NEIGHBORHOOD EFFECTS
ON SEXUAL AND REPRODUCTIVE HEALTH:
A REVIEW OF THE LITERATURE

Ushma D. Upadhyay, PhD, MPH
Deborah Karasek, MPH

Advancing New Standards in Reproductive Health (ANSIRH)
Bixby Center for Global Reproductive Health
University of California, San Francisco
1330 Broadway, Suite 1100
Oakland, CA 94612
(510) 986-8928 (office)
(410) 404-4103 (mobile)

Abstract

Social and contextual conditions of the neighborhood environment may affect sexual and reproductive health behavior. This review assesses the quality, quantity, methodological variation, and consistency of quantitative evidence examining neighborhood effects on sexual and reproductive health outcomes. We identified 15 articles and organized them according to key sexual and reproductive outcomes of interest, neighborhood definition used, neighborhood level variables and data source, and analytic technique. The majority of studies found evidence of the relationship between some group level factors and sexual and reproductive outcomes. However not all findings were internally or externally consistent. Associations between neighborhood level conditions and individual sexual and reproductive health outcomes remain inconclusive due to lack of appropriate data and methodological technique. Further research should examine the complex interactions of neighborhood contextual factors and individual sexual behavior.

I.   Introduction and Aims

Recent epidemiological studies have demonstrated the importance of neighborhood environment to a variety of individual health risks and outcomes. This interest has been sustained by established theory that posits that health is determined by one's environment, known as ecological systems theory (Bronfenbrenner 1979). Additionally, the increased availability of multilevel analysis techniques, formerly available to only the most advanced statistical programmers, has resulted in the growing popularity of these studies. Multilevel analysis allows for the assessment of the associations between neighborhood context and health after controlling for potential individual-level confounders. The use of multilevel models recognizes the existence of heterogeneity within and between communities and makes use of the natural community-level clustering of population groups to explain some of the variation in the outcome variables (Duncan, Jones and Moon 1996).

Despite this interest, relatively few studies have examined the effects of neighborhood context on sexual and reproductive health outcomes. While sexual and reproductive health outcomes are a consequence of proximate determinants including individual sexual behavior and contraceptive use, larger distal determinants likely affect women's and men's' ability to negotiate these immediate influences. To complement the existing knowledge of individual-level influences it is critical to understand how more distal determinants, such as social and physical conditions of a neighborhood, contribute to sexual and reproductive health outcomes. Ultimately such research would suggest and inform novel and innovative interventions to improve sexual and reproductive health.

Ecological studies suggest that indeed neighborhood factors affect the risk of unintended pregnancy. Such analyses have found macro-level associations between such structural determinants as poverty, and unintended pregnancy rates at the neighborhood-level (Gold et al. 2002; Kirby, Coyle and Gould 2001; Singh 1986). For example, one analysis examined contextual factors related to teen birth rates at the state level. While the results cannot be applied to individuals, the study did find that state teen birth rates were affected by both state levels of poverty and income inequality. A path analysis demonstrated that the effect of income inequality on teen births primarily functioned through its impact on social capital (Gold et al. 2002). In another analysis of variation in birthrates among California adolescents by zip code found that poverty and low levels of education were associated with higher birth rates within the zip code (Kirby et al. 2001). A study using block-level data, researchers examined the association of a physical disorder index—based on observations of street conditions such as graffiti, litter, abandoned cars, and vacant homes—with adolescent pregnancy rates within the block (Wei et al. 2005). However because these studies were ecological, inferences cannot be made about individuals based on their findings.

Qualitative research has been useful in identifying specific neighborhood-level factors that affect health outcomes, and suggesting causal pathways, thereby providing a theoretical basis for selection of factors for quantitative evaluation (O'Campo et al. 2005). In such studies, researchers have suggested that social norms (Espey, Cosgrove and Ogburn 2007) and community beliefs (Bird and Bogart 2005) contribute to reduced contraceptive use or increased unintended pregnancy rates. Women's wishes to avoid pregnancy, whether decisive or ambivalent, are often inadequate to overcome normative pressures from the community (Zabin 1994a, 1994b). Other ethnographic work suggests that educational, employment, and other life opportunities influence unintended pregnancies (Edin and Kefalas 2005; Kendall et al. 2005; Luker 1975, 1996). These qualitative studies suggest that potential influences for exploration in neighborhood studies include the community level of unintended pregnancy and contraceptive

use, community level acceptance of single motherhood, opportunities for women's employment and higher education, and gender equity.

Given the growing recognition of the importance of neighborhood level influences, we reviewed the literature on neighborhood effects on sexual and reproductive health to determine what specific research questions were pursued, to inventory the methodologies used, and to synthesize the current research findings. It is our hope that this work will help guide future studies and alert reproductive health researchers to important theoretical and methodological issues pertaining to this developing science.

II.   Methods

We defined sexual and reproductive health outcomes as those related to sexual behavior, condom use, sexually transmitted infections, contraceptive use, unintended pregnancy, and abortion. For purposes of maintaining a well-defined scope of the review, we excluded birth outcomes, infant and child health, maternal health, and HIV related outcomes.

Studies were primarily identified using PubMed, Scopus and POPLINE. Search terms included a combination of the following topical key words "sexual," "contraception," "family planning," "unwanted pregnancy," or "unintended pregnancy" along with one of the following methodological key words "neighborhood," "contextual," "multilevel," or "community." Additional studies were identified from the reference lists of the papers identified in the PubMed and Scopus and POPLINE searches. Studies included in this review are quantitative, US or International, in English language, and published between January 1985 and December 2010. Excluded articles include studies that examined sexual and reproductive health outcomes only as mediators, school-based studies that did not look at neighborhood characteristics, and articles using only qualitative research techniques.

III.   Preliminary Results

As of the date of this abstract, our literature review has yielded 15 studies that directly examine the effect of neighborhood level characteristics on sexual and reproductive health outcomes using quantitative methods (see Table 1). . We intend to expand the breadth of the review to include additional articles, and to continue analysis of the validity and consistency of identified studies.

Research questions and key outcomes of interest

The articles examine a variety of outcomes. All studies sought to examine whether community or environmental conditions affected the sexual and reproductive health outcomes of interest. The most common outcome studied was contraceptive use (n=5), followed by unintended pregnancy or birth (n=3). We found two studies examining each of the following outcomes sexual risk behavior, STI incidence, condom use at first and most recent sex, sexual initiation, and number of sexual partners.

Study populations

There was great variety in the study populations across the 15 articles reviewed. Five of the articles analyzed residents within a large city in the United States as their population of interest (Bluthenthal et al. 2007; Browning et al. 2008; Cohen et al. 2000; Hogan, Astone and Kitagawa 1985; Kaplan et al. 2009). Three articles selected a subsample from national datasets (Brewster 1994; Cubbin et al. 2005; Mosher, Deang and Bramlett 2003) . Five of the identified studies

examined international populations including South Africa (Speizer et al. 2009; Stephenson, Beke and Tshibangu 2008) Nigeria (Uthman 2008; Uthman and Kongnyuy 2008) including one inter-country analysis in the European Union (Lazarus et al. 2009).

Six of the studies restricted their study population to adolescents, examining outcomes of sexual initiation, teen pregnancy (Speizer et al. 2009), condom use ((Lazarus et al. 2009; Speizer et al. 2009; Van Horne et al. 2009), contraceptive use at first sex Hogan, 1985 #65;Cubbin, 2005 #158}, and sexual risk behavior (Browning et al. 2008). Seven of the studies included only female respondents in their population of interest (Billy and Moore 1991; Mosher et al. 2003; Speizer et al. 2009; Stephenson et al. 2008; Uthman 2008; Uthman and Kongnyuy 2008; Van Horne et al. 2009). One study examined the differential effects of neighborhood context on adolescent sexual behavior for both males and females (Cubbin et al. 2005).

In the full paper we will synthesize the strengths and limitations of study populations examined in the articles.

Neighborhood definitions
There is substantial variation in the definitions of neighborhoods used in the studies. Often the neighborhood definition is selected based on availability of data. Six of ten US studies used Census tracts as the unit of aggregate level data (Billy and Moore 1991; Bluthenthal et al. 2007; Brewster 1994; Cubbin et al. 2005; Hogan et al. 1985; Mosher et al. 2003). International studies using DHS data defined communities based on the sub-national reporting area, usually provinces or groups of provinces within the country (Stephenson et al. 2008). The articles used census tract (Billy and Moore 1991; Bluthenthal et al. 2007; Brewster 1994; Cubbin et al. 2005; Hogan et al. 1985; Mosher et al. 2003), county (Billy and Moore 1991; Mosher et al. 2003), census block group (Cohen et al. 2000), municipality (Speizer et al. 2009), country (Lazarus et al. 2009), participant report (Van Horne et al. 2009), or investigator defined (Browning et al. 2008; Kaplan et al. 2009) definitions of community examining neighborhood level factors and individual or aggregate variation in contraceptive use, sexual risk behavior, STI incidence, and unintended pregnancy.

Key Neighborhood Level Variables
We report on the neighborhood-level factors that were examined in the studies and discuss the authors' reported reasons for selecting those factors. We elaborate on how they were measured and sources of data. We discuss methodological considerations including obtaining community level data from a Census or other data source, versus aggregating individual level data.

Analytical techniques
While the majority of studies utilize multilevel data on both the individual and neighborhood level, they vary in the statistical and analytic technique applied.

Five of the reviewed articles used single level multivariable regression (Cohen et al. 2000; Cubbin et al. 2005; Hogan et al. 1985; Kaplan et al. 2009; Van Horne et al. 2009). Two used a multivariable hazard model (Billy and Moore 1991; Brewster 1994).

Eight of the studies used multilevel analysis techniques to account for the individual and community level data, and the clustering of participants by these same higher level units. Models used included from random intercept multilevel model (Bluthenthal et al. 2007), Random effects model (Browning et al. 2008), and multilevel linear regression using HLM (Lazarus et al.

2009; Mosher et al. 2003; Speizer et al. 2009; Stephenson et al. 2008; Uthman 2008; Uthman and Kongnyuy 2008).

In the full paper we will comment on the methodological advantages and disadvantages to using each analytic technique.

Neighborhood and Community Effects
We synthesize the major findings of the studies to determine whether neighborhood context affects reproductive health, identifying common themes and limitations.
The majority of studies found evidence of the relationship between some group level factors and sexual and reproductive outcomes. However not all findings were internally or externally consistent. Three articles reported an association between census tract level socioeconomic characteristics and contraceptive use (Brewster 1994; Hogan et al. 1985; Stephenson et al. 2008). Another found no relationship between socioeconomic status and contraceptive use at most recent sex, although these same factors were associated with contraceptive use at first sex (Cubbin et al. 2005). High neighborhood poverty rates as well as low proportions of profession employment were also associated with higher rates of unwanted births in US counties (Mosher et al. 2003). Racial concentration was linked to unprotected sex (Bluthenthal et al. 2007), age of sexual initiation (Cubbin et al. 2005), and increased incidence of STIs (Kaplan et al. 2009).

Few studies examined measures of social constructs in relation to sexual health outcomes. One study examined neighborhood level collective efficacy, and found that is was negatively associated with likelihood of having multiple sexual partners (Browning et al. 2008). Another used a measure of the physical neighborhood decay (social disorder) and found it explained much of the variation of gonorrhea rates across high poverty neighborhoods (Cohen et al. 2000).

The lack of consistency of neighborhood level measures is a general limitation of the identified studies.

In the full paper we will discuss these findings at greater length and draw common findings among the studies.

IV.   Conclusions

We will discuss the significance of the sum of the evidence for neighborhood effects on sexual and reproductive health outcomes and make recommendations for further research.

We expect that multilevel analyses that allow for the examination of the effects of individual, microsystem, and exosystem influences on individual-level outcomes will improve our understanding of unintended pregnancy and inform new, innovative multilevel interventions.

References

Billy, J.O.G.and D.E. Moore. 1991. "A Multilevel Analysis of Marital and Nonmarital Fertility in the US." *Social Forces* 70:977.

Bird, S.T.and L.M. Bogart. 2005. "Conspiracy beliefs about HIV/AIDS and birth control among African Americans: implications for the prevention of HIV, other STIs, and unintended pregnancy." *J Soc Issues* 61(1):109-126.

Bluthenthal, R.N., D.P. Do, B. Finch, A. Martinez, B.R. Edlin, and A.H. Kral. 2007. "Community characteristics associated with HIV risk among injection drug users in the San Francisco Bay Area: a multilevel analysis." *J Urban Health* 84(5):653-666.

Brewster, K.L. 1994. "Neighborhood context and the transition to sexual activity among young black women." *Demography* 31(4):603-614.

Bronfenbrenner, U. 1979. *The ecology of human development*. Cambridge, MA: Harvard University Press.

Browning, C.R., L.A. Burrington, T. Leventhal, and J. Brooks-Gunn. 2008. "Neighborhood structural inequality, collective efficacy, and sexual risk behavior among urban youth." *J Health Soc Behav* 49(3):269-285.

Cohen, D., S. Spear, R. Scribner, P. Kissinger, K. Mason, and J. Wildgen. 2000. ""Broken windows" and the risk of gonorrhea." *Am J Public Health* 90(2):230-236.

Cubbin, C., J. Santelli, C.D. Brindis, and P. Braveman. 2005. "Neighborhood context and sexual behaviors among adolescents: findings from the national longitudinal study of adolescent health." *Perspect Sex Reprod Health* 37(3):125-134.

Duncan, C., K. Jones, and G. Moon. 1996. "Health-related behaviour in context: a multilevel modelling approach." *Soc Sci Med* 42(6):817-830.

Edin, K.and M. Kefalas. 2005. *Promises I can keep: why poor women put motherhood before marriage*. Berkeley: University of California Press.

Espey, E., E. Cosgrove, and T. Ogburn. 2007. "Family planning American style: why it's so hard to control birth in the US." *Obstet Gynecol Clin North Am* 34(1):1-17, vii.

Gold, R., B. Kennedy, F. Connell, and I. Kawachi. 2002. "Teen births, income inequality, and social capital: developing an understanding of the causal pathway." *Health Place* 8(2):77-83.

Hogan, D.P., N.M. Astone, and E.M. Kitagawa. 1985. "Social and environmental factors influencing contraceptive use among black adolescents." *Family Planning Perspectives* 17(4):165-169.

Kaplan, M.S., C.J. Crespo, N. Huguet, and G. Marks. 2009. "Ethnic/racial homogeneity and sexually transmitted disease: a study of 77 Chicago community areas." *Sex Transm Dis* 36(2):108-111.

Kendall, C., A. Afable-Munsuz, I. Speizer, A. Avery, N. Schmidt, and J. Santelli. 2005. "Understanding pregnancy in a population of inner-city women in New Orleans--results of qualitative research." *Soc Sci Med* 60(2):297-311.

Kirby, D., K. Coyle, and J.B. Gould. 2001. "Manifestations of poverty and birthrates among young teenagers in California zip code areas." *Fam Plann Perspect* 33(2):63-69.

Lazarus, J.V., M. Moghaddassi, E. Godeau, J. Ross, C. Vignes, P.O. Ostergren, and J. Liljestrand. 2009. "A multilevel analysis of condom use among adolescents in the European Union." *Public Health* 123(2):138-144.

Luker, K. 1975. *Taking chances: abortion and the decision not to contracept*. Berkeley, CA: University of California Press.

—. 1996. *Dubious conceptions: the politics of teenage pregnancy*. Cambridge, MA: Harvard University Press.

Mosher, W.D., L.P. Deang, and M.D. Bramlett. 2003. "Community environment and women's health outcomes: contextual data." *Vital Health Stat 23*(23):1-72.

O'Campo, P., J. Burke, G.L. Peak, K.A. McDonnell, and A.C. Gielen. 2005. "Uncovering neighbourhood influences on intimate partner violence using concept mapping." *J Epidemiol Community Health* 59(7):603-608.

Singh, S. 1986. "Adolescent pregnancy in the United States: an interstate analysis." *Fam Plann Perspect* 18(5):210-220.

Speizer, I.S., A. Pettifor, S. Cummings, C. Macphail, I. Kleinschmidt, and H.V. Rees. 2009. "Sexual violence and reproductive health outcomes among South African female youths: a contextual analysis." *Am J Public Health* 99 Suppl 2:S425-431.

Stephenson, R., A. Beke, and D. Tshibangu. 2008. "Contextual influences on contraceptive use in the Eastern Cape, South Africa." *Health Place* 14(4):841-852.

Uthman, O.A. 2008. "Geographical variations and contextual effects on age of initiation of sexual intercourse among women in Nigeria: a multilevel and spatial analysis." *Int J Health Geogr* 7:27.

Uthman, O.A.and E.J. Kongnyuy. 2008. "A multilevel analysis of effect of neighbourhood and individual wealth status on sexual behaviour among women: evidence from Nigeria 2003 Demographic and Health Survey." *BMC Int Health Hum Rights* 8:9.

Van Horne, B.S., C.M. Wiemann, A.B. Berenson, I.B. Horwitz, and R.J. Volk. 2009. "Multilevel Predictors of Inconsistent Condom Use Among Adolescent Mothers." *Am J Public Health*.

Wei, E., A. Hipwell, D. Pardini, J.M. Beyers, and R. Loeber. 2005. "Block observations of neighbourhood physical disorder are associated with neighbourhood crime, firearm injuries and deaths, and teen births." *J Epidemiol Community Health* 59(10):904-908.

Zabin, L.S. 1994a. "Addressing adolescent sexual behavior and childbearing: self-esteem or social change?" *Womens Health Issues* 4(2):92-97.

—. 1994b. "Adolescent sexual behavior and childbearing." *Womens Health Issues* 4(2):73-75; discussion 75-77.

Table 1. Literature on Neighborhood Effects on Sexual and Reproductive Health

Author, year	Key outcome(s) of interest	Study sample	Neighborhood definition used	Key Neighborhood Level Variables	Study design	Key analytical technique	Results
Brewster, 1994	Contraception use at first intercourse	United States. 698 African American respondents age 20 or younger from 1982 NSFG.	Census tracts	1. Socioeconomic status (proportion of population aged 15 and over employed in white collar occupations) 2. Female LF structure (proportion of female labor force participants employed full-time) 3. Mamageable Males (ratio of single males aged 18-24 to single females aged 25-29 4. Family Processes (proportion of female population aged 15 and over separated or divorces) 5. Racial Compositions (proportion of population that is African American) 6. Youth Idleness (Proportion of population ages 16 to 19 who are school dropouts and not in civilian labor force or Armed Services)	Cross sectional	Multivariable hazard model	Neighborhood socioeconomic status, female employment and marital dissolution rates, and peers departure from the mainstream life course influence black women's sexual and contraceptive behaviors.

The effects of SES and female employment. are greater for urban teens. |
| Hogan, Astone, and Kitagawa, 1985 | Contraceptive use | Chicago. 366 sexually active unmarried adolescent black females and 131 similar black males | 1970 census tract | Social Class (median family income) Neighborhood Quality- (high, middle, and low quality neighborhoods based on proportion black, proportion family below the poverty line, proportion of never married females aged 14 and over, sex ratios, average number of children born per ever-married woman, incidence of juvenile crime) | Cross-sectional | Multivariable Linear regression | Teens in lowest quality neighborhoods were least likely to use a contraceptive at first intercourse. Social class and neighborhood quality were found to affect contraceptive use at first intercourse only and not subsequent practice. |
| Bluthenthal et al. 2007 | Sexual risk behavior | San Francisco Bay Area. 4,956 injection | 2000 US census tracts | Percent African American Percent male unemployment Percent of households that receive public assistance Median household income | Cross sectional | Two level random intercept logistic regression model | Recent receptive and distributive syringe sharing, multiple sex partners, unprotected sex

Percent African American in a census tract was associated with receptive and distributive syringe sharing, independent of individual characteristics. |

Author, year	Key outcome(s) of interest	Study sample	Neighborhood definition used	Key Neighborhood Level Variables	Study design	Key analytical technique	Results
		drug users (IDUs) 1998-2002. Urban Health Study					Percent African American also had a significant inverse relationship with propensity to engage in unprotected sex. Community level characteristics remained unassociated with multiple sex partners
Browning et al. 2008	Sexual risk behavior	Chicago. 768 adolescents aged 11-16	Neighborhood clusters defined by study	Neighborhood structural disadvantage Collective efficacy	Longitudinal cohort study	Random effects multinomial logistic regression	Collective efficacy was negatively associated with having two or more sexual partners versus one sexual partner. The effect of collective efficacy was dependent
Cohen et al. 2000	Sexually transmitted infections	New Orleans block groups.	1990 Census block groups	Poverty Index (% households earning <$15,000; % population with no high school diploma; % population employed) Broken Window Index(% properties with major structural damage; % properties with minor structural damage; % properties with minor cosmetic damage; % segments with graffiti; % segments with accumulated garbage; % segments with abandoned vehicles; # neighborhood public high school problems)	Ecological, using GIS	Linear regression	The broken window index explained most of the variation in neighborhood gonorrhea rates. In high poverty neighborhoods, block groups with high broken windows scores had significantly higher gonorrhea rates than block groups with lower scores.
Van Horne et al. 2009	Condom use	Texas. 636 Adolescent women after delivery 1993-1996.	Self report of family, peer, community and social system factors	1. perceived condom use beliefs by friends (most or all of friends believe people should use condoms during sexual intercourse) 2. Perceived use of condoms by friends (most or all of friends use condoms during sexual intercourse) 3. Community Violence (Number of times in the past 3 months they had	Prospective cohort	Multinomial logistic regression	Factors from multiple spheres of influence in the lives of young mothers predict the extent to which they use condoms. In bivariate analyses, perceived belief of friends that condoms should be worn during sex and perceived use of condoms by friends during sex were significantly associated with always using condoms.

Author, year	Key outcome(s) of interest	Study sample	Neighborhood definition used	Key Neighborhood Level Variables	Study design	Key analytical technique	Results
				carried a women for protection, were afraid of being hurt by others, and had seen someone attacked with a weapon)			
Billy and Moore 1991	Marital and Non-marital birth	United States. 3244 unmarried and 3487 married nonblack women from NSFG III.	Census Tracts and County level	1. Religiosity: prevalence of religious adherents (% total population of country who are church adherents 1980) and Orthodoxy of local religions (country % of church adherents belonging to conservative religious bodies, 1980)

2. Socioeconomic Status: housing values (Median tract/county housing value, 1980); Income level (Median family income, 1979); Poverty level (% persons with income below poverty, 1979); Education level (% population aged 25 or older with less than a high school education, 1980); Occupational status level (% civilian labor force in white collar occupations, 1980)

3. Female Labor Force Participation: Labor force participation levels (% females aged 16 or older in civilian labor force); full-time employment levels (% working females full-time, 1979); unemployment (unemployment rate, females aged 15 or older, 1980)

4. Social Disorganization: Marital dissolution (% female population aged 15 or older separated or divorces, 1980); Crime (total county crime rate, 1981); Unemployment (Unemployed rate, persons aged 15 or older, 1980); Migration (% aged 5 | Cross-sectional | Hazard rate models with time-dependent covariates | For married women, the extent of full-time female labor-force participation, percent white collar workers, and percent females in the community who are divorces of separated affect the likelihood of birth.

For unmarried women, median housing value, percent of females separated or divorces, percent females of childbearing age, the sex ration of the never married population, and the child/woman ration for women 15-24 affect likelihood of birth.

Almost all of these community characteristics operate independently of individual-level characteristics of the woman. |

Author, year	Key outcome(s) of interest	Study sample	Neighborhood definition used	Key Neighborhood Level Variables	Study design	Key analytical technique	Results
				or older in the same country in 1980 as 1985); Population Growth (# of occupied housing units moved into between 1975 and 1980) 5. Local Demography: sex ratio (sex ratio of never married persons 15 or older and of all persons, 1980); Race and ethnic compositions (percent black, other, Spanish origin, foreign born, 1980); Age Structure (median age, 1980; % female population in prime childbearing age (20-34), 1980) 6. Service Availability: Family Planning Services (family planning clinics per capita, % female population aged 15-44 using family planning services, 1981) and Abortion Providers (presence-absence of abortion providers; abortion rate, 1981) 7. Fertility Level: marital fertility (child-woman ration; total fertility rate, 1980) nonmarital fertility (child/woman ration; illegitimate fertility rate, 1980)			
Cubbin et al, 2005	Initiation of sex and contraceptive use at first and most recent sex	United States 14,151 adolescents from the National Longitudinal Study of Adolesce	1990 Census tracts	1. Socioeconomic characteristics: Poverty (% of households below 1989 federal poverty level) and Affluence (% of households with a 1989 income ≥$75,000) 2. Norms and opportunity structure: Proportions of idle youth (% of youth ages 16–19 who were not in school or the armed forces, not high school graduates, and not in the	Cross-sectional	Single-level logistic regression	Sexual initiation: For females, higher concentration of idle youth, higher concentration of black residents, lower concentration of married residents, and lower concentration of Hispanic residents were associated with increased odds of sexual initiation. For males, higher concentration of poverty, higher concentration of idle youth, lower concentration of affluent households, lower concentration of working women were associated

Author, year	Key outcome(s) of interest	Study sample	Neighborhood definition used	Key Neighborhood Level Variables	Study design	Key analytical technique	Results
		nt Health (1994-1995)		labor force) and Women's full time workforce participation (% of females aged 16 and older who "usually" worked at least 35 hours per week for 48 weeks or more in 1989) 3. Social disorganization: Proportions of married couples (% of households that consisted of married couples with their own children younger than 18) and Residential stability (% of residents living in the same house as in 1985) 4. Racial and ethnic composition (% of black households, % of Hispanic households)			with increased odds of sexual initiation. For females, higher concentration of idle youth had reduced odds of using contraception at first sex. For both females and males, neighborhood factors were not associated with contraceptive use at most recent sex.
Mosher, 2003	Unwanted births Number of sexual partners Contraceptive use	United States 10,847 women ages 15–44 from the 1995 National Survey of Family Growth	1990 US counties	1. Median income 2. Poverty (% of households below 1989 federal poverty level) 3. % College graduates 4. Male unemployment rate 5. Percent in managerial or professional jobs	Cross-sectional	Multilevel linear regression	Unwanted births: High poverty rates, low proportions of the workforce in professional or managerial jobs was associated with higher rates of unwanted births. Number of sexual partners: Higher concentration of household with low median income was associated with more women with ≥3 sexual partners in the last 12 months. Contraceptive use: Higher concentration of neighborhood poverty is associated with use of female sterilization vs. other methods. Higher median neighborhood income was associated with greater condom use vs. other methods.
Speizer 2009	Condom use at last sex Adolescent pregnancy	Over 3,000 unmarried female youth ages 15-24 in	Municipalities	Municipality-level prevalence of violence experience (% who have been threatened or forced to have sex) Municipality-level prevalence of	Cross sectional	Multivariable modeling using Huber-White standard errors	Female youth from municipalities with greater rates of threatened or forced sex were less likely to use a condom at last sex. Female youth from municipalities with greater rates of threatened or forced sex were more likely to have a pregnancy.

Author, year	Key outcome(s) of interest	Study sample	Neighborhood definition used	Key Neighborhood Level Variables	Study design	Key analytical technique	Results
		South Africa		sexual experience (% who have ever had sex) Municipality-level completion of high school (who have completed high school) (Aggregated respondent data)		(using STATA 9.2)	Female youth from municipalities with greater rates of sexual experience were less likely to have a pregnancy.
Lazarus 2009	Condom use at last sex	Aged 15 Health and Behavior in School-Aged Children survey Data from 18 European countries	Countries and subnational entities (England, Flanders, Scotland, and Wales)	1. National socio-economic level (per capita GDP rank, based on purchasing power parity, minus Human Development Index) 2. Socio-economic distribution in the country measured with the Gini coefficient index. 3. Human Development Index rank 4. Gender Related Development Index rank 5. Main religion (Catholic vs. other Christian) 6. Sexuality education index 7. Place of residence (Western Europe vs. Eastern Europe) 8. HIV prevalence in 2001	Cross sectional	Multilevel models (using MLwiN)	Adolescents living in countries with a higher Gini coefficient, Human Development Index rank, national socio-economic level, and Gender Related Development Index rank were more likely to have used condoms at last sex. Adolescents living in countries that are predominately non-Catholic Christian were less likely to use condoms at last sex. Adolescents living in countries with high HIV prevalence were more likely to use condoms at last sex.
Kaplan 2009	Incidence of chlamydia and gonorrhea per 100,000 population	77 communities in Chicago, Illinois	communities	1. Ethnic/racial community composition (% of the population in the community that was Hispanic or black) Data obtained from 2000 census sources. 2. Socio-economic status (% of community residents with incomes below poverty level)	Ecological (Communities were the unit of	Multiple linear regression	Communities where at least 60% of the residents were black had higher incidence rates of chlamydia and gonorrhea than other communities. Communities with at least 20% living in poverty, at least 10% unemployed, and at least 45% between the ages of 15 to 44 had higher incidence rates of chlamydia and gonorrhea than

Author, year	Key outcome(s) of interest	Study sample	Neighborhood definition used	Key Neighborhood Level Variables	Study design	Key analytical technique	Results
				Education (% of residents ages 25 or older who have completed high school or equivalent) Age (% of residents ages 15 to 44) Unemployment (% of residents ages 16 and older without work and actively seeking employment)	analysis)		other communities. Communities where fewer than 70% of residents were highschool graduates had higher rates of chlamydia (but not gonorrhea).
Uthman 2008	Early sexual debut (having had sex by age 15)	5531 ever or currently married women from the 2003 Nigeria Demographic and Health Survey	Communities nested within states	1. Community ethnic diversity (Number of ethnic groups in a community) 2. Community median age at marriage 3. Community median spousal age gap (Aggregated respondent data)	Cross sectional	3-level multivariable logistic regression (using MLWiN)	Lower community median age of marriage was associated with having had sex by age 15, after adjusting for individual factors. With every one-year increase in the community median age of marriage was associated with a 26% lower likelihood of early sexual debut. Community ethnic diversity and community median spousal age gap were not associated with having had sex by age 15.
Uthman, Kongnyuy 2008	Multiple concurrent sex partners in the last 12 years	6362 sexually active women aged 15-49 from the 2003 Nigeria Demographic and Health Survey		Community economic status (average wealth index at the community level) (Aggregated respondent data)	Cross sectional	Multilevel logistic regression (using MLWiN)	Women from communities with lower economic status were less likely than those from communities of high economic status to have had multiple concurrent sex partners.
Stephenson 2008	Current contraceptive use	Sexually active women ages 15-49 from the 1998	Community (PSU)	1. Community asset score (mean asset score for all households in the PSU) 2. Spousal age difference (mean spousal age difference for all	Cross sectional	Multilevel logistic regression (using MLWiN)	Women living in communities where the ratio of men to women with primary education was higher were less likely to be using contraception. Women living in communities with a higher mean age at marriage and in which a higher

Author, year	Key outcome(s) of interest	Study sample	Neighbo rhood definitio n used	Key Neighborhood Level Variables	Stud y desi gn	Key analytical technique	Results
		South Africa Demogra phic and Health Survey		respondents in the PSU) 3. Male to female primary education (Ratio of the number of men to the number of women in the PSU with primary education) 3. Male to female secondary education (Ratio of the number of men to the number of women in the PSU with secondary education) 4. Female employment (% of women in the PSU who report working outside the home) 5. Control of earnings (Percentage of women in the PSU who report controlling their earnings) 6. Age at marriage (Mean age at marriage for women in the PSU) 7. Physical partner violence (% of women in the PSU who report experiencing physical violence from their partners in the 12 months prior to the survey) 8. Female approval of family planning (% of women in the PSU who report that they approve of family planning) Male approval of family planning (% of men in the PSU who report that they approve of family planning) (Aggregated respondent data)			percentage of women reported recent physical violence from their partner were more likely to be using contraception.

7