[9] to examine associations between current neighborhood conditions and concurrent sexual partnerships among young adult women. Add Health is a school-based, longitudinal study of students in 7th-12th grade that utilized a multistage, stratified and clustered sampling design to ensure a nationally representative sample of U.S. schools with respect to region of country, urbanicity, school size, school type and ethnicity.[10] Four waves of data have been collected spanning from adolescence to young adulthood. Data are available from multiple sources, including adolescents, parents, partners, schools and communities. Wave III individual data were collected in 2001-2002 and the neighborhood data were derived from the 2000 U.S. Census. Wave III of Add Health is comprised of those respondents from Wave I who were able to be relocated and interviewed during the data collection time frame (N= 15,170). The weighted response rate for Wave III was 75.6% and the sample is comparable to the Wave I sample when final sampling weights are used.[11] Wave III of Add Health provides sampling weights for 14,322 young adults, aged18-27 years. Our sampling frame included non-Hispanic Black, non-Hispanic White and Hispanic women aged 18 -27 years who reported at least one current heterosexual relationship (N=4,155). Participants missing data on independent variables were excluded from analysis. The final sample size was 3,867 participants across 2,314 neighborhoods (missing n=288 or 6.9%).

Dependent Variables

The dependent variable – concurrent heterosexual partnership was based on self-reported engagement in a current vaginal and/or anal sex with an opposite sex partner. Respondents who reported more than one heterosexual relationship at the time of the interview were classified as concurrent (coded as 1).

Independent Variables

Individual-level variables

Individual-level variables were based on respondent self report and selected for inclusion based on previous research and theory. Sociodemographic characteristics included age (continuous measure), married (yes/no), race and ethnicity (non-Hispanic White, non-Hispanic Black and Hispanic), foreign birth (yes/no), economic hardship (if received food stamps, housing assistance or AFDC in the past year coded as yes), employed at least 10 hours weekly (yes/no), enrolled in high school or college (yes/no), current residence in parental household (yes/no), individual residential stability (continuous variable of the number of years resided in current neighborhood) and heterosexual orientation (yes/no). Sexual-risk factors included sexual risk behaviors, substance use and criminal activity. Sexual risk behavior controls included a continuous measure of age at first vaginal intercourse and categorical measures for exchanged money for sex in past year (yes/no), had sex with an IV drug user in past year (yes/no) and belief that current partner(s) was non-monogamous (belief partner was non-monogamous, unsure or belief that partner was monogamous). In addition, we included a categorical measure to control for a history of sexual abuse by a parent, guardian or trusted adult caregiver before 6th grade (yes/no). Substance use measures included level of binge drinking in past year (continuous measure of the number of days during the past year the respondent drank five or more drinks ranging from never to every/almost every day) and a categorical measure of drug use in the past year (whether the respondent used marijuana, methamphetamine, cocaine, or other illegal drugs=1). Last, a history of criminal activity was included in the analysis and measured as a lifetime history of arrest (yes/no).

Neighborhood-level variables

The neighborhood was defined as a geographic unit and measured as the census tract of residence. Census tracts commonly serve as proxies for neighborhoods and are often the basis for geographically delimited resource allocation.[12,13] Neighborhood social disorganization was measured via 4 indicators based on theory,[14-17] previous research[18-20] and available data: racial and ethnic composition, concentrated poverty and residential instability. Racial and ethnic composition was measured via 2 variables – (1) non-Hispanic Black concentration, which was composed of one standardized item: proportion of Black residents living in the census tract and (2) immigrant concentration, which was composed of 3 standardized items: proportion of Latino/Hispanic residents, proportion of linguistically isolated residents and proportion of foreign born residents. Exploratory factor analysis and internal consistency was conducted and results supported the inclusion of the 3 immigrant concentration items into one index (factor loadings > 0.65 onto one factor and internal consistency α=.95).

Concentrated poverty was a composite of 4 standardized items: proportion of households below poverty, proportion of households on public assistance, total unemployment rate and proportion of female-headed households with children. Exploratory factor analysis and internal consistency was conducted and results supported the inclusion of the 4 items into one index (factor loadings > 0.65 onto one factor and internal consistency α=.82). Residential instability was composed of 2 standardized items: proportion of households living in the census tract for 5 years or more and proportion of owner occupied homes. Internal consistency was α=.82. Last, three neighborhood control variables were included: region (Northeast, Midwest, West and South-reference), urbanicity (standardized item of proportion of persons

living in an urbanized area) and a standardized item of the proportion of residents in the neighborhood aged 18-24 years.

Analysis

Analyses consisted of multilevel logistic regression modeling to examine the contribution of neighborhood structural factors to racial differences in concurrent heterosexual partnering among stratified samples of young adult males and females, adjusting for individual and neighborhood control variables. We examined a series of 6 models to examine racial differences in heterosexual concurrent partnering and the extent to which individual-level factors and neighborhood structural conditions explained these differences. Consequently, model 1 included only race and ethnicity. In model 2, we included the individual level sociodemographics and sexual risk behaviors. In models 3-6, the neighborhood variables were included into the analyses. Specifically, model 3included the neighborhood controls, model 4 included neighborhood racial and ethnic composition and models 5 and 6 included concentrated poverty and residential instability into the analyses respectively to examine the extent to which they mediated relationships between neighborhood racial and ethnic composition and concurrent heterosexual partnerships. Continuous variables were grand mean centered. Multicollinearity was examined prior to multilevel analyses; tolerance and variance inflation factors were within range. The findings presented are from unweighted analyses because the Add Health sampling weights account only for the clustering of schools and not neighborhoods. Thus, their inclusion could lead to erroneous findings (personal communication, Kim Chantala, Add Health User's Conference, 2008). However, we did conduct sensitivity analyses using the weights and found no differences in statistical significance, although the strength of the associations was greater for weighted versus unweighted analyses.

Results

Descriptive statistics for the sample are presented in Table 1. The prevalence of concurrent heterosexual partnerships among the young women was 6%. Approximately 63% self-identified as White, 21% Black, and 16% as Hispanic and 4% were foreign born. In respect to socioeconomic position, 11% reported economic hardship in the past year, 70% were employed at least part time and 37% were enrolled in high school or college. In addition, 29% of the young adults were married, 87% reported heterosexual orientation and 30% lived with their parents. Respondents lived an average of 4.6 years at their current residence. The average age at first intercourse was 16.3 years, 6% reported a history of sexual abuse by an adult caregiver before 6th grade and approximately 2% of the young women reported having exchanged money for sex during the previous year. In addition, 16% of the young women reported that they believed that one or more of their sexual partners had been non-monogamous and 2% were unsure. Nearly 30% reported illicit drug use in the past year and 2% reported having had sexual intercourse with an IV drug user in the past year.

Findings from multivariate analyses on the associations between neighborhood structural conditions and concurrent heterosexual partnerships are presented in Table 2. In model 1, we examined associations between individual race and ethnicity and concurrent heterosexual partnerships and found that non-Hispanic Black women were approximately 2.3 times more likely to engage in this high –risk behavior than non-Hispanic White women. In model 2 we regressed concurrent heterosexual partnerships on individual-level sociodemographic characteristics and sexual-risk behaviors and found that the inclusion of these variables accounted for 31% of the Black-White difference on concurrent sexual partnerships. In models 3 and 4, we included the neighborhood level controls and the neighborhood structural variables of Black resident concentration and immigrant resident concentration. The inclusion of these neighborhood variables accounted for 64% of the Black-White difference in concurrent heterosexual partnerships observed in Model 2 (after adjustment of individual-level factors). In addition, in model 4, the relationship between individual race and concurrent sexual partnerships was no longer significant. However, for all young women, living in a neighborhood with increasing proportions of non-

Hispanic Black residents was positively associated with concurrent sexual partnering. In models 5 and 6, we included neighborhood concentrated poverty and residential instability respectively and neither of these variables were significantly associated with concurrent heterosexual partnerships. The relationship between neighborhood concentration of Black residents and concurrent heterosexual partnerships was not significant when neighborhood concentrated poverty was included in model 5. However, the magnitude of the regression coefficient changed very little.

Several significant individual-level associations also were found (see Model 6). Specifically, young women who were married and self-identified as heterosexual were less likely to engage in heterosexual partnerships while those who lived with their parents were more likely to engage in this high-risk behavior. In respect to sexual-risk behaviors, young women who reported an earlier age at first vaginal intercourse were more likely to engage in concurrent heterosexual partnerships as were those who reported illicit drug use during the previous year. Last, young women who reported awareness or uncertainty that one or more of their partner(s) were engaged in concurrent sexual partnering were more likely to report concurrent sexual partnerships compared to those who reported that their partner was monogamous.

Discussion

Our study found that racial concentration was significantly related to concurrent heterosexual partnerships among a sample of young adult women, above and beyond individual and neighborhood control variables. Specifically, we found that young adult women who lived in neighborhoods with a higher concentration of Black residents were more likely to report having a concurrent heterosexual partnership than those young women who lived in neighborhoods with lower concentrations of Black residents. Furthermore, we found that living in racially segregated neighborhoods accounted for a significant proportion of the individual-level racial difference in concurrent heterosexual partnerships between non-Hispanic Black and White women. Thus the observed individual level Black-White disparity in concurrent sexual partnering may be capturing the effects of racial segregation on informal social control processes and normative orientations related to sexual partnering. Although the relationship between neighborhood racial concentration of non-Hispanic Blacks and concurrent heterosexual partnerships was non-significant when neighborhood concentrated poverty was added into the multilevel model, the regression coefficient decreased only slightly. Further research is needed to better understand how racial segregation may shape concurrent heterosexual partnering and account for the individual differences in this high-risk behavior.

In contrast to theory, [14-17] immigrant concentration, residential instability and concentrated poverty were not significantly associated with concurrent heterosexual partnerships in our study. First, with respect to immigrant concentration, the majority of the Add Health sample lived in neighborhoods that contained few immigrant residents. This limitation may have reduced the power to detect significant relationships that may occur in more segregated neighborhoods. Second, with respect to concentrated poverty and residential instability, young adults may be more likely to live in neighborhoods with greater residential mobility and concentrated poverty due to their developmental stage in the life course. During young adulthood, youth typically become more autonomous and they leave their parental home to attend college, begin new employment opportunities and/or explore independent living options. This developmental transition is normative, thus residentially unstable and more economically disadvantaged living environments may have less of an impact on their risk-taking behaviors.

In addition to our neighborhood findings, we also found that young women who engaged in illicit drug use during the previous year and who reported a younger age at first sexual intercourse were more likely to have a concurrent heterosexual partnership than their peers who did not engage in these high-risk behavior. In addition, young women who believed that their sexual partner(s) was non-monogamous or who were uncertain about their partner's monogamy were more likely to report having a concurrent heterosexual partnership than young women who believed that their partner was monogamous. These findings in relation to sexual risk are consistent with previous research[5-6] and suggest important avenues

for behavioral change interventions. In addition, future research should explore the context of young women's sexual relationships, such as "friends with benefits" and their engagement in concurrent heterosexual partnerships. For example, non-monogamous sexual relationships may be mutually accepted in some young adults' sexual relationships while others may engage in concurrency in reaction to learning of a partner's infidelity.

Several limitations to our study warrant further discussion. First, this study is cross-sectional, thus causal inferences cannot be made. Second, Add Health questions related to concurrent heterosexual partnerships are asked only in a section on detailed relationships. However, 1,244 young adult females in Add Health did not complete this section and of these, 770 or 62% reported that they had vaginal sexual intercourse at least once in their lifetime. Consequently, the inability to measure the sexual-risk behaviors of these young women may bias our findings. Future analyses within our study will examine other sexual-risk taking behaviors between those missing on the relationship data file and those in our sample to explore the potential bias. Third, the school-based design of Add Health limited the sample to young adults attending school at Wave 1 (1995). Thus, the sample does not include high-risk youth in the community at Wave 1 who had dropped out of school. The Wave 3 sample does include young adults who participated in Wave 1, but dropped out of school after their Wave 1 interview.

Despite these limitations, our study offers evidence that neighborhood racial concentration of non-Hispanic Black populations is associated with young women's engagement in concurrent heterosexual partnering, and accounts for the individual racial differences in this high-risk behavior among the young women in our study. The Centers for Disease Control and Prevention's (CDC) Strategic Plan for 2008-2013 calls for a reduction in STI disparities and enhanced efforts to address the social and economic determinants of STI, including the incorporation of structural interventions into their STI prevention efforts.[21] Our study suggests that the racial segregation of non-Hispanic Black populations may play a role in shaping concurrent heterosexual partnering and that interventions targeting this long-standing form of discrimination are imperative.

Table 1 Characteristics of the sample of young adults aged 18-27 years, 2001-2002 National Survey of Adolescent Health (Add Health), N=11,370 young adults across 4,912 neighborhoods.

	Unweighted Means (sd)
Concurrent heterosexual partnership	.06 (.23)
Sociodemographics	
Race and ethnicity	
Hispanic	.16 (.37)
Black	.21 (.41)
White (ref)	.63 (.39)
Age	21.8 (1.7)
Foreign born	.04 (.21)
Economic hardship	.11 (.32)
Employed	.70 (.46)
Enrolled in school	.37 (.48)
Residential stability	4.6 (7.6)
Married	.29 (.45)
Lives with parents	.30 (.46)
Heterosexual orientation	.87 (.34)
STI risk factors	
Age of first vaginal sex	16.3 (2.5)
Sex with IV drug user	.02 (.13)
Exchanged sex for money	.02 (.15)
History of sexual abuse	.06 (.23)
Partner non-monogamous	
Yes	.16 (.37)
Unsure	.02 (.15)
No (ref)	.72 (.40)
Drug use in past year	.29 (.45)
Binge drinking	.87 (1.3)
Ever been arrested	.04 (.20)

Table 2 Random effects logistic regression of the associations between neighborhood social disorganization and concurrent heterosexual partnerships among young adult females aged 18-27 years, 2001-2002 National Survey of Adolescent Health (Add Health), N=3,867 young adult females across 2,314 neighborhoods.

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
Individual Level						
Sociodemographics						
Race and ethnicity						
Hispanic	.27 (.20)	.31 (.22)	.38 (.23)	.47 (.24)	.47 (.25)	.46 (.25)
Black	.84 (.16)***	.58 (.18)**	.51 (.19)**	.21 (.24)	.21 (.24)	.21 (.24)
White (ref)						
Age		.01 (.05)	.02 (.05)	.02 (.05)	.03 (.05)	.03 (.05)
Foreign born		-.83 (.55)	-.94 (.56)	-.83 (.56)	-.83 (.56)	-.83 (.56)
Economic hardship		.16 (.21)	.15 (.22)	.13 (.22)	.13 (.22)	.13 (.22)
Employed		.05 (.16)	.06 (.16)	.08 (.16)	.08 (.16)	.09 (.16)
Enrolled in school		.03 (.16)	.02 (.16)	.04 (.16)	.04 (.16)	.04 (.16)
Residential stability		-.01 (.01)	-.01 (.01)	-.01 (.01)	-.01 (.01)	-.01 (.01)
Married		-.47 (.23)*	-.50 (.23)*	-.49 (.23)*	-.49 (.23)*	-.49 (.23)*
Lives with parents		.41 (.20)*	.41 (.20)*	.44 (.20)*	.44 (.21)*	.42 (.21)*
Heterosexual orientation		-.53 (.18)**	-.53 (.18)**	-.54 (.18)**	-.54 (.18)**	-.55 (.18)**
STI risk factors						
Age of first vaginal sex		-.06 (.03)*	-.06 (.03)*	-.06 (.03)*	-.06 (.03)*	-.05 (.03)*
Sex with IV drug user		-1.03 (.56)	-1.01 (.51)	-.99 (.55)	-.99 (.55)	-.99 (.55)
Exchanged sex for money		.45 (.39)	.43 (.37)	.46 (.37)	.46 (.38)	.46 (.38)
History of sexual abuse		-.05 (.31)	-.03 (.31)	-.01 (.31)	-.01 (.31)	.01 (.31)
Partner non-monogamous						
Yes		1.65 (.16)***	1.65 (.16)***	1.64 (.15)***	1.64 (.16)***	1.65 (.16)***
Unsure		1.06 (.35)**	1.10 (.35)**	1.09 (.35)**	1.09 (.35)**	1.10 (.35)**
No (ref)						
Drug use in past year		.66 (.17)***	.70 (.17)***	.70 (.17)***	.70 (.17)***	.71 (.17)***
Binge drinking		.08 (.06)	.08 (.06)	.08 (.06)	.08 (.06)	.08 (.06)
Ever been arrested		.18 (.29)	.20 (.29)	.22 (.29)	.22 (.29)	.24 (.29)
Neighborhood Level						
Neighborhood controls						
Region						
West			-.54 (.22)*	-.45 (.23)*	-.45 (0.23)*	-.46 (.23)*
Midwest			-.24 (.20)	-.25 (.21)	-.25 (0.20)	-.25 (.21)
Northwest			-.25 (.23)	-.21 (.24)	-.21 (0.24)	-.22 (.24)
South (ref)						
Urbanicity			.06 (.08)	.08 (.08)	.08 (0.08)	.09 (.09)
% aged 18-24 years			.01 (.07)	.01 (.07)	.01 (0.08)	.07 (.08)
Neighborhood structure						
Racial/ethnic composition						
Black concentration				.17 (.08)*	.16 (.10)	.16 (.11)
Immigrant concentration				-.15 (.11)	-.15 (.12)	-.13 (.12)
Concentrated poverty					.01 (.12)	.03 (.13)
Residential instability						-.10 (.12)
Intercept	-3.09 (.10)***	-3.51 (.27)***	-3.31 (.29)***	-3.34 (.28)***	-3.34 (.29)***	-3.34 (.29)***

Unweighted analysis
*p<0.05, **p<0.01,***p<0.001

References

1. Morris M, Kretzschmar M. Concurrent partnerships and transmission dynamics in networks. Soc Networks. 1995; 17:299-318.
2. Adimora AA, Schoenbach VJ. Social context, sexual networks, and racial disparities in rates of sexually transmitted infections. J Infect Dis. 2005; 191 Suppl 1: S115-S122.
3. Kelley SS, Borawski E, Flocke S, Keen KJ. The role of concurrent and sequential sexual relationships in the risk of sexually transmitted diseases among adolescents. J Adolesc Health. 2003; 32: 296-305.
4. Ford K., Sohn W, Lepkowski J. American adolescents: Sexual mixing patterns, bridge partners, and concurrency. Sex Transm Dis. 2002; 29: 13-19.
5. Adimora AA, Schoenbach VJ, Bonas DM, Martinson FE, Donaldson KH, Stancil TR. Concurrent sexual partnerships among women in the United States. Epidemiology. 2002; 13: 320-327.
6. Adimora AA, Schoenbach VJ, Taylor EM, Khan MR, Schwartz RJ. Concurrent partnerships, nonmonogamous partners, and substance use among women in the United States. Am J Public Health. 2010 Aug 19. [Epub ahead of print]
7. Morris M. Kurth AE, Hamilton DT., Moody J, Wakefield S. Concurrent partnerships and HIV prevalence disparities by race: Linking science and public health practice. Am J Public Health. 2009; 99: 1023-1031.
8. Adimora AA, Schoenbach VJ, Martinson FE, et al.Heterosexually transmitted HIV infection among African Americans in North Carolina. J Acquir Immune Defic Syndr. 2006; 41: 616–623.
9. Harris KM. 2009. The National Longitudinal Study of Adolescent Health (Add Health), Waves I & II, 1994–1996; Wave III, 2001–2002; Wave IV, 2007-2009 [machine-readable data file and documentation]. Chapel Hill, NC: Carolina Population Center, University of North Carolina at Chapel Hill.
10. Harris KM, Halpern CT, Whitsel E, Hussey J, Tabor J, Entzel P, Udry JR. 2009. The National Longitudinal Study of Adolescent Health: Research Design. http://www.cpc.unc.edu/projects/addhealth/design. Accessed July 25, 2010.
11. Chantala K, Kalsbeek, WD, Andraca E. Non-Response in Wave III of the Add Health Study. http://www.cpc.unc.edu/projects/addhealth/data/guides/W3nonres.pdf. Accessed July 25, 2010.
12. Leventhal T, Brooks-Gunn J. The neighborhoods they live in: The effects of neighborhood residence on child and adolescent outcomes. Psychol Bull. 2000; 126: 309-337.
13. Subramanian SV, Chen JT, Rehkopf DH, Waterman PD, Krieger N. Racial disparities in context: a multilevel analysis of neighborhood variations in poverty and excess mortality among black populations in Massachusetts. Am J Public Health. 2005; 95: 260-265.
14. Shaw CR, McKay HD. Juvenile Delinquency and Urban Areas. Chicago: The University of Chicago Press; 1969.
15. Sampson RJ, Raudenbush S, Earls F. Neighborhoods and violent crime: A multilevel study of collective efficacy. Science. 1997; 277:918-24.
16. Wilson WJ. The Truly Disadvantaged: The Inner City, the Underclass, and Public Policy. Chicago: University of Chicago Press; 1987.
17. Jencks C, Mayer SE. The social consequences of growing up in a poor neighborhood. In: Lynn LE, McGeary MGH, eds. Inner-City Poverty in the United States. Washington, DC: National Academy of Press; 1990: 111-186.
18. Browning CR, Burrington LA, Leventhal T, Brooks-Gunn J. Neighborhood structural inequality, collective efficacy, and sexual risk behavior among urban youth. J Health Soc Behav. 2008; 49:269-85.
19. Browning CR, Leventhal T, Brooks-Gunn J. Neighborhood context and racial differences in early adolescent sexual activity. Demography. 2004; 41:697-720.
20. Browning CR, Olinger-Wilbon M. Neighborhood structural disadvantage, social organization, and number of short-term sexual partnerships." J Marriage Fam. 2003; 65:730-45.
21. Centers for Disease Control and Prevention. Division of STD prevention strategic plan 2008-2013. www.cdc.gov/STD/general/DSTDP-Strategic-Plan-2008.pdf. Accessed July 12, 2010.