The Contribution of Neighborhood Social Disorganization to Sexually Transmitted Infection Biomarkers

Jodi L. Ford, PhD, College of Nursing
Christopher R. Browning, PhD, Department of Sociology
The Ohio State University

OVERVIEW

Sexually transmitted infections (STI) remain pervasive among adolescents and young adults despite national priority goals aimed at reducing rates among this population.[1] In comparison to older age-groups, adolescents and young adults have the highest Chlamydia and gonorrhea rates[2] and they account for nearly half of all newly diagnosed STI in the U.S. each year.[3] Furthermore, recent surveillance data indicates that syphilis rates are actually increasing among male and female adolescents and young adults, as are AIDS rates among males.[2] Although a plethora of informative studies have been conducted on the factors contributing to the STI epidemic among this vulnerable population, most have focused on individual, peer, partner/network or parental determinants.[4] Evidence from the few studies on the contribution of neighborhood and community conditions to STI outcomes suggests that structural disadvantage plays an important role in shaping STI.[5-9] However, outcome measures from these studies tend to be community STI rates[6,8,9] or subjective reports of individual STI7, while data sources tend to be at the state or local level[5,6,8,9]. Therefore, the purpose of this preliminary study is to extend prior research to examine the contribution of neighborhood social disorganization to STI diagnoses among young adults using the biomarker STI outcomes from the National Longitudinal Study of Adolescence Health (Add Health), while adjusting for individual sociodemographic and risk behaviors as well as neighborhood controls.

THEORETICAL FRAMEWORK

This study applies social disorganization theory[10-14] to examine the contribution of neighborhood concentrated poverty, residential instability and racial/ethnic heterogeneity to STI diagnosis among young adults in the U.S. Social disorganization theory posits that these three indicators of structural disadvantage shape individual health and risk behavior by reducing local access to institutional recourses, disrupting social ties due to migration flows in and out of disadvantaged areas, weakening social relationships between differing racial and ethnic groups and reducing social control and exposure to positive role models and social norms.[10-14] Although social disorganization theory posits that more negative outcomes will occur as these three indicators of neighborhood social disorganization increase, their association with STI outcomes has not been adequately tested.

METHODS

Design

This research employed a cross-sectional multilevel design using secondary, restricted-use data from the National Longitudinal Study of Adolescent Health (Add Health).[15] 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. Data were collected from multiple sources, including adolescents, parents, schools and communities, which enable the exploration of how multiple contexts influence health outcomes. Three waves of data have been collected spanning from adolescence to young adulthood. Data from Wave III (collected in 2001-2002) were analyzed for this project because of our interest in the contribution of current neighborhood structural conditions to STI biomarker diagnosis among young adults.

Sample

Wave III of Add Health provides data on 14,322 young adults, aged18-26 years.[15] All respondents were eligible to participate in STI urine testing, which includes testing for Chlamydia, gonorrhea and Trichomonas vaginalis. A total of 12,545 respondents had biomarker results for these 3 STIs (1,185 respondents refused to participate in the STI testing and an additional 592 respondents had specimens that yielded no results).[16] Participants who were missing data on items of interest were excluded from the analysis (n=723 or 5.8%) for a final sample size of 11,822.

Measures

Dependent Variable: STI diagnosis

The dependent variable, STI diagnosis, measured a positive or negative urine assay screen to Chlamydia, gonorrhea or Trichomonas vaginalis collected on the day of the interview. Respondents provided 15-20cc of first stream urine, which was tested for Chlamydia and gonorrhea via Ligase Chain Reaction (LCR™) amplification technology in the Abbott LCx® Probe System[16] and for Trichomonas vaginalis[*] via the PCR-ELISA.[17]

Level I Independent Variables: Sociodemographics, STI-risk behavior and controls

The Level I independent variables consisted of self-reported individual sociodemographic factors and STI-risk behaviors identified through previous research and theory to be associated with a STI diagnosis. Sociodemographic factors included gender (male/female), married (yes/no), race and ethnicity (non-Hispanic white, non-Hispanic Black, non-Hispanic American Indian, non-Hispanic Asian and Hispanic), foreign birth (yes/no) and economic hardship (receipt of food stamps, housing assistance or AFDC in the past year). Measures of STI-risk behaviors included number of vaginal sex partners in past year,[+] exchanged money for sex in past year (yes/no), had sex with an IV drug user in past year (yes/no), self reported STI diagnosis in past year (yes/no), engaged in binge drinking in past year (yes/no)[ϒ] drug use in the past year (yes/no).[ƒ] One control variable, antibiotic use in past month (yes/no) was included to adjust for possible treatment of an undiagnosed STI prior to urine screening during the Add Health interview.

Level II Independent Variables: Neighborhood social disorganization and controls

The level II independent variables were derived from the 2000 U.S. Census and provided to researchers in Add Health's Wave III contextual data set. The neighborhood was defined for this study as a geographic unit and measured as the census tract of residence. Census tracts commonly serve as proxies for neighborhoods throughout the literature.[13] Neighborhood social disorganization was conceptualized and measured via 3 indicators: concentrated poverty, residential instability and ethnic heterogeneity. Concentrated poverty was a standardized index composed of 4 items: proportion of households below poverty, proportion of households on public assistance, unemployment rate and proportion of female headed households with children. Exploratory factor analysis and internal consistency were conducted prior to construction of the index. Results supported the inclusion of the four items into one index (factor loadings greater than 0.65 onto one factor and α=.81). Residential instability was composed of 2 items: proportion of households living in the census tract for 5 years or more and proportion of owner occupied homes with an internal consistency of α=.82. Last, racial heterogeneity was composed of one item measuring the proportion of two or more races in the census tract. All three indicators for social disorganization were standardized for multivariate analyses. Two control variables were included: region (Northeast, Midwest, West and South-reference) and urbanicity (proportion of persons in the census tract living in an urbanized area).

---

[*] Specificity and sensitivity testing for Chlamydia and gonorrhea via urine are well established. Urine testing for the protozoa, Trichomonas vaginalis is still considered experimental, but has been validated with wet mount and culture in published studies.[16-17]

[+] Section 16 of Add Health contains items related only to vaginal intercourse, thus individuals who reported that they never had vaginal intercourse were coded as having no vaginal sex partners in the past year. A proportion of respondents who reported no vaginal intercourse had a positive urine STI screen, which could have been acquired through anal sex with a same-sex or opposite sex partner. The relationship data file (Section 19) does contains more detailed information about oral and anal sex, but a proportion of persons who reported that they had vaginal sex did not complete this section.

[ϒ] Binge drinking was defined as having 5 or more drinks in a row.

[ƒ] Drug use was coded as yes if respondents self-reported using pot, cocaine, crystal meth or other illicit or prescriptive drugs not prescribed to them in the past year.

Data Analysis

Descriptive statistics were examined to better understand the sociodemographic and risk-behaviors of the young adults in the sample, including the structural characteristics of their neighborhoods. Multivariate analyses employed hierarchical generalized linear modeling (HGLM) to examine the contribution of neighborhood social disorganization to STI diagnosis among young adults, adjusting for individual sociodemographic factors, sexual-risk behaviors, substance use and neighborhood controls. HGLM analyses were conducted using a series of models to better understand the potential mediating role of individual risk behavior on the relationships between neighborhood structural characteristics and STI outcomes. Multicollinearity was examined prior to analyses and no influential correlation between variables was found. Analyses were adjusted for the complex survey design. However, weights were not employed because they were developed based on clustering of schools and not neighborhoods, thus their inclusion could lead to erroneous findings (personal communication, Kim Chantala, Add Health User's Conference, 2008).

RESULTS

Table 1 provides the descriptive results related to the individual and neighborhood level characteristics of the young adults in the sample. Approximately 6.9% of the young adults tested positive for Chlamydia, gonorrhea or Trichomonas vaginalis on their urine assay.

Table 2 provides the findings from this preliminary HGLM analyses. The first model examined the main effects of neighborhood social disorganization while adjusting for neighborhood controls of region and urbanicity. Findings indicated that young adults who lived in neighborhoods with higher levels of concentrated poverty were more likely to have a positive STI assay. However, an inverse relationship was found for residential instability and racial/ethnic heterogeneity. Specifically, young adults who lived in neighborhoods with higher levels of residential instability and racial/ethnic heterogeneity were less likely to have a positive STI assay. Model 2 includes individual level risk behaviors in the analysis to examine their mediating effect on the relationships between neighborhood social disorganization and the log odds of a positive STI screen, but little effect noted. However, neighborhood concentrated poverty, residential instability and racial/ethnic heterogeneity remained statistically significant and in the same direction as in Model 1. Individual risk behaviors positively associated with a positive STI assay included self-reported STI in past year, greater number of vaginal sex partners, having exchanged money for sex and drug use, while binge drinking in the past year was negatively associated with a positive STI assay. Model 3 removed the individual risk behaviors and introduced the individual sociodemographic factors into the analyses. The three indicators for neighborhood social disorganization remained statistically significant, but the magnitude of the log odds decreased. The findings for individual sociodemographic factors indicated that minority self-identification, economic hardship, marital status and gender were significantly associated with having a positive STI assay. In the final model, all individual and neighborhood level variables were introduced into the analyses. All three indicators of neighborhood social disorganization remained statistically significant and in the same direction as in Model 1.

SUMMARY

The findings from these preliminary analyses provide evidence that neighborhood social disorganization is associated with objective measures of STI diagnosis among young adults in the U.S., above and beyond the individual composition of the neighborhood. The findings indicated that concentrated poverty was positively associated with a positive urine assay screen, which is supported by previous research.[5-9] However, as residential instability and racial/ethnic heterogeneity increased, the likelihood of a positive STI assay decreased. The reason for the inverse relationship between residential instability, racial/ethnic heterogeneity and a positive STI assay may be due to the sexual network structure in these neighborhoods. Specifically, neighborhoods characterized by higher rates of residential mobility and racial/ethnic

diversity may lead to more open sexual networks, and ultimately reduced STI risk as evident by sexual network research.[18]

The findings presented in this abstract are preliminary and further analyses are planned, including (1) an examination of potential cross-level interactions between the neighborhood social disorganization indicators and individual sociodemographic and risk behaviors and (2) application of the same models to another STI biomarker provided in Wave III of Add Health – human papillomavirus (HPV).

Table 1 Descriptive statistics of the total sample of young adults 18-26 years of age (N=11,822)

	Total	
	Mean	SE
Dependent Variable		
Positive STI screen	.069	.004
Independent Variables: Level I: Individual		
Sociodemographics		
Male	.471	.005
Race/ethnicity		
Hispanic	.165	.034
NH Black	.206	.023
NH American Indian	.009	.004
NH Asian	.070	.024
NH White	.550	.058
Foreign born	.081	.019
Economic hardship	.073	.005
Married	.179	.009
Risk Behaviors		
Self-reported STI	.066	.003
Number partners	1.50	.023
Exchanged money for sex	.023	.002
Sex with IV drug user	.007	.001
Binge drink	.484	.018
Drug use	.331	.011
Controls		
Antibiotic use past month	.134	.004
Independent Variables: Level II: Neighborhood		
Social disorganization[1]		
Concentrated poverty	.085	.003
Residential instability	.432	.008
Racial/Ethnic heterogeneity	.030	.003
Controls		
Region		
Northeast	.128	.017
Midwest	.254	.043
South	.369	.041
West	.249	.066
Urbanized area	.732	.034

[1] Concentrated poverty, residential instability and racial/ethnic heterogeneity are not standardized
[2]Uneighted due to neighborhood analyses (see text), but design effect accounted for

Table 2 Multilevel analysis of biomarker STI among young adults 18-26 years of age (N=11,822): Sociodemographic, risk behavior and neighborhood social disorganization determinants

	1		2		3		4	
Individual								
Sociodemographics								
Male					-.165*	(.082)	-.239*	(.085)
Race/ethnicity								
Hispanic					.662*	(.135)	.668*	(.136)
NH Black					1.53*	(.108)	1.55*	(.111)
NH American Indian					1.03*	(.384)	.998*	(.399)
NH Asian					.563*	(.211)	.610*	(.212)
NH White (reference)								
Foreign born					-.066	(.166)	-.017	(.168)
Economic hardship					.615*	(.119)	.593*	(.121)
Married					-.342*	(.110)	-.277*	(.113)
Risk Behaviors								
Self-reported STI			.303*	(.122)			.018	(.130)
Number partners			.058*	(.016)			.045*	(.016)
Exchanged money for sex			.507*	(.189)			.233	(.192)
Sex with IV drug user			-.528	(.485)			-.387	(.517)
Binge drink			-.230*	(.088)			.089	(.092)
Drug use			.205*	(.085)			.217*	(.099)
Controls								
Antibiotic use past month					-.269*	(.122)	-.303*	(.126)
Neighborhood								
Social disorganization[1]								
Concentrated poverty	.463*	(.037)	.433*	(.037)	.168*	(.039)	.172*	(.039)
Residential instability	-.223*	(.051)	-.209*	(.051)	-.116*	(.051)	-.122*	(.050)
Racial/Ethnic heterogeneity	-.117*	(.044)	-.120*	(..044)	-.099*	(.041)	-.099*	(.041)
Controls								
Region								
Northeast	-.542*	(.144)	-.529*	(.144)	-.238	(.145)	-.258	(.145)
Midwest	-.360*	(.108)	-.351*	(.108)	-.082	(.109)	-.105	(.109)
West	-.515*	(.130)	-.322*	(.116)	-.319*	(.119)	-.435*	(.130)
South (reference)								
Urbanized area	.209	(.112)	.201	(.112)	.023	(.107)	.025	(.108)
Intercept	-2.59*	(.079)	-2.58*	(.086)	-3.11*	(.110)	-3.21*	(.127)

[1] Concentrated poverty, residential instability and racial/ethnic heterogeneity are standardized
[2] Unweighted due to neighborhood analyses (see text).

REFERENCES

1. Healthy People 2010. (2006). Sexually transmitted infections: Midcourse review. Accessed September 17, 2009 from http://www.healthypeople.gov/Data/midcourse/html/focusareas/FA25References.htm
2. Gavin, L. et al. (2009). Sexual and Reproductive Health of Persons Aged 10--24 Years --- United States, 2002—2007. *MMWR*, *58*, 1-58.
3. Weinstock, H., Berman, S, & Cates, W. (2004). Sexually transmitted diseases among American youth: Incidence and prevalence estimates, 2000. *Perspectives on Sexual and Reproductive Health, 36*, 6-10.
4. Kirby, D., Lepore, G. & Ryan, J. (2005). Sexual risk and protective factors: Factors affecting teen sexual behavior, pregnancy, childbearing and sexually transmitted disease: Which are important? Which can you change? National Campaign to Prevent Teen Pregnancy.
5. Krieger, N., Waterman, P.D., Chen, J.T., Soobader, M.J., & Subramanian, S.V. (2003). Monitoring socioeconomic inequalities in sexually transmitted infections, tuberculosis, and violence: Geocoding and choice of area-based socioeconomic measures--The Public Health Disparities Geocoding Project (US). *Public Health Reports, 118*, 240-260.
6. Zierler, S., Krieger, N., Tang, Y., Coady, W., Siegfried, E., DeMaria, A., & Auerbach, J. (2000). Economic deprivation and AIDS incidence in Massachusetts. *American Journal of Public Health, 90,* 1064-1073.
7. Upchurch, D., Mason, W., Kusonoki, Y., & Kriechbaum M. (2004). Social and behavioral determinants of self-reported STD among adolescents. *Perspectives on Sexual and Reproductive Health, 36*, 276-87.
8. 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*, 230-6.
9. Du, P., McNutt, L.A., O’Campo, P., & Coles, B. (2009). Changes in Community Socioeconomic Status and racial distribution associated with gonorrhea rates: An analysis at the community level. Sexually Transmitted Diseases, 36, epub ahead of print.
10. Shaw, Clifford R. and Henry D. McKay. 1969.Juvenile Delinquency and Urban Areas.Chicago: The University of Chicago Press.
11. Wilson, William J. 1987. The Truly Disadvantaged:The Inner City, the Underclass, and Public Policy. Chicago: University of Chicago Press.
12. Jencks, C. & Mayer, S.E. (1990). The social consequences of growing up in a poor neighborhood. In L.E. Lynn and M.G. H. McGeary (Ed.), Inner-City Poverty in the United States (pp. 111-186). Washington, D.C.: National Academy of Press.
13. Leventhal, T., & Brooks-Gunn, J. (2000). The neighborhoods they live in: The effects of neighborhood residence on child and adolescent outcomes. *Psychological Bulletin, 126*, 309-337.
14. Browning, C.R. & Cagney, K. (2003). Moving beyond poverty: Neighborhood structure, social processes, and health. *Journal of Health and Social Behavior, 44,* 552-571.
15. Harris, K.M., Florey, F., Tabor, J., Bearman, P.S., Jones, J., & Udry, J.R. (2003). The National Longitudinal Study of Adolescent Health: Research Design. Retrieved September 14, 2009, from http:// www.cpc.unc.edu/projects/addhealth/design.
16. Ford, C.A., Florey, F.A. & Tabor, J. (n.d.). Chapter 3: STI and HIV testing: Field, transportation and notification procedures. In Biomarkers Wave III of the Add Health Study. Retrieved September 14, 2009 from, http://www.cpc.unc.edu/projects/addhealth/data/using/guides/biomark.pdf
17. Hobbs, M.M. (n.d.) Trichomonas vaginalis testing. In Biomarkers Wave III of the Add Health Study. Retrieved September 14, 2009 from, http://www.cpc.unc.edu/projects/addhealth/data/using/guides/biomark.pdf

18. Morris, M., Kurth, A.E., Hamilton, D.T,, Moody, J., & Wakefield, S. (2009). Concurrent partnerships and HIV disparities by race: Linking science and public health practice. *American Journal of Public Health, 99*: 1023-1031.