

Social Context, Sexual Networks, and Racial Disparities in Rates of Sexually Transmitted Infections

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Background. Social context (demographic, socioeconomic, macroeconomic, and sociopolitical features of the environment) influences the epidemiology and consequences of individual behaviors that affect health outcomes. This article examines the role of social context in heterosexual networks that facilitate the spread of human immunodeficiency virus (HIV) infection and other sexually transmitted infections (STIs), particularly in relation to persistent racial disparities in rates of STIs in the United States.

Methods. Review of the medical, public health, and social science literature.

Results. Contextual factors, such as poverty, discrimination, epidemiology of illicit drug use in the community, ratio of men to women, incarceration rates, and racial segregation, influence sexual behavior and sexual networks directly and indirectly through a variety of mechanisms. Disparities in these contextual features likely contribute substantially to the persistence of marked racial disparities in rates of STIs.

Conclusions. Given the importance of contextual factors and the sharply contrasting social contexts for blacks and whites, exclusive emphasis on individual risk factors and determinants is unlikely to produce solutions that will significantly decrease HIV rates among blacks. Effective HIV prevention in this population will require multidisciplinary research to address the contextual factors that promote patterns of sexual networks that facilitate transmission of STIs.

Sexual networks are critical in the spread of sexually transmitted infections (STIs). Social context is an important influence on behavior, including sexual behaviors and the formation of sexual networks. This article will examine the potential role of socioeconomic context in the formation of, participation in, and evolution of sexual networks that facilitate spread of STIs. Because of the persistent and poorly understood racial disparities in rates of HIV infection and other STIs in the United States, we focused on the relationship between social context and patterns of heterosexual networks in black populations.

CRITICAL ROLE OF SEXUAL NETWORKS IN TRANSMISSION OF STIs

Although modern epidemiology has tended to focus on individual risk factors and behaviors, the fundamental determinants of health at the population level are patterns of exposure and the environment—that is, the social and economic, as well as physical, environments [1, 2]. Population patterns of exposure, rather than simply numbers of exposed individuals, help determine a population's health [1]. This influence is particularly relevant for transmission of STIs, which is inherently social. Therefore, public health practitioners and researchers have devoted increasing attention to the role of sexual networks in STI epidemiology [3–13].

CHARACTERISTICS OF SEXUAL NETWORKS

The term “sexual network” refers to a set of people who are linked directly or indirectly through sexual contact [3, 14]. The pattern of linkages can dramatically influence health outcomes in a population [1], such as

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the transmission of HIV and other STIs [15]. With regard to disease transmission, the important characteristics of a network are its size and its density or connectivity [16]. Because networks are dynamic, with new linkages forming and old ones dissolving, time is an important element [17]. The pattern least likely to propagate infection is a population predominantly composed of either individuals with no partners (isolates) or individuals in long-term monogamous relationships (unconnected dyads) [16]. The presence of a small number of individuals who change partners frequently has dramatic implications for transmission and persistence of a curable STI in a population [15, 18].

CONCURRENT PARTNERSHIPS AND TRANSMISSION OF STIs

The key building block of sexual networks that fosters transmission of STIs, even in the context of stable partnerships, is concurrency. Concurrent sexual partnerships (sexual relationships that overlap in time) permit an even more rapid spread of infection through a network than would the same rate of acquisition of new, sequential partnerships [19]. Once a concurrent partner acquires infection, transmission to a third person can occur without the delay involved in completing the first partnership and beginning the next. Moreover, because relationships overlap in time, early concurrent partners are not protected from infection more than those partners acquired later in the sequence [19]. The prevalence of concurrent partnerships influences both the speed of the epidemic's spread during its initial phase and the number of individuals who are infected at a later time period [20].

CONNECTIVITY AND TRANSMISSION OF STIs

The degree of connectivity of sexual networks also affects the likelihood of transmission across networks throughout the population. Infection is much less likely to propagate in a population composed of individuals in unconnected triads—each individual with 2 partners—than in a population composed of individuals with 2 partners within a completely connected network [1]. Moreover, a susceptible individual who has 1 partner in a high-risk network and 1 partner in a low-risk network will likely have a greater impact on the introduction of infection to the low-risk population than would an individual who has numerous partners who are all at low risk for infection [1].

DIFFERENCES IN SEXUAL NETWORKS IN BLACK VERSUS WHITE POPULATIONS

Differences in numbers of sex partners have not been established as an adequate explanation for the marked racial disparity in rates of STIs, but evidence suggests that patterns of sexual networks may differ between black versus white populations

in ways that foster more-rapid dissemination of STIs in the former. One difference is that, among black persons, more-frequent sexual contact occurs between those with many partners (the “core”) and those with few partners [21]. Another is that, because black persons are more likely to choose other black persons as sex partners, the sexual networks of black persons are more racially segregated than those of other racial or ethnic groups [21]. In addition, data from the 1995 National Survey of Family Growth (NSFG; sponsored by the National Center for Health Statistics, Hyattsville, MD) [22] indicate that the prevalence of concurrent sexual partnerships is greater among black women (21% in the preceding 5 years) than among white women (11% in the preceding 5 years) (table 1). This difference in concurrency appears to be mostly due to lower marriage rates and younger age at first sexual intercourse among black women, since the differences between black and white women markedly diminished with control of these variables [22]. Data from the population-based control group in our study of heterosexual transmission of HIV infection among black persons in North Carolina showed a higher prevalence of concurrent partnerships among black men (53% in the preceding 5 years) than among black women (31% in the preceding 5 years); in turn, the prevalence among black women was greater than that in the NSFG [22, 23]. Black persons in North Carolina who had recently reported HIV infection had even higher 5-year concurrency rates (60%) [24].

FORMATION OF SEXUAL NETWORKS

Formation of sexual networks is similar to that of social networks; people recruit sex partners in the same way that they recruit other associates, namely, through social networks and activities. Relationships tend to form among people with similar attributes, such as age, race or ethnicity, educational back-

Table 1. Prevalence of marriage and of concurrent partnerships during preceding 5 years, among US women and among black persons in rural North Carolina.

| Group, stratified by race or sex | Married, % | Had concurrent partnerships during preceding 5 years, % (95% CI) |
|----------------------------------|------------|--|
| US women | | |
| Black | 25 | 21 (19–23) |
| White | 54 | 11 (10–12) |
| Hispanic | 47 | 8 (7–10) |
| Asian/Pacific Islander | 49 | 7 (4–9) |
| Black persons in North Carolina | | |
| Women | 39 | 31 (24–39) |
| Men | 55 | 53 (41–64) |

NOTE. Sources: National Survey of Family Growth, Cycle 5 [22], and the Rural Health Project [23]. CI, confidence interval.

ground, and religion [16]. However, the additional forces that influence participation in sexual networks are poorly defined.

EFFECTS OF SOCIAL CONTEXT ON SEXUAL NETWORKS

The term “social context” refers to demographic, socioeconomic, macroeconomic, sociopolitical, and related features of the individual’s environment. Economic forces, demographic features, and other structural aspects of society outside the individual’s control play an important role in epidemiological factors and individual behaviors [25, 26], including sexual behaviors [27], transmission of STIs [25], and other health outcomes [28–34]. Community attributes—including poverty, rates of substance abuse, sex roles, norms for sexual behavior, and prevalence of STIs—can increase the frequency of and risk associated with individual behaviors and can impede the ability of individuals to adopt preventive behaviors [25].

MAJOR EVENTS AND FEATURES OF SOCIETY

On a macro level, major events such as war, famine, and migration result in increased sexual mixing of different groups of people and in social upheaval that increases the exchange of sex for goods, services, and personal security [35]. Such events have altered social and sexual networks in Africa, Eastern Europe, and Asia, with the resultant widespread transmission of HIV infection and other STIs in these regions [36–43]. Although the United States has enjoyed a relatively high degree of political and economic stability, enduring divisions and disparities along racial, ethnic, religious, and economic lines—along with high mobility, commercially driven media and entertainment industries, and considerable freedom from family, religious, and community constraints on personal behavior—have promoted the rapid but uneven evolution of sexual mores and lifestyles without a corresponding evolution of social institutions. The resulting incongruities, such as widespread sexual involvement among adolescents but severely constrained sex-education and reproductive-health services, foster patterns of sexual behavior that promote transmission of STIs.

RACIAL SEGREGATION

Probably the major fault line in American society is the centuries-old racial divide [44, 45]. Racial segregation—legal and extralegal—has characterized all sectors of American society since the colonial era. Despite the advances of the Civil Rights Movement and the more recent promotion of diversity, racial dualism persists in educational institutions, most occupations, health care, and social and sexual networks.

Residential segregation by race has been one of the most prominent features of racial discrimination in the United States. Marked residential segregation by race persists, particularly in

urban areas, and is maintained not only by individual actions but also by long-standing structural mechanisms, such as discrimination in mortgage rates and by realtors [46]. Segregation concentrates poverty and other deleterious social and economic influences within racially isolated groups and thus increases the risk of socioeconomic failure of the segregated group [46]. For example, compared with the children of middle-income white families, children of middle-income black families are more likely to be exposed to violence, poverty, drugs, and teenage pregnancy in the neighborhoods where they live [46]. Residential segregation is important to the structure of sexual networks, because people tend to choose sex partners from the neighborhoods where they live [47], and may be especially critical to the networks of young persons, since, in many areas of the United States, residence dictates the school district students attend, which, in turn, influences the social (and sexual) networks of adolescents. The movement of black persons and other ethnic minority populations to urban areas and “white flight” to the suburbs have increased the physical separation of living areas and school districts for white persons and other ethnic groups.

For many black persons, racism and discrimination are a constant feature of the contextual landscape, which differs dramatically for black versus white populations. Institutional racism is a key factor underlying the enduring racial disparities in income, education, housing, neighborhood quality, government services, political power, morbidity, and mortality [46, 48–51]. Krieger [51] describes 5 pathways through which discrimination can harm health. Potential pathways with direct relevance to sexual networks and transmission of STIs include economic and social deprivation, residential segregation, targeted marketing of legal and illegal psychoactive substances, and inadequate health care from health-care facilities and from specific providers [51]. Additional mechanisms of critical importance include the numerous factors that alter the ratio of men to women (sex ratio) and the macroeconomic forces that discourage long-term stable partnering patterns.

LOW SEX RATIOS IN BLACK POPULATIONS

The sex ratio is likely a key determinant of the structure of sexual networks, marital patterns, and family stability [52]. The sex ratio in black populations is strikingly low (figure 1), owing to a variety of factors, including higher mortality rates among black male infants, children, and adults because of disease and violence [54]. For example, in the United States during 1989–1991, the probability of survival from age 15 years to age 65 years was 0.62 among black men, compared with 0.77 among black women, 0.77 among white men, and 0.87 among white women [55]. Other than during postwar shortages of men that have been experienced by various countries, black populations in the United States have sustained the most severe and per-

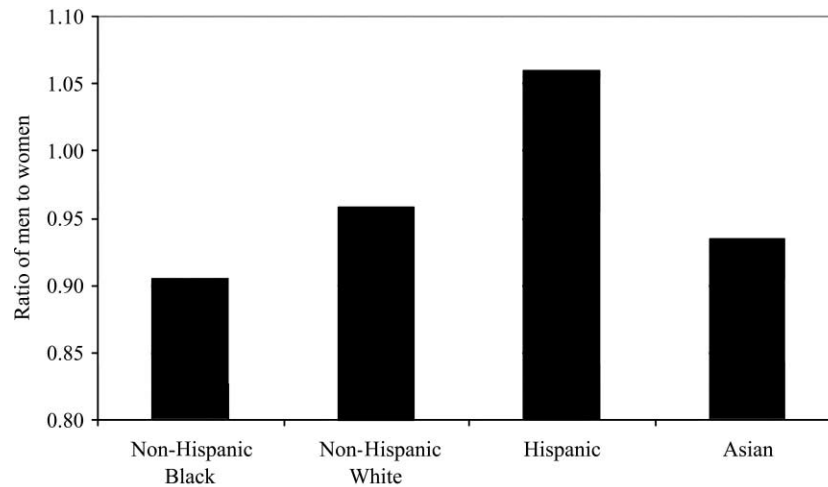


Figure 1. Ratio of men to women among selected racial and ethnic groups, United States, 2000. Source: Census 2000 Summary File 1 [53].

sistent shortage of men of any subculture since documentation by modern censuses [52] (table 2).

The relative scarcity of men results in low marriage rates and higher divorce rates among those who do marry [52]. The shortage of men places women at a disadvantage in negotiating and maintaining mutually monogamous relationships, because men can easily find another relationship if they perceive their primary relationship to be problematic [9]. Moreover, men who maintain multiple simultaneous partnerships may be confident that their primary partner will not end the relationship, because primary relationships are relatively difficult for women to attain [27]. In focus groups conducted among black persons in rural North Carolina, both men and women believed that the scarcity of men and the extremely adverse socioeconomic plight of black women (and men) profoundly influence partner selection, the sexual availability of women, the type of male sexual behavior that women tolerate, and the participation of both sexes in high-risk sexual behaviors [58]. Respondents reported extensive concurrent partnerships among unmarried persons, particularly men.

DESTABILIZATION OF PARTNERING PATTERNS BY ECONOMIC FACTORS

Economic adversity, another contextual feature, works in concert with the low sex ratio to destabilize long-term partnering patterns in black communities. Poverty is associated with marital instability [59]. In addition, the marginal economic status of many African American men makes them less appealing as potential husbands and decreases their interest in becoming husbands, ultimately limiting the feasibility of marriage in black communities [60]. The “male marriageable-pool index” (calculated as the ratio of the number of employed civilian men to the number of women of the same race and age group)

assesses the combined influence of unemployment and low sex ratio on the “marriage market” [61]. From the 1960s through the early 1980s, this ratio declined particularly sharply among young black adults, revealing a progressive decrease in the proportion of young black men who were financially capable of supporting a family [61]. Thus, demographic features (such as the low sex ratio in this population), economic factors (such as poverty and unemployment), and interactions between demographic and economic factors may conspire to promote concurrency and partner change among black persons [62].

DRUGS

The rise of the drug culture within poor black communities has worsened the myriad problems caused by segregation and concentrated poverty [46], with direct effects on sexual networks and transmission of STIs. The effects of crack cocaine have been particularly well documented. Crack cocaine use spread widely throughout many urban areas of the United States during the 1980s, especially in poor racial and ethnic minority communities, in part because of its low price and prevailing socioeconomic conditions in urban ghettos [63–65]. The drug has subsequently made substantial inroads into rural areas of the United States as well [66, 67]. Because it is highly addictive, crack cocaine has directly altered sexual networks through increased sexual exploitation of women and high-risk sexual behavior, including increased numbers of sex partners and the exchange of sex for drugs, and has been found to promote heterosexual transmission of HIV infection [68–70]. Crack cocaine has had other, indirect effects as well. The crack-cocaine epidemic, which has altered the existing social structures of communities by providing an alternative source of money and power, has been associated with marked increases in violence and crime, which have further eroded already-trou-

Table 2. Ratio of men to women, by race, United States, 1950–2000.

| Year | Ratio of men to women, by race | |
|-------------------|--------------------------------|-------|
| | Black | White |
| 2000 ^a | 0.905 | 0.957 |
| 1990 ^b | 0.896 | 0.954 |
| 1980 ^c | 0.896 | 0.948 |
| 1970 ^c | 0.908 | 0.953 |
| 1960 ^c | 0.934 | 0.974 |
| 1950 ^c | 0.943 | 0.991 |

^a Source: Census 2000 Summary File 1 [53].

^b Source: Census 1990 Summary Tape File 1 [56].

^c Source: US Summary, General Population Characteristics: 1980 Census of Population [57].

bled ghetto communities [35]. The US response to the crack-cocaine epidemic has centered on efforts to interdict drug importation and to incarcerate dealers and users; public health efforts to combat the epidemic and its effects have been relatively limited [71].

INCARCERATION

Mostly as a consequence of the war on drugs, the United States has one of the highest incarceration rates in the world [72], with markedly disproportionate imprisonment of black and Latino men and women [73, 74]. Almost one-third of black men between the ages of 20 and 29 years are in jail, in prison, on probation, or on parole [75], and it has been estimated that, as of the year 2000, roughly 10% of all black men were incarcerated [76]. By 2002, 10.4% of black men 25–29 years of age were in prison, compared with 2.4% of Hispanic men and 1.2% of white men in the same age group [77].

Incarceration directly affects sexual networks through disruption of existing partnerships. The partner entering prison is now at risk of forming new (sometimes coercive) sexual connections with a pool of individuals among whom the prevalences of high-risk sexual behaviors, HIV infection, and other STIs are high [78–81]. The prevalence of HIV infection among prison inmates is estimated to be 8–10 times that of the general US population [73]. The partner who remains behind in the community forfeits the social and sexual companionship of the incarcerated partner and may pursue other partnerships to satisfy these needs. If the inmate contributed materially to the household, the partner who is not incarcerated loses financial support as well. Ethnographic research has suggested that “separational concurrency” is common among people whose partners are frequently incarcerated [82].

While in prison, inmates may join gangs and develop new long-term links with antisocial networks [73]. Because social

networks affect patterns of sexual partnerships, these new associations can adversely affect sexual networks by connecting persons who previously were at low risk for HIV infection with subgroups whose prevalence of HIV infection is high. As inmates return to the community, they may either establish new sexual partnerships or resume old ones, increasing the likelihood of concurrency. A history of incarceration reduces the employment prospects of individuals [83], which increases the likelihood of poverty and the resultant instability of long-term partnerships [59, 84].

Incarceration also has adverse effects on the community. High incarceration rates result in high unemployment rates in poor minority communities, shrinking not only the absolute number of men but also the proportion of financially attractive male partners. Incarceration thus decreases the already low ratio of marriageable men to women and likely promotes concurrent sexual partnerships [62]. High incarceration rates also can influence community norms and create an environment in which “jail culture is normative,” as evidenced by recent trends in clothing and music [73, page 224]. Such norms are likely to influence sexual behavior and sexual networks.

Economic, judicial, and political systems affect racial and ethnic minority groups with lower socioeconomic status more than other groups, mostly because these systems reinforce existing hierarchies and protect the privileged [46, 85–87]. In doing so, these systems create a demographic and socioeconomic context (e.g., scarcity of men and disproportionate economic adversity) that discourages long-term partnering patterns and promotes networks that facilitate transmission of STIs. The exclusive reliance of public health programs on individual-level behavioral interventions, such as condom use, may have slowed the increase in rates of heterosexual transmission of HIV infection among black persons but have not succeeded in reducing them. The physical and social circumstances associated with impoverishment hamper individually oriented behavioral risk-reduction approaches [88], because personal agency in situations of oppression is limited [49].

In a revealing account of how macro-level forces shaped the contextual factors and health outcomes in a specific situation, Wallace [89, 90] vividly delineates the links between municipal planning policies, disruption of social networks, and death rates from AIDS in the Bronx, New York, in the latter portion of the twentieth century. In the 1970s, city agencies embarked on a deliberate policy of “planned shrinkage” of the populations in black and Hispanic neighborhoods. The plan involved withdrawal of critical municipal services, including fire-fighting resources from areas that already had high fire rates. As a result, these neighborhoods sustained extensive loss of housing, and large numbers of people migrated to other parts of the borough, with disruption of social networks and community structure. What was presumably not anticipated were changes in the ge-

ography of drug abuse that resulted from this migration and a subsequent upsurge in HIV transmissions.

The relationship between socioeconomic context and sexual networks suggests that continued emphasis solely on individual risk factors and determinants for prevention efforts is unlikely to yield a significant effect on rates of HIV infection among black persons in the United States. Etiological and intervention research must consider contextual factors in order to eliminate the tragic disparity in rates of HIV infection in the African American population. Clinicians and public health scientists will not be able to accomplish this research without the involvement of people with expertise in anthropology, sociology, economics, urban planning, political science, and other disciplines. For example, to reduce transmission of HIV infection in the Bronx, Wallace [89] called for community interventions involving restoration of critical municipal services, provision of housing, and community organizing to strengthen social networks.

Although a history of racism and discrimination is the root cause of the enormous gulf between black versus white populations, in terms of access to political and economic resources, this gulf is maintained by current and often intentional actions of individuals and institutions. Following the model of environmental impact statements, the public health impact of government actions and policies should be explicitly assessed before adoption and continuously monitored for effects after implementation. Unless the attention of public health researchers extends to these macro-level forces, efforts at controlling HIV infection will continue to miss the forest for the trees.

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