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Integrating individual and contextual factors to explain disparities in HIV/STI among heterosexual African American youth: A contemporary literature review and social ecological model

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Abstract

Heterosexual African American youth face substantial disparities in sexual health consequences such as HIV and STI. Based on the social ecological framework, the current paper provided a comprehensive, narrative review of the past 14 years of literature examining HIV/STI risk, including risky sexual behavior, among heterosexual African American youth and a conceptual model of risk among this population. The review found that individual psychological and biological factors are insufficient to explain the sexual health disparities faced by this group; instead, structural disadvantage, interpersonal risk, and community dysfunction contribute to the disparity in HIV/STI outcomes directly and indirectly through individual psychological factors. The conceptual model presented suggests that for African American youth, a) HIV/STI risk commonly begins at the structural level and trickles down to the community, social, and individual levels, b) risk works in a positive feedback system such that downstream effects compound the influence of structural risks, and c) contextual and individual risk factors must be considered within the advanced stage of the epidemic facing this population. Despite advanced HIV and STI epidemics among heterosexual African American youth, multisystemic interventions that target structural risk factors and their downstream effects are posited to reduce the disparity among this high-risk population.

Keywords

HIV risk; risky sexual behavior; STI; African American; youth

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Introduction

Heterosexual African Americans face significant disparities in adverse sexual outcomes. African Americans aged 15–24 years account for the greatest proportion of all new cases of sexually transmitted infections (STI) compared to any other age by racial/ethnic category (Centers for Disease Control and Prevention [CDC], 2016), and heterosexual African Americans are 20 times more likely than heterosexual Whites to receive an HIV diagnosis (Lansky et al., 2015). The most common theoretical perspectives of HIV/STI risk have focused on individual-level determinants of risky sexual behavior (RSB) such as self-efficacy, knowledge, and motivation (Pedlow & Carey, 2003; Romero, Galbraith, Wilson-Williams, & Glopen, 2011). However, HIV/STI risk remains elevated among young African Americans compared to Whites regardless of RSB (Hamilton & Morris, 2015; Harawa, Greenland, Cochran, Cunningham, & Visscher, 2003). For example, although African American males report more sexual partners than their White and Latino peers throughout adolescence, this difference in RSB does not explain racial differences in STI (Dariotis, Sifakis, Pleck, Astone, & Sonenstein, 2011), suggesting that factors other than behavior contribute to infection among this group. Further, whereas White young adults have been found at elevated risk for STI only when they engage in high-risk sexual behavior, African Americans have been found at elevated risk even when they engage in low-risk sexual behavior (Hallfors, Iritani, Miller, & Bauer, 2007). Thus, perspectives of HIV/STI risk focused solely on individual determinants of RSB may not be appropriate for heterosexual African American youth.

Beginning in the 2000s, a second body of research emerged that focused on the influence of social, economic, and environmental factors in explaining risk for HIV/STI among African American heterosexual youth. Adimora & Schoenbach (2002) proposed that African Americans' disproportionate experience of socioeconomic disadvantage fosters HIV/STI transmission by discouraging long-term partnering and increasing sexual concurrency (i.e., engagement in sexual relationships that overlap temporally). They and other researchers called for interventions at the social and structural levels to decrease disparities in poverty, residential segregation, and incarceration, positing that these factors contribute to the racial disparity in HIV/STI over the influence of individual behavior (Adimora & Schoenbach, 2005; Adimora, Schoenbach, & Floris-Moore, 2009; Farley, 2006; Lightfoot & Milburn, 2009). Although these models were helpful in explaining HIV/STI risk regardless of behavior among American youth, they have largely excluded discussion of individual determinants of risk.

A third body of research that emphasizes the interaction between the individual and their environment on individual health behavior was developed based on the ecological model by Bronfenbrenner (1977) and its successor, the *social* ecological model (McLeroy, Bibeau, Steckler, & Glanz, 1988). According to the social ecological model, change in health behavior is influenced by changes at any of five levels: intrapersonal (e.g., attitudes), interpersonal (e.g., family, peers), institutional (i.e., organizations), community (e.g., neighborhood, culture), and policy (McLeroy et al., 1988). These five levels are also reciprocal; that is, just as the environment shapes behavior, behavior shapes the environment. Applied to HIV/STI risk among heterosexual African American youth, the social ecological

model suggests that environmental factors such as socioeconomic disadvantage and cultural norms among this group lead to RSB, which contributes to HIV/STI. Given their disparate risk for HIV/STI regardless of individual behavior, a social ecological model considering context is preferred in order to understand unique risk and resilience among African American youth. The social ecological model is also preferred because it allows for rather than competes with other models considering the influence of culture. For example, recent support for models such as life history theory—which posits that environmental conditions affect individuals' biological responses to maximize reproductive success—and social learning theories in the explanation of RSB among African American youth (Simons, Sutton, Simons, Gibbons, & Murry, 2016) concurrently provide support for the social ecological model. However, contextual models of risk, including social ecological models, have largely been applied to engagement in RSB rather than risk for HIV/STI infection (e.g., Kotchick, Shaffer, Miller, & Forehand, 2001).

To better explain infection risk, Baral, Logie, Grosso, Wirtz, and Beyrer (2013) proposed a modified social ecological model for infection that not only accounted for risks at the intrapersonal (i.e., individual), social, community, and policy levels, but also accounted for the stage of the HIV epidemic within a population. Although Baral et al.'s (2013) modified social ecological model attempted to explain HIV infection among high-risk populations in general, the authors recognized that “[HIV] sub-epidemics within populations have differing dynamics. No one model can describe all risk factors across these diverse domains” (p. 2). Thus, work is needed to address the specific dynamics of individual and contextual contributors to HIV/STI outcomes for specific high-risk groups. More recent work has begun to do just that among African Americans. For example, Brawner (2014) proposed a social ecological model of risk for African American women, positing that unique individual and contextual factors interact not only to influence sexual behavior among African American women, but also to influence indicators of transmission—such as incidence rates—in their community. The current work aims to extend this model and the previous models discussed by reviewing empirical evidence of the relationships between distinct individual and cultural factors influencing HIV/STI risk to develop a comprehensive and testable model for heterosexual African American youth.

The Current Study

Given the disparities in HIV risk among heterosexual African American youth, the current study aims to synthesize the existing literature on HIV/STI risk among this population to provide a comprehensive social ecological model for risk. The review will demonstrate both the unique and interactive effects of individual and contextual influences based on the contemporary literature published since the mid-2000s. The paper will be organized in three main sections. First, based on the social ecological model, we will provide a review of factors found to contribute to HIV/STI risk among heterosexual African American youth across four domains: individual, social, community, and structural (i.e., implications of policy). Next, we review how these factors interact across domains to pose risk for HIV/STI among this vulnerable population. Finally, we will consolidate the literature by proposing an overall conceptual model based on the modified social ecological model that demonstrates the individual and interactive effects of individual and contextual influences on HIV/STI

disparities among heterosexual African American youth. This section will close with a discussion on implications and future directions for work with this high-risk population.

The work presented extends previous work by not only synthesizing the literature on factors associated with HIV/STI risk among heterosexual African American youth, but also synthesizing empirical evidence of their interactions. We hope that a comprehensive review of interactions between the four domains (i.e., individual, social, community, and structural) and the resulting conceptual model will facilitate innovative research to better understand the complex risk pathways among this high-risk group. Additionally, novel interventions may be developed based on identified factors to potentially mitigate risk for HIV/STI outcomes among heterosexual African American youth.

Methods

This paper is based on an exhaustive review of the literature on HIV/STI risk among young, heterosexual African Americans (see Table 1 for search terms). The literature search was conducted in three online databases including research in the social and health sciences and public health: PubMed, SCOPUS, and PsycINFO). The initial searches produced over 6,000 results. However, after removing duplicate records and using the parameters described below, 230 relevant articles were retained for the review (see Figure 1 for selection of studies).

Items included were peer-reviewed original research or review articles published between January 2005 and December 2017 that 1) examined HIV/STI risk factors among a sample exclusively composed of U.S. African Americans/non-Hispanic Blacks (hereafter referred to as “African Americans”), 2) stratified results by racial/ethnic group so that HIV/STI risk was examined among African Americans, or 3) examined racial/ethnic differences in HIV/STI risk between African Americans and another group. We chose not to review literature published prior to 2005, as the period from the mid-2000s represents the time frame when researchers began to emphasize the influence of contextual factors beyond that of individual factors on the disparity in HIV/STIs among African Americans. It also represents a period in which researchers noted national increases in RSB among young African Americans (Aral, Patel, Holmes, & Foxman, 2005; Eaton et al., 2011; Santelli, Morrow, Anderson, & Lindberg, 2006).

In addition to these parameters, the following criteria were used to limit the search to the most relevant articles. First, the review only includes studies examining HIV/STI risk among individuals reporting penile-vaginal sex or identifying as heterosexual. Exclusionary search terms (e.g., “men who have sex with men”, “gay”, etc.) were used to narrow this criterion as well as review of studies’ methods. For example, the search string with inclusion search terms (see Table 1) and exclusion search terms in SCOPUS was as follows:

“(TITLE-ABS-KEY (“african american” OR black OR “black-white” OR “white-black”) AND TITLE-ABS-KEY (“risky sexual behavior” OR “risky sex” OR “sexual risk-taking” OR “unsafe sex” OR “sex risk” OR “sexual risk” OR “condom use” OR “condom non-use” OR “unprotected sex” OR “use of a condom” OR “multiple partner*” OR “serial partner*” OR “concurrent partner*” OR “HIV risk”

OR “STD risk” OR “STI risk” OR “HIV/AIDS risk” OR “HIV/STD risk” OR “STD/HIV risk” OR “STI/HIV risk” OR “HIV/STI risk”) AND TITLE-ABS-KEY (young OR youth OR adolescen* OR student*) AND NOT TITLE-ABS-KEY (msm) AND NOT TITLE-ABS-KEY (transgender) AND NOT TITLE-ABS-KEY (“women who have sex with women”) AND NOT TITLE-ABS-KEY (“men who have sex with men”) AND NOT TITLE-ABS-KEY (bisexual) AND NOT TITLE-ABS-KEY (gay) AND NOT TITLE-ABS-KEY (lesbian) AND NOT TITLE-ABS-KEY (homosexual) AND NOT TITLE-ABS-KEY (“sexual minorit*”) AND PUBYEAR > 2004”

Second, included articles were restricted to those examining HIV/STI risk among adolescents and young adults (i.e., those with participants between the ages of 11–24 or with a mean age in that range). Finally, in addition to studies examining HIV/STI outcomes (i.e., *infection outcomes*), relevant articles were included that examined RSB (hereafter referred to as “*behavioral outcomes*”), as many researchers examine RSB as a proxy for HIV/STI risk among young African Americans. Behavioral outcomes were 1) sex with multiple partners, 2) partner concurrency, or 3) vaginal sex without a condom. Having multiple partners and partner concurrency were chosen, as these behaviors are common among youth and may pose a heightened risk for HIV/STI among this population (Boothe, Wilson, Lassiter, & Holland, 2014; Buhi, Marhefka, & Hoban, 2010; Dariotis et al., 2011). Inconsistent condom use was also included as it is associated with a five-fold increase in the odds of HIV incidence (Patel et al., 2014) and is also common among African American youth (Biello, Niccolai, Kershaw, Lin, & Ickovics, 2013; Buhi et al., 2010). Together these behavioral outcomes significantly increase the odds of HIV/STI acquisition among young African Americans (Dariotis et al., 2011). We excluded research validating measures or testing interventions on these outcomes unless they also examined explanatory mediators.

This literature review is divided into three sections. In the first section, we provide an overview of the individual, social, community, and structural (i.e., implications of policy) factors—as proposed by the modified social ecological model—known to contribute to HIV/STI risk *specifically* for heterosexual African American youth. Within each domain we also document what is known as to gender differences in risk based on the current literature. In the second section, we provide an overview on the evidence examining how factors interact across domains to pose risk for HIV/STI among this vulnerable population. Finally, within the third section, we propose a conceptual model based on the modified social ecological model that demonstrates the main and interactive effects of individual and contextual influences on HIV/STI risk among heterosexual African American youth. In this section, we discuss the implications of the model and future directions in the area of HIV/STI risk among heterosexual African American youth.

Domain Specific Risk for HIV/STI among African American Youth

Domain 1: Individual Level Factors

The first domain that emerged in the review comprised individual-level factors related to HIV/STI risk among heterosexual African American youth. Most of the research examining the contribution of individual factors to HIV/STI risk among African American youth has

examined psychological factors, such as psychological symptoms, attitudes about sex and HIV/STI, more general cognitions and traits, and substance use. For example, with regard to psychological symptoms, internalizing psychological symptoms, such as those of depression and anxiety, are consistent predictors of behavioral outcomes (Brawner et al., 2017; Brawner, Gomes, Jemmott, Deatrick, & Coleman, 2012; L. K. Brown et al., 2006; Elkington, Bauermeister, & Zimmerman, 2010; Roberts et al., 2012; Seth, Patel, et al., 2011; Turner, Latkin, Sonenstein, & Tandon, 2011) and infection outcomes (Brawner, Davis, Fannin, & Alexander, 2012; Lee, O’Riordan, & Lazebnik, 2009; Salazar et al., 2007; Seth, Raiji, et al., 2009). Less research has examined externalizing symptoms in relation to HIV/risk, though initial results suggesting a positive relationship (Kogan, Yu, Brody, & Allen., 2013; Starr, Donenberg, & Emerson, 2012; Wilson, Pettineo, et al., 2015). However, when comparing African American and White female adolescents, one study found that internalizing and externalizing symptoms were related to behavioral outcomes among Whites, but not African Americans (Mulatu et al., 2008), suggesting that African American youth may engage in RSB regardless of psychological problems. However, more research is needed on racial differences in these relationships.

Individual sex-related attitudes, such as those that condom non-use include beliefs that condoms take the “fun” out of sex (Crosby, DiClemente, et al., 2013; Crosby, DiClemente, Wingood, Salazar, Head, et al., 2008; El Bcheraoui, Sutton, Hardnett, & Jones, 2013), and diminish pleasure (Brawner, 2012; Brawner, Jemmott, Wingood, Reason, & Mack, 2018; Browne et al., 2014; Kennedy, Nolen, Applewhite, Waiters, & Vanderhoff, 2007) are also associated with behavioral risk (Charnigo, Crosby, & Troutman, 2010; Winfield & Whaley, 2005). Behavioral risk is also associated with partner-related attitudes, including beliefs that a partner wants to conceive a child (Crosby, Graham, et al., 2015) and that condom use shows less commitment to a partner (El Bcheraoui et al., 2013), will lead to rejection (Ferguson, Quinn, Eng, & Sandelowski, 2006; T. Hall, Hogben, Carlton, Liddon, & Koumans, 2008), or is not important with a serious partner (Thorburn, Harvey, & Ryan, 2005). However, evidence is mixed as to whether beliefs about HVI/STI pose risk for outcomes among African American youth. Although most studies have found that accurate beliefs about HIV/STI (i.e., HIV/STI knowledge) are unrelated to behavioral and infection outcomes (Brown, Shepperson, Gopalan, & El-Amin, 2012; Raiford, Seth, Fasula, & DiClemente, 2017; Voisin, Hotton, Tan, & DiClemente, 2013; Voisin, Tan, & DiClemente, 2013a), they may be related to risk for *re*-infection (Craft-Blacksheare, Jackson, & Graham, 2014). Other beliefs, such those about personal risk for HIV/STI (El Bcheraoui et al., 2013; Kennedy, Nolen, Applewhite, Pan, et al., 2007; Voisin & Bird, 2009; Younge et al., 2013) and stigma towards infection have been associated with fewer behavioral and infection outcomes (Buzi, Weinman, Smith, Loudd, & Madanay, 2018; Kraft et al., 2015; Sales et al., 2007; Simons et al., 2016).

Other psychological factors such as cognitions and traits predict behavioral outcomes among African American youth, but not infection outcomes, suggesting that they may be less impactful psychological factors among this group. For example, cognitive-based risk factors associated with economic disadvantage, including hopelessness (Kagan et al., 2012; Kogan, Yu, et al., 2013; Sterrett et al., 2014), low future orientation (Edwards et al., 2017; So, Voisin, Burnside, & Gaylord-Harden, 2016) and low self-esteem are all associated with

behavioral (Danielson et al., 2014; Ellis, 2014; Lopez et al., 2011; Ritchwood, Howell, Traylor, Church, & Bolland, 2014; Ritchwood, Traylor, Howell, Church, & Bolland, 2014), but not infection outcomes (e.g., Salazar et al., 2005). Other cognitions and traits that have been consistently related to HIV/STI risk include impulsivity, which predicts increased behavioral outcomes (Byck, Swann, Schalet, Bolland, & Mustanski, 2015; Kogan, Brody, et al., 2010; Kogan, Cho, Barnum, & Brown, 2015; Sales et al., 2013; Sales et al., 2015; Stock, Gibbons, Peterson, & Gerrard, 2013; Voisin, Tan, & Diclemente, 2013b; Wood et al., 2013), and sexual communication (including condom negotiation) self-efficacy, which is related to decreased behavioral outcomes (Burns & Dillon, 2005; Crosby, Voisin, et al., 2013); in regards to other sexual self-efficacy (e.g., condom skills and refusal), the relationship with HIV/STI risk has been equivocal (Brown et al., 2014; Childs, Moneyham, & Feldman, 2008; Jones, Tiwari, Salazar, & Crosby, 2018).

Substance use has also been implicated in HIV/STI risk among young African Americans, including cigarette (Berg et al., 2012; Hill et al., 2014; Swartzendruber, Sales, Brown, DiClemente, & Rose, 2014; Waldrop-Valverde et al., 2013) cocaine (Ritchwood, DeCoster, Metzger, Bolland, & Danielson, 2016), opiate (Mulatu, Leonard, Godette, & Fulmore, 2008), ecstasy (J. M. Jackson et al., 2015; Stephens et al., 2016) and inhalant use (Berger, Khan, & Cleland, 2016) as well as general substance use problems (Woods-Jaeger, Jaeger, Donenberg, & Wilson, 2013). However, alcohol and marijuana, the most commonly-used substances among African American adolescents and young adults (Miech, Johnston, O'Malley, Bachman, & Schulenberg, 2016), are the substances most often studied among this population, both showing consistent relationships with HIV/STI risk (e.g., Keen, Blanden, & Rehmani, 2016; Salazar et al., 2007; Sales, Monahan, et al., 2014; Seth, Sales, et al., 2011; Swartzendruber, Sales, Brown, DiClemente, & Rose, 2014; 2016). Alcohol use in particular should elicit attention among heterosexual African American youth, as there is some evidence to suggest that *any* alcohol use poses risk for infection and behavioral outcomes among African American youth whereas only high levels of use pose risk among White youth (Hipwell, Stepp, Chung, Durand, & Keenan, 2012; Khan, Berger, Wells, & Cleland, 2012; Miller & Broman, 2016; Sales, Brown, Vissman, & DiClemente, 2012; Sales et al., 2015; Seth, Wingood, DiClemente, & Robinson, 2011).

Although studied to a far lesser extent than psychological factors, biological factors also emerged in the review as individual-level factors related to HIV/STI risk among heterosexual African American youth. For example, pubertal maturation has been thought to contribute to behavioral outcomes (Kan, Cheng, Landale, & McHale, 2010; Kogan, Cho, Simons, et al., 2015) through greater opportunities for romantic and sexual involvement over time (Siebenbruner, Zimmer-Gembeck, & Egeland, 2007). Obesity has also been examined in relation to HIV/STI risk with mixed results by gender: BMI was associated with behavioral outcomes among males (Kogan, Cho, Simons, et al., 2015) but not females (Leech & Dias, 2012). Few other biological risk factors for HIV/STI risk have been examined among African American youth as research regarding the contribution of genetic variants to behavioral outcomes is limited and has not been replicated among this group (e.g., Kogan, Beach, et al., 2010; Latendresse et al., 2017; Sales, DiClemente, et al., 2014; Sales et al., 2015).

There is also evidence of gender differences in the relationship between individual factors, although findings are sparse as few studies have examined such differences among African American youth. Further, most studies examining individual factors and HIV/STI risk have only been examined among females (e.g., sexual sensation seeking, sexual communication self-efficacy). Despite these limitations, there is evidence that the risk posed by substance use context and depression may vary by gender, as young, African American males have been found more susceptible to infection outcomes based on substance use proximal to sex (Crosby, DiClemente, Wingood, Salazar, Lang, et al., 2008; Crosby, Milhausen, Sanders, Graham, and Yarber, 2014; Depadilla et al., 2011; Jolly et al., 2016). However, whether depressive symptoms pose greater risk for behavioral outcomes among male or female adolescents is equivocal (Khan et al., 2009; Paxton & Robinson, 2008). More research directly comparing male and female youth is needed to clarify gender differences in the pathway from individual psychological and biological risk factors to HIV/STI. Gender may differentially determine not only the effects of psychological symptoms and substance use, but also those of individual factors that are susceptible to the influence of gender norms (e.g., self-efficacy, impulsivity, partner- and condom-related attitudes).

Domain 2: Social Level Factors

The second domain that emerged in the review are social level factors that have been shown to influence risk for HIV/STI among African American youth. Such factors included are relationship characteristics, parent/peer factors, and sexual networks. The largest body of evidence was available on the influence of partner and relationship characteristics on HIV/STI risk among African American youth, making up approximately 20% of all the reviewed articles. This review revealed a total of six partner and relationship risk factors related to HIV/STI risk: 1) older partners (Bralock & Koniak-Griffin, 2007; Crosby, DiClemente, Wingood, Salazar, Head, et al., 2008; Raiford, Seth, & DiClemente, 2013; Ritchwood, Penn, DiClemente, Rose, & Sales, 2014; Waldrop-Valverde et al., 2013), 2) main versus casual partner (Baker et al., 2012; Brawner, 2012; Lima et al., 2018; Matson, Adler, Millstein, Tschann, & Ellen, 2011; Seth, Wingood, Robinson, & DiClemente, 2009; Woodhams, Sipsma, Hill, & Gilliam, 2018), 3) lack of sexual communication (Crosby, et al., 2018; DePadilla, Windle, Wingood, Cooper, & DiClemente, 2011; Painter et al., 2012; Sales, Lang, et al., 2012; Seth et al., 2010), 4) commitment and intimacy (Bralock & Koniak-Griffin, 2007; Brawner, 2012; Brawner et al., 2018; Cooke-Jackson et al., 2013; Hicks et al., 2016; Kennedy, Nolen, Applewhite, Waiters, et al., 2007; Matson, Chung, & Ellen, 2012; McLaurin-Jones et al., 2017; Nelson et al., 2011; Rosenbaum, Zenilman, Rose, Wingood, & DiClemente, 2012; Sales, DiClemente, et al., 2012), 5) a male-dominated power imbalance (Crosby, DiClemente, et al., 2013; Crosby, DiClemente, Wingood, Salazar, Head, et al., 2008; Hicks et al., 2016; Lilleston et al., 2015), and 6) intimate partner violence (French & Neville, 2013; Seth et al., 2010; Wilson, Woods, Emerson, & Donenberg, 2012). Although there is strong support for the effect of all of these partner and relationship characteristics on behavioral outcomes among African American youth, intimate partner violence may also contribute to the disparity in HIV/STI risk among this group. African American adolescent females are more likely to face intimate partner violence than their White and Latino counterparts (Boothe et al., 2014) and those who have been victimized by a partner have been found 50% to 340% more likely to test positive for an STI than those

who have not (Raiford, Seth, & DiClemente, 2013; Seth et al., 2010; Seth, Wingood, Robinson, Raiford, & DiClemente, 2015).

Parents and peers were also found to play important roles in risk for HIV/STI among African American youth with social support from both groups providing resilience (Briggs, Kim, Mowbray, Orellana, & Elkins, 2018; Hsieh et al., 2017; Hulland et al., 2015; Hurd & Zimmerman, 2010). Regarding parents, research has largely focused on prosocial parental factors that prevent behavioral outcomes during adolescence, and subsequent infection outcomes during early adulthood (e.g., Hill et al., 2014). Attentive parenting, including parental monitoring (Crosby, Terrell, & Pasternak, 2015; Donenberg, Emerson, & Mackesy-Amiti, 2011; Jones, Salazar, & Crosby, 2015; Ritchwood, Howell, et al., 2014; Ritchwood, Traylor et al., 2014; Roberts et al., 2012; Steiner, Swartzendruber, Rose, & DiClemente, 2014; Sterrett et al., 2014; Voisin, Harty, Kim, Elsaesser, & Takahashi, 2017), and communication about sex, is a robust predictor of decreased behavioral and infection outcomes among African American youth (Craddock, Rice, Rhoades, & Winetrobe, 2016; Kerpelman, McElwain, Pittman, & Adler-Baeder, 2016; Kogan, Brody, et al., 2010; Lightfoot & Milburn, 2009; Nappi et al., 2009; Woodhead et al., 2009). Attentive parenting may be a particularly important resilience factors among this group as it has been found associated with outcomes among African American youth but not their White counterparts (Cox, 2006). Further, low levels of attentive parenting have been found to account for the relationship between parental risk behavior (e.g., parental substance use and RSB) and HIV/STI risk (Elkington, Bauermeister, & Zimmerman, 2011; Woodhead et al., 2009). The associations with parental monitoring may also explain findings demonstrating that father involvement and having two parents in the home are associated with decreased behavioral outcomes among this group (Barton, Kogan, Cho, & Brown, 2015; Berg et al., 2016; Li et al., 2018). There is also support for the negative impact of peer factors on behavioral outcomes (Elkington et al., 2011). In particular, peer norms (Jones et al., 2015; Kogan, Brody, et al., 2010; Romero et al., 2011; Sales et al., 2015; Simons et al., 2016; Spitalnick et al., 2007), and peer delinquency emerged as the most consistent risk factors for behavioral and infection outcomes among African American youth (Berger, Khan, & Hemberg, 2012; Hill et al., 2014; Nebbitt & Voisin, 2016; Roberts et al., 2012; Salazar et al., 2007; Young & Vazsonyi, 2011). Emerging research among youth in college also suggests that greater peer engagement via social media is associated behavioral outcomes (Carmack & Rodriguez, 2018). Moreover, there is evidence to suggest that both peer and parental factors may be important preventive factors for reducing the HIV/STI disparity among African American youth. For example, parental communication (Craddock et al., 2016) and peer delinquency, have been found more pertinent risk factors for infection outcomes among heterosexual African American youth than their White peers (e.g., Berger et al., 2012) although such factors may only influence HIV/STI risk during the school-aged years (e.g., Gillmore et al., 2011).

However, the social factor most consistently related to the disparity in infection rates among African American heterosexual youth is a youth's sexual network. Sexual networks demonstrate to whom one is connected sexually via their sex partners, their partners' sex partners, etc. Thus, they represent the pathways by which one could contract an STI (Fichtenberg et al., 2009; Hamilton & Morris, 2015). For African American youth, sexual

networks have been shown to promote the spread of HIV and STIs regardless of individual or behavioral risk in three important ways. First, African Americans are more likely than Whites to demonstrate disassortative mixing (i.e., sexual partnerships between people of differential behavioral risk; Adimora, Schoenbach, & Doherty, 2006). For example, African Americans at the periphery of a sexual network (i.e., those with only one partner connecting them to the network) are five times more likely than Whites with a similar network position to engage with sexual partners from the core of the network (i.e., those that have the most sexual partners; Adimora et al., 2006). Second, the sexual networks of African Americans are dense, meaning that large numbers of individuals in the core are engaged in concurrency (i.e., sexual partnerships with more than one partner at the same time; Adimora et al., 2006). Third, African Americans' sexual networks tend to be racially homogenous; that is, African Americans are more likely than individuals of other racial/ethnic groups to choose African Americans as partners, which increases risk among African Americans due to the higher base rate within this group (Adimora et al., 2006). Segregated mixing has not only been associated with infection outcomes but has also been found to partially explain the racial disparity in chlamydia rates (Hamilton & Morris, 2015). Thus, disassortative mixing, density, and homogeneity characteristic of African Americans sexual networks contribute to more connections among 1) behaviorally high-risk individuals and 2) infected individuals who are not behaviorally high risk (Adimora et al., 2006; Ellen et al., 2005). Such connections contribute to a greater likelihood of exposure among this group.

However, risk for exposure to HIV and STI does vary by network position. African American adolescents engaged in a confirmed monogamous partnership are least likely to be infected, followed by those who have one partner whom in turn, has other partners (i.e., the periphery of the sexual network), and then those who have multiple partners whom also have multiple partners (i.e., the core of the sexual network; Fichtenberg, Jennings, Glass, & Ellen, 2010; Fichtenberg et al., 2009). Accordingly, concurrency of a partner in a sexual network has been found not only to predict infection outcomes, but also to reduce the effect of African American race on chlamydia infection to non-significance (Hamilton & Morris, 2015). Thus, sexual network position may also help explain within-group variation in HIV/STI outcomes among African American youth.

There may also be significant gender differences in the HIV/STI risk of African American youth posed by social factors. For example, there is evidence that peer risk factors (e.g., peer norms and peer delinquency) are more strongly related to increased behavioral outcomes among males (Crosby, DiClemente, et al., 2013; Berger et al., 2012) whereas parental protective factors (e.g., sexual communication and attentive parenting) are more strongly related to decreased outcomes among females (Kogan, Brody, Chen et al. 2010; Landor et al., 2011 Young & Vazsonyi, 2011). Regarding partner characteristics, factors like partner age, relationship power and fear, sexual communication, and intimate partner violence have almost exclusively been examined among young females. As these factors are each related to gender-related disparities in relationship and sexual power, they may be more salient risk factors for African American females due to increased pressured, unplanned, or unwanted sex. However, more research with males and partner dyads is needed to examine the impact of such factors on African American males' HIV/STI risk relative to females. Finally, with regard to sexual networks, females are less likely than males to be at the core of a network

(i.e., have multiple partners with multiple partners) but are equally as or more likely than males to be at risk for infection due to the core positions of their male partners (Fichtenberg et al., 2009). Thus, the structure of sexual networks among heterosexual African American youth may also disproportionately affect females' risk for infection outcomes.

Domain 3: Community Level Factors

The third domain included community factors that occur within the youth's physical and cultural environment. This section is divided into two subsections to provide specific information regarding environmental factors, such as neighborhood characteristics and exposure to life stressors, and cultural factors, such as discrimination and racial identity, that influence HIV/STI risk among heterosexual African American youth.

Environmental Factors—An environmental factor that was highlighted in the review was the sex ratio imbalance among African American communities, which refers to the depressed ratio of available males to females (Adimora et al., 2006). It has been estimated that the sex ratio, or proportion of males to females in the population, among African Americans is .3 to .45 (Knittel, Snow, Riolo, Griffith, & Morenoff, 2015) and where it is lowest, rates of concurrent partnerships are higher (Knittel et al., 2015). It has been posited that the sex ratio imbalance is a consequence of male attrition due to the disproportionate incarceration of young African American males, as well as the high rates of drug addiction and mortality among this group (Adimora et al., 2006). In qualitative studies, African American youth report that the low sex ratio contributes to partner concurrency among males and a tolerance of this behavior among females (Ferguson et al., 2006; Johnson, 2017) because males can easily find another sexual relationship if they perceive problems in the current one (Adimora et al., 2006). To date, research has not examined the relationship between the sex ratio imbalance and infection outcomes within exclusively African American communities. Such research is needed given its relationship with concurrency, as this environmental disparity may also be an important factor in explaining disproportionate HIV/STI risk among heterosexual African American youth.

Also related to environmental factors is neighborhood disadvantage. In the reviewed literature, neighborhood disadvantage was defined in two terms: *structural* (e.g., proportion of poverty, welfare receipt, single-headed households, unemployment, and lack of high school education) or *dysfunctional* (i.e., crime, violence, low connectedness, and presence of boarded up and abandoned buildings). Structural neighborhood disadvantage is associated with increased behavioral outcomes (Bauermeister, Zimmerman, & Caldwell, 2011; Byck, Bolland, et al., 2015; Kogan, Brody, et al., 2010; Romero et al., 2011) and has been found to help explain the African American–White disparity in number of sexual partners (Carlson et al., 2014). Dysfunctional neighborhood disadvantage is also positively associated with behavioral (Jones et al., 2015; Kerr et al., 2015; Kogan, Cho, Barnum, et al., 2017; Ritchwood, Traylor, et al., 2014; Romero et al., 2011; Seth, Jackson, DiClemente, & Fasula, 2017; Tewksbury, Higgins, & Connor, 2013; Voisin, Patel, Hong, Takahashi, & Gaylord-Harden, 2016) and infection outcomes (Sales et al., 2007; Swenson et al., 2010), even when structural risk is accounted for (Sterrett et al., 2014). In particular, neighborhood violence, of which African Americans report higher rates than other races/ethnicities, may help explain

the disparity in HIV/STI as researchers have found a stronger relationship between violence and behavioral outcomes among African American youth relative to their White and Latino peers (Voisin, Chen, Fullilove, & Jacobson, 2015).

The final environmental factor that emerged in the review is early life stressors, including victimization (i.e., physical, sexual, and emotional abuse). Studies have shown that early life stress (e.g., Khan, Scheidell, Rosen, Geller, & Brotman, 2018), particularly victimization in early life is related to behavioral (Gibbons et al., 2012; Kogan, Cho, Barnum, et al., 2017; Lang et al., 2011; Sales et al., 2008; Wilson, Donenber, & Emerson, 2014; Wilson, Samuelson, Staudenmeyer, & Widom, 2015) and infection outcomes (Fasula et al., 2018; Wingood, Seth, DiClemente, & Robinson, 2009), with increased severity of victimization related to increased behavioral outcomes among youth in a dose-response manner (Brown et al., 2014; Perron, Gotham, & Cho, 2008; Wilson et al., 2012; Younge et al., 2010). However, a different pattern of results emerges when comparing African American youth to White youth such that abuse history is associated with behavioral outcomes only among White youth (Mulatu et al., 2008; Wadsworth & Records, 2013). These results may be explained by increased rates of behavioral and infection outcomes among African Americans relative to Whites regardless of abuse history (Wadsworth & Records, 2013) and suggest that abuse may not help explain the disparity in HIV/STI outcomes.

Cultural Factors—Given the difficulty researchers have had explaining variance in HIV/STI risk among African American youth through the use of traditional risk factors (e.g., individual beliefs and attitudes; Rinehart, Bridges, & Sigelman, 2006), attention has turned to examine non-traditional factors, such as racial discrimination, masculinity, religion, and racial identity, that are thought to be more culturally-relevant for African American youth. However, research examining cultural influences on behavioral outcomes is still sparse, and findings on the influence of cultural factors on HIV/STI outcomes for African American youth have been mixed. For example, discrimination has been found to pose risk for behavioral outcomes among African American adolescents (Gibbons et al., 2012; Kogan, Yu, Allen, Pocock, & Brody, 2015; Roberts et al., 2012; Stevens-Watkins, Brown-Wright, & Tyler, 2011; Tobler et al., 2013), but not young adults (Kogan, Brody et al., 2010; Kogan, Cho, Barnum, et al., 2017; Reid, Dovidio, Ballester, & Johnson, 2014), suggesting early experiences of discrimination (i.e., in early to mid-adolescence) may be key to the risk posed by discrimination. Reputational masculinity (i.e., sexual prowess, toughness, “gamesmanship,” and “street smarts” as opposed to hegemonic or responsibility-based masculinity based on marriage, economic provision for one’s family, accomplishment, and economic independence; Roy & Dyson, 2010) has been found associated with behavioral outcomes among young, African American males, (Kogan, Cho, Barnum, et al., 2015; Kogan, Cho, Barton, et al., 2017; Miller, Farrell, Barnes, Melnick, & Sabo, 2005) with one study finding an association among male and female youth (Berg et al., 2016). Additionally, African American female youth who hold more traditional female gender ideologies, including a preference for traditional male patterns of sexual behavior, are also at higher risk for behavioral outcomes (Kerrigan, Andrinopoloulos, Chung, Glass, & Ellen, 2008). Lastly, research regarding the effect of religiosity (Boyd-Starke, Hill, Fife, & Whittington, 2011; Childs et al., 2008; Dalmida et al., 2018; Fife et al., 2011; Younge et al., 2013) and racial

identity on HIV/STI risk is also equivocal, perhaps due to varying operationalization of these concepts (e.g., Espinosa-Hernández & Lefkowitz, 2009; Locke & Newcomb, 2008; Voisin, Salazar, et al., 2013; Oparanozie, Sales, DiClemente, & Braxton, 2012; Udell, Donenberg, & Emerson, 2011). More robust research is needed on these topics to clarify whether they act as protective factors for RSB as they do for other risky behaviors (e.g., Rivas-Drake et al., 2014).

Domain 4: Structural Level Factors

Although previous social ecological models include policy as a determinant of health, few studies have examined the direct impact of policy on African American's HIV/STI risk. Those that have examined policy reveal that its implications have disproportionately affected African Americans' HIV/STI risk. Specifically, African American youth face substantial disadvantages related to structural racism including low income and educational attainment, unemployment, residential segregation, and disproportionately higher rates of incarceration (Gee & Ford, 2011). These structural disadvantages will each be discussed below as they relate to behavioral and infection outcomes indicative of HIV/STI risk among African American youth.

Poverty and low income are the most consistent structural risk factors for African American's HIV/STI outcomes. Low family income among African American youth is associated with behavioral (Carlson et al., 2014; Elkington et al., 2011; Fichtenberg et al., 2010; Hong et al., 2016; Kogan, Yu, et al., 2013; Raiford et al., 2014; Stock et al., 2013) and infection outcomes, including gonorrhea and chlamydia (Sales, Brown, DiClemente, Davis, et al., 2012; Sales, Smearman, et al., 2014), and cases of AIDS (Lightfoot & Milburn, 2009). As key indicators of income, unemployment and low education have also been associated with behavioral and infection outcomes (Bauermeister, Zimmerman, Gee, Caldwell, & Xue, 2009; Bauermeister, Zimmerman, Xue, Gee, & Caldwell, 2009; Crosby et al., 2007; Kogan, Cho, Barton, et al., 2017; Kogan, Simons, et al., 2013; Kraft et al., 2015; Painter et al., 2012; Pflieger, Cook, Niccolai, & Connell, 2013). However, with regard to education, researchers have found that education is a more salient predictor of HIV/STI risk among White than African American youth (Annang et al. 2010). This finding may be explained by the tendency of African Americans to derive fewer economic and health benefits than Whites at equivalent levels of education and employment (Annang et al., 2010).

African American–White disparities in income have been associated with dramatic disparities in STI rates (Adimora et al., 2006), suggesting that income may help explain the disparity in HIV/STI risk. However, even after income is taken into account, disparities, though smaller, persist (Dariotis et al., 2011; Harling et al., 2013). These findings may be explained by disparities in the relationship between income and HIV/STI risk. That is, whereas income has little effect on STI among White youth, it is a robust predictor of infection among African American youth (Harling et al., 2013). Thus, although accounting for income reduces the African American–White disparity in STI, this is primarily found among the poorest people (Harling et al., 2013).

A second structural factor associated with risk for HIV/STI is racial residential segregation, defined as the racial composition of neighborhoods and their spatial distribution. Residential

segregation has been associated with behavioral (Lutfi, Trepka, Fennie, Ibanez, & Gladwin, 2015; Reid, Dovidio, Ballester, & Johnson, 2014) and infection outcomes among African American youth (Biello et al., 2012). These associations have been primarily driven by isolation (low exposure of African Americans to other races in their neighborhoods) and centralization indices (the degree to which African Americans live in neighborhoods proximal to an urban center relative to other groups), which are significantly higher among African Americans than Whites (Biello et al., 2012; Lutfi et al., 2015). Research comparing the relationship of residential segregation and behavioral outcomes by race has found no differences between African American and White youth (Biello et al., 2013). However, as most African Americans live in highly segregated areas and are substantially more geographically isolated from other races than the general population (Adimora et al., 2006), this factor may be particularly important for understanding risk for African American youth.

The final structural factor identified in the review was incarceration. Incarceration has been documented to affect African Americans at a rate 6 times that of Whites (Lichtenstein, 2009). Nearly one-third (32.2%) of African American males between the ages of 20 and 29 are incarcerated or otherwise supervised by the criminal justice system (Thomas, 2006). The high rate of incarceration among African Americans is also associated with HIV/STI risk, as African American males who have been incarcerated are five times more likely to have HIV than their White counterparts (Lichtenstein, 2009). This disparity in HIV/STI risk does not appear to due to events that occur while incarcerated, as incarceration is initially protective against HIV/STI among African American males (Lichtenstein, 2009). However, incarceration becomes a risk factor when males are released back into the community (Jolly et al., 2016; Kogan, Cho, Barnum, et al., 2015; Kogan, Cho, Barnum, et al., 2017; Ricks, Crosby, & Terrell, 2015). For example, history of incarceration has been related to partner infection risk (Auerswald, Muth, Brown, Padian, & Ellen, 2006). This phenomenon of incarceration switching from a protective factor to a risk factor has been explained by “catch-up sex” and decreased condom use after a long period of imprisonment (Lichtenstein, 2009). However, the positive association between justice-involvement and behavioral outcomes found among African American youth has not been found among White youth (Mulatu et al., 2008). Further, previous incarceration has not only been found to increase HIV/STI risk for African American males, but also their female partners (Danielson et al., 2014; Swartzendruber, Brown, Sales, Murray, & DiClemente, 2012), and larger communities (Knittel et al., 2015). These findings suggest that contextual factors rather than individual behavior explain the phenomenon of incarceration switching from protective to risky.

There are few gender differences in the influence of structural factors on HIV/STI risk among African American youth. For example, disparities in income have been found to help partially explain disparities behavioral (Carlson et al., 2014) and infection outcomes regardless of gender (Harling, Subramanian, Barnighausen, & Kawachi, 2013). However, little research has examined the relationships between other structural factors and HIV/STI risk among African American youth by gender, and those that have found mixed results (e.g., Harris et al., 2013; Jolly et al., 2016). The disparity in rates of incarceration between African American males and females has largely precluded researchers from examining its effects by gender although one study found that a partner’s positive incarceration history explained higher rates of infection among African American women relative to men

(Auerswald et al., 2006). Thus, although poverty and low income appears to pose equal risk among heterosexual African American youth, more research is needed to examine whether related structural factors pose similar risk to male and female youth.

Interactive Effect of Risk across Social Ecological Domains

Based on the social ecological model, health results from the interactions of an individual and their environment. Accordingly, the current review revealed two main themes regarding the interactions among individual and contextual factors on HIV/STI risk among heterosexual African American youth. First, individual factors often explained the relationship between the contextual factors (i.e., social, community, and structural factors) and HIV/STI risk. Second, factors related to contextual disadvantage interacted to predict increased HIV/STI risk among African American youth. Below we will discuss the extant literature on these interactive relationships in explaining HIV/STI risk.

Individual and Social Factors

Individual psychological and biological factors have been found to explain the effects of social factors such as parenting, peer norms, and partner/relationship characteristics, on behavioral outcomes among African American youth (Barton et al., 2015; Kogan, Yu, et al., 2013; Simons et al., 2016). For example, regarding parenting, there is evidence that attentive parenting and parental sexual communication are associated with promotive sexual behaviors through adaptive cognitions (e.g., hope, self-control, protective attitudes, and self-efficacy; Craddock et al., 2016; Harris et al., 2013; Kogan, Yu, et al., 2013; Roberts et al., 2012; Simons et al., 2016) and later pubertal onset (Kogan, Cho, Simons, et al., 2015; Simons et al., 2016). Similarly, parental substance is associated with behavioral outcomes through youth substance use (Brakefield et al., 2012; Elkington et al., 2011). Peer risk may similarly influence behavioral outcomes among African American youth through cognitions (Geter & Crosby, 2014; Roberts et al., 2012) and substance use (Elkington et al., 2011), and has also been found to interact with genetic factors (Sales et al., 2015).

Individual level factors also account for the relationship between partner/relationship factors and HIV/STI risk (Waldrop-Valverde et al., 2013). Specifically, partner-related risk has been linked to behavioral outcomes through smoking (Berg et al., 2012), psychological symptoms (French & Neville, 2013), cognitions (Curran et al., 2016), and coping strategies (Nguyen et al., 2010). Conversely, individual factors have also been found to predict partner-related factors, suggesting an interactive contribution between individual and social domains. For example, substance use and psychological symptoms have been connected to behavioral outcomes through partner-related factors (DePadilla et al., 2011). However, these relationships between individual factors and partner/relationship characteristics are complex and vary based on partner type, commitment, and intimacy among African American youth (e.g., Mustanski et al., 2013; Raiford et al., 2009). For example, impulsivity, hostility, and hopelessness have been associated with condom use with casual partners, but not main partners among African American males (Hicks et al., 2016; Kagan et al., 2012). Similar results have been found with partner age such that risky cognitions only pose risk among younger (i.e., lower risk) partners (Ritchwood, Penn, et al., 2014). These findings suggest

that the effects of individual psychological factors on behavioral outcomes must be considered in the context of the relationship and warrant further investigation.

Individual and Community Factors

Individual psychological and biological factors have also been found to explain the effects of environmental factors, such as abuse, neighborhood disadvantage, and culture on HIV/STI risk among African Americans. For example, the relationship between abuse and behavioral outcomes has been explained by negative condom attitudes (T. Hall et al., 2008). Similarly, the relationship between neighborhood disadvantage and behavioral outcomes has been explained by hopelessness, low self-efficacy (Cooper et al., 2015; Wallace et al., 2017), risk-taking (Kogan, Brody, Chen, et al., 2011; Kogan, Cho, Barnum, et al., 2017), and aggression (Voisin, Hotton, & Neilands, 2018). These effects have also been found to differ across gender, with internalizing symptoms mediating the relationship between environmental factors and behavioral outcomes for females (Lopez et al., 2011; Wilson et al., 2013) and externalizing symptoms for males (Voisin et al., 2014). Differences have also been found in regard to the mediating role of biological factors. Among males, earlier pubertal timing has been found to mediate the relationship between neighborhood dysfunction and behavioral outcomes (Kogan, Cho, Simons, et al., 2015). Among females, those with a short allele variant on the 5-HTTLPR gene have been found less likely to increase condom use in response to an intervention if they have been abused (Sales, DiClemente, et al., 2014). Although studied less, an environmental factor that has also been speculated to work through individual factors is the low sex ratio. Specifically, it has been suggested that the sex ratio imbalance among African American communities influences females' beliefs that males will reject them for any slight, leading to low self-efficacy for condom negotiation and thus, increased risk for behavioral outcomes (Ferguson et al., 2006; W. J. Hall & Tanner, 2016).

Psychological individual factors have also been shown to account for the effect of cultural factors, such as religiosity, discrimination, and masculinity, on risk for HIV/STI outcomes. For example, conservative religious beliefs have been associated with condom non-use through negative affect (DePadilla et al., 2011) whereas discrimination has been associated with multiple partners through depressive symptoms (Kogan, Yu, et al., 2015). Regarding masculinity, studies have documented its direct effect on risky cognitions among both young males and their partners, including lower self-efficacy and negative condom-related attitudes (Vincent et al., 2016), which are both related to behavioral outcomes. Males high in reputational masculinity have also been found more likely to respond abusively to condom negotiation, which may contribute to decreased self-efficacy among their partners (Raiford, Seth, Braxton, et al., 2013).

Individual and Structural Factors

Lastly, individual psychological factors have also been shown to help explain the effect of structural factors, such as poverty or low income, on HIV/STI outcomes among African American youth (DePadilla et al., 2011; Raiford et al., 2014). For example, low SES during early adolescence has been found to predict hopelessness, anger, and poor self-control during mid-adolescence, which in turn, predicted behavioral outcomes in early adulthood (Kogan, Yu, et al., 2013). As for other structural factors, such as employment, education, and

incarceration, although they have been linked to individual psychological factors including depression, substance use, self-efficacy, and HIV knowledge (J. M. Jackson et al., 2015; Swenson et al., 2010), no study has examined whether such individual factors mediate the relationship between these structural factors and HIV/STI risk among heterosexual African American youth.

Interactions among Contextual Factors

Although important information has been gained through examining the interactive effect of individual and contextual factors (i.e., social, community, and structural factors) on HIV/STI risk, most of the interactive effects across social ecological domains have been found between the three contextual domains. These relationships appear to originate with structural factors, with downward effects to environmental and social factors. Thus, we begin with a discussion of the structural factors and how they interact with community and social factors to influence risk for HIV/STI among African American youth.

First, as discussed above, the structural disadvantage faced by African Americans has profound effects on their communities. Income disparities that disproportionately affect African Americans contribute to their neighborhood disadvantage (Carlson et al., 2014). Disproportionate rates of both poverty and incarceration among African Americans contribute to the low sex ratio in their communities (Oser et al., 2017)—and relatedly, low marriage rates—which promotes risky sexual networks (Adimora & Schoenbach, 2005) and predicts STI (Beydoun, Dail, Tamim, Ugwu, & Beydoun, 2010).

Thus, structural disadvantage also contributes to social risk among African American youth, particularly risky sexual networks. Regarding income, African Americans in the greatest poverty have been found 85% less likely to be in a confirmed monogamous network position than African Americans in other income brackets (Fichtenberg et al., 2010). Incarceration also contributes to risky sexual networks through the long-term connections formed with high-risk antisocial networks in prison. Incarcerated youth returning to the community may serve as a bridge from lower-risk community partners to members of higher-risk networks whom they connected with in prison (Adimora et al., 2006). For example, a simulation based on African American communities with high incarceration rates of young males showed that incarceration produces a five-year increase in the number of sexual partnerships among not only former inmates, but also males and females in their communities (Knittel et al., 2015). Regarding residential segregation, this factor may be an important contributor to the homogeneity of sexual networks among heterosexual African Americans as it decreases exposure of African Americans to other races. Accordingly, residential segregation contributes to more segregated and risky sexual networks among African American youth as they tend to select partners in areas in which they live (Biello et al., 2012)

Incarceration contributes to low marriage rates through attrition of African American males (Adimora et al., 2006; Thomas, 2006) and stigma, leading to difficulty maintaining committed relationships (i.e., risky sexual networks; Lichtenstein, 2009); poverty and unemployment also decrease the available pool of marriageable males and contribute to relationship instability (Adimora & Schoenbach, 2005; Oser et al., 2017). However, structural factors may pose the highest risk for HIV/STI when they interact with community

risk factors. For example, Knittel et al. (2015) found that incarceration rates pose the greatest risk for concurrency in communities with low sex ratios and where male employment and education are markedly low relative to that of females.

Structural factors also contribute to other social factors, such as parenting and partner characteristics. Low income has been found to predict less attentive parenting, which in turn predicted riskier cognitions and behavioral outcomes (Kogan, Yu, et al., 2013). Regarding partner-related factors, low income has been associated with disparities in partner age (Raiford et al., 2014) and having a partner as a primary spending source, which is in turn associated with infection outcomes (Rosenbaum et al., 2012). Partner characteristics, including disparities in partner age, increased gender-power disparities, and more fear in negotiating condom use, have also been found to mediate the relationship between low education and STI risk (Crosby et al., 2007). Incarceration may also contribute to behavioral outcomes through gender power disparities and risky partner choice as adolescent females with a recently-incarcerated partner have been found more likely to experience intimate partner violence, decreased sexual communication, and more partner substance use at sex (Swartzendruber et al., 2012).

There are also interactive effects between community—both environmental and cultural factors—and social risk factors that contribute to HIV/STI disparities among African American youth. Regarding environmental factors, the low sex ratio has been associated with a high proportion of female-headed households, which may also influence gender power disparities: because males have more options for sexual partners, females may tolerate males' indiscretions and defer to their condom preferences for fear of rejection or to secure intimacy (Alleyne & Gaston, 2010; W. J. Hall & Tanner, 2016). Thus, the low sex ratio may contribute to more permissive peer norms toward concurrency (W. J. Hall & Tanner, 2016) and subsequent risk for infection outcomes. Other community factors have also been linked to social risk. Neighborhood dysfunction has been associated with riskier peer norms, and in turn behavioral outcomes (Voisin et al., 2014; 2018). Early life stress has been found to have a greater effect on behavioral outcomes among youth with low peer support (Brady et al., 2009). Regarding culture, masculinity has been found to pose risk for behavioral outcomes through relationship conflict (Raiford, Seth, Braxton, et al., 2013) and religiosity has been found to work through promotive parenting and peer norms to protect against behavioral outcomes (Landor et al., 2011).

Lastly, there are interactive effects found *within* each contextual domain. As discussed previously, structural factors are highly related, with incarceration posing risk for low work and income prospects and vice versa (Lichtenstein, 2009). Risk and protective factors in other domains may interact similarly. For instance, in the community domain, neighborhood disadvantage has been found to predict increases in reputational masculinity during early adulthood among young males, which in turn predicted increases in number of sexual partners (Kogan, Cho, Barton, et al., 2017). In the social domain, relationship, peer, and parental factors are all related. Attentive parenting has been associated with decreased likelihood of a partner age disparity (Emerson et al., 2012) and casual partner among youth (Steiner et al., 2014). Promotive parental factors have also been found to work through relationship power equity and partner condom communication to increase condom use

(DePadilla et al., 2011; Kogan, Simons, et al., 2013). Parenting and peer factors also interact to influence behavioral outcomes. Roberts et al. (2012) found that *non*-attentive parenting predicted more deviant peer associations among African American youth, which led to *more* attentive parenting, a subsequent decrease in deviant peers, and finally, decreased behavioral outcomes. There is also evidence that peer and partner factors interact to contribute to risk, as African American females with riskier peers have also been found to have older sexual partners (Emerson et al., 2012).

Customized Social Ecological Model of HIV/STI Risk for African American Youth

The current model (See Figure 2 for the complete depiction of the proposed model) provides a new and comprehensive understanding of HIV/STI risk by 1) incorporating individual risk factors with risk factors in all three contextual domains (i.e., structural, community, and social), 2) accounting for the contribution of these domains not only to behavioral outcomes, but also to infection outcomes, and 3) focusing on a specific, high-risk population: heterosexual, African American youth. As noted in the current model and discussed above, there are direct links between the risk domains and HIV/STI outcomes. Yet, consistent with the ecological perspective, the current review revealed there are also important interactions found between domains that help provide a more comprehensive understanding of risk such that a change in one domain affects changes in others. Specifically, as it relates to heterosexual African American youth, our review suggests that interactions between domains trend downward such that risk generally originates from structural risk factors (i.e., income, poverty, unemployment, low education, incarceration, and residential segregation), which influences community and social risk, which in turn, contribute to individual level risk factors.

As depicted in Figure 2, structural disadvantage faced by African American youth serves as the greater context in which other contextual and individual factors contributing to HIV/STI risk operate. Structural determinants appear to facilitate HIV/STI risk at least in part through community factors. In turn, those community factors contribute to individual risk, behavioral outcomes, and infection outcomes. For example, African American youth living in poverty are more likely to live in a neighborhood with harsher conditions, which in turn, predicts early pubertal maturation. Early pubertal maturation is in turn linked to increased behavioral outcomes and thus, increased risk for HIV/STI exposure. Thus, the pathway from structural to individual risk for African American youth works in part, through factors that characterize their communities.

The pathway from structural to individual risk for HIV/STI also works through social risk factors. For example, low education is related to partner-related factors such as fear of condom negotiation, which in turn contributes to negative condom use attitudes and low self-efficacy, and HIV/STI risk. Thus, like community risk, social risk appears to help explain the relationship between structural disadvantage and individual risk. However, as discussed above, community and social factors also interact to pose increased individual risk. For example, youth without social support may be more susceptible to the

psychological effects of community risk factors such as abuse, violence, and neighborhood disadvantage than those with social support. Thus, the pathways from structural risk to community and social risk may interact to affect African American youth at the individual level.

Thus, the current model of HIV/STI risk for African Americans describes the effects of contextual risk factors on the development of individual risk factors and highlights their role in explaining the disparity in HIV/STI outcomes among African American youth. However, although the current model suggests that contextual effects generally work in a descending manner, per the social ecological framework, this model also recognizes that there are reciprocal relationships within and between domains. First, contextual factors not only contribute to risk factors in other domains, but also in their own domain. For example, harsh parenting promotes other social risk such as a gender power imbalance in relationships and deviant peer associations. Similarly, structural factors such as incarceration, underemployment and poverty are interrelated, posing reciprocal risk. Second, some risk factors in the hierarchy may work upward. For example, individual factors such as externalizing symptoms and substance use contribute to risky partner choice and incarceration. Thus, the model posits that contextual and individual factors create a positive feedback loop such that individual risk developed within structural, community, and social dysfunction in turn contributes to increased risk in these contextual domains.

Although there is evidence to support the current model's proposal that structural factors and their interaction with other contextual and individual factors better explains (i.e., community and social) the disparity in HIV/STI outcomes among African American youth than each of the contextual and individual factors alone, it may not fully explain disparities in HIV/STI outcomes. We posit that that no model, including the current model, can fully explain this disparity without considering the stage of the epidemic. As noted by Baral et al. (2013), all contextual and individual factors contributing to HIV risk are situated within the stage of the epidemic, theorizing that these factors "can only create conditions which either increase or decrease the probability of acquisition or onward transmission of an already prevalent disease" (p. 4). Recent evidence shows that besides proportion of poverty, proportion of African Americans is the greatest predictor of county-level STI rates in the United States (Marotta, 2017). Thus, regardless of structural, community, social, or individual risk factors, heterosexual African American youth are more likely than heterosexual youth of other races/ethnicities to be infected with HIV and STIs due to the existing disparities in their incidence and prevalence. Given this understanding of the epidemic, we propose that in order to utilize the current model in explaining risk for HIV/STI among African American youth and disparities related to HIV/STI outcomes, one must consider these pathways within the magnitude of the HIV/STI epidemic among African American youth. Thus, although changes within the structural, contextual, and individual domains will influence HIV/STI outcomes for heterosexual African American youth, the stage of the epidemic will either slow or help accelerate adaptive changes in any domain.

Discussion

The current review aimed to synthesize the research in multiple disciplines examining factors contributing to the HIV/STI disparity among heterosexual African American youth. The review also extended previous work by documenting empirical evidence of interactive effects of risk factors across domains and developing a comprehensive social ecological model of HIV/STI risk for heterosexual African American youth. This theoretical model extended previous models by explaining relationships between contextual and individual domains, accounting for the influence of those relationships not only on behavior, but also directly on sexual health outcomes, and focusing on those factors pertinent to risk among heterosexual African American youth. Based on our model, we propose that among African Americans, HIV/STI risk tends to begin in disparities at the structural level, which contribute to social and community risk factors, individual psychological and biological risk factors, and ultimately, increased behavioral outcomes. However, there are also direct pathways from contextual risk to HIV/STI. The model presented also emphasizes that these social ecological pathways to risk operate within already advanced stages of the HIV and STI epidemics among African American youth, which must be considered when determining the overall effect adaptive changes within each pathway can have on HIV/STI outcomes among African American youth. With this in mind, below we offer potential clinical implications of the theoretical model and future directions for research.

Clinical Implications

One contribution of the current study is that it helps clinicians and community interventionists identify African American youth at highest risk for infection. Based on evidence on the downward effect of structural and community factors on HIV/STI outcomes, interventionists should focus on not only high-risk individuals, but also high-risk communities. Within communities with high rates of violence, high incarceration rates, and high residential segregation, youth who are behaviorally low risk may be at high HIV/STI risk due to risky social and sexual networks. Moreover, based on the steep relationship between poverty/income and STI (Harling et al., 2013), poor and low-income youth are likely among those African Americans at greatest risk for infection. Other highly indicated groups include incarcerated youth transitioning back to the community and their partners, youth who are not enrolled in school, and youth living in highly segregated areas.

Thus, large-scale prevention efforts such as the CDC's (2011) High-Impact Prevention approach should focus on African American communities with these characteristics. Interventions such as the High-Impact Prevention, which addresses structural and contextual factors on health outcomes are known as structural interventions (Blankenship, Friedman, Dworkin, & Mantell, 2006). Structural interventions vary widely and include direct policy approaches such as promoting condom use and availability, and indirect approaches such as challenging gender norms and masculinity (Gupta et al., 2008). Although structural approaches may be difficult to implement and have been criticized as too broad or infeasible, Gupta et al. (2008) noted that "total change of a distal structural factor might not be needed to exert its effect on HIV vulnerability" (p. 55). As the current model demonstrates that HIV/STI risk among African Americans originates from implications of society-level policy

that promotes their structural disadvantage, such interventions may be particularly relevant among this population. For example, rather than attempting to change SES and incarceration rates, structural interventions for heterosexual African American youth may target mediators of the relationship between structural factors and HIV/STI risk including community-level discrimination, masculine norms, and sexual networks.

Yet many of the existing intervention programs for HIV/STI risk have largely focused on individual psychological factors, with the greatest focus on knowledge, intentions to engage in RSB, and self-efficacy or self-empowerment (Hendrick & Canfield, 2017; Romero et al., 2011). Although there is evidence that individual level factors, such as high psychological symptoms, substance use, feelings of hopelessness, and lack of future orientation, are particularly indicated for HIV/STI intervention and have been used as targets for interventions (e.g., Beadnell et al., 2003; C. Jackson, Geddes, Haw, & Frank, 2012; Lennon, Huedo-Medina, Gerwien, & Johnson, 2012), there is mixed evidence on their utility for African American youth as the primary intervention focus (Romero et al., 2011). Thus, based on our study, we propose that these interventions should place more focus on environmental conditions, which often mitigate the effects of HIV/STI interventions among African American youth. For example, interventionists should be mindful that evidence-based interventions for HIV/STI may be less impactful among African American youth who live in highly segregated communities, experience high levels of discrimination (Reid et al., 2014), are victims of abuse, and belong to committed partnerships with poor sexual communication (Sales, Brown, DiClemente, & Rose, 2012; Sales, DiClemente, et al., 2014). Yet, where structural interventions are not feasible, individual downstream effects may be important targets of intervention. For example, interventions may include hopelessness as an individual-level target in communities where structural disadvantage is prevalent (Raiford et al., 2014).

Directions for Future Research

As discussed previously, although some contextual factors were found to help explain disparities in HIV/STI risk among African American youth, no study found that one factor fully accounted for differences between African American and White youth. Moreover, although several studies in the current review used an ecological or similar framework to examine the interactive effects of individual and contextual factors to HIV/STI risk, only one examined factors in all four ecological domains (Kogan, Brody, et al., 2010). Thus, future research testing the current model is needed to provide empirical support for pathways to risk for HIV/STI across multiple factors in the risk domains.

Future research should also examine whether the current model holds under various demographic and behavioral parameters. In the current review, few studies examined developmental differences in risk factors, but those that did suggest that some contextual risks may vary in importance based on age among African American youth. For example, parental warmth was found to protect against behavioral outcomes during early adolescence, but not young adulthood (Kan et al., 2010; Ritchwood, Howell, et al., 2014), and income was found to have a stronger effect on STI risk among school-aged adolescents than emerging adults (Sales, Brown, DiClemente, Davis, et al., 2012). Thus, future research

should examine developmental differences in the model's pathways to HIV/STI risk. Gender differences in risk pathways were also observed and warrant further investigation. For example, Simons et al. (2016) found that mediators of the relationship between supportive parenting and behavioral outcomes varied by gender, with pubertal timing mediating the relationship for males, and attitudes and self-control mediating the relationship for females. However, there were also several factors, particularly at the individual level, in which studies only examined pathways for African American females. Research at the structural and community levels also lacked examination of gender differences. Future research examining the differential influence of incarceration, the sex ratio imbalance, and sexual networks by gender is critical given African American women's vulnerability may be largely geobehavioral (i.e., based on behavior within certain geosocial spaces) (Brawner, 2014). Finally, the current model is based on a limited definition of RSB that focused on high-risk sexual behavior that were strongly related to infection outcomes. However, as African American youth are at increased risk for HIV/STI regardless of behavior, future research should examine lower risk behavioral outcomes, such as frequency of sex and early sexual debut, which may be more relevant indicators of risk among this group than among Whites (Wickrama, & 2012).

The current review and model also revealed several gaps in the current literature regarding HIV/STI risk among African American youth that warrant further empirical research. First, little research has examined the contribution of genetic variants to HIV/STI risk among this group. Genetic differences have been shown to influence individual RSB (Harden, 2014) and susceptibility to infection (Lama & Planelles, 2007). According to the ecological perspective, heritable risk factors for HIV/STI are most likely influenced by environmental risk factors (Harden, 2014); thus, future research should not only examine the unique contribution of genetic differences, but also how they interact with contextual risk factors to contribute to HIV/STI risk among African American youth. Second, the relationship between partner and individual risk was found to be complex. Whether partner-related risk factors influence individual risk, individual factors influence partner selection, or these factors have a reciprocal relationship is unknown. Prospective research is needed to clarify the pathways to risk among those domains and identify those youth at greatest risk for HIV/STI.

Third, the review revealed mixed evidence regarding the influence of promotive cultural variables such as racial identity and religiosity, and limited research regarding their interactions with other domains. Researchers have highlighted the moderating influence of such cultural variables on environmental risk factors for other health risk behavior (e.g., alcohol use; Nasim, Belgrave, Jagers, Wilson, & Owens, 2007). Future research should also examine the interactions of culture and interpersonal risk factors, particularly parenting factors, which contribute to racial identity and religious development (Hughes, Witherspoon, Rivas-Drake, & West-Bey, 2009), and discrimination, which may be buffered by cultural factors (Rivas-Drake et al., 2014). Fourth, most of the research reviewed examined behavioral outcomes, but not HIV or STI outcomes, as risk indicators. Although RSB is indicative of HIV/STI risk among both African American and White youth, it is a poorer predictor of risk among the former group (Einwalter, Ritchie, Ault, & Smith, 2005) given their contextual risk factors and stage of the epidemic. Thus, some of the extant research

examining risk among heterosexual African American youth may overlook those contextual factors most pertinent to their risk. Further, interventions based on such research also may not address the most important mechanisms of risk for African American youth (Romero et al., 2011). Future etiological and intervention research targeting HIV/STI among African American youth should more often examine infection outcomes.

Fifth, although some of the research reviewed found gender differences in pathways from risk domains to behavioral and infection outcomes, these findings were sparse and often mixed. Most of the research reviewed examined samples of either males or females with the majority of these studies examining adolescent females. Thus, the model documented here is based on evidence primarily conducted among female youth. Future research is needed examining gender as a moderator of the hypothesized pathways to confirm whether they are generalizable to both heterosexual male and female youth. Lastly, although the current review has several strengths, including scientific rigor in methodology, comprehensiveness of the literature reviewed, and integration of various disciplines, the current model is limited in that it only focuses on heterosexual African American youth. Adolescents and young adults disproportionately face HIV/STI outcomes and some of the identified mechanisms may apply to youth who do not identify as heterosexual.

Conclusion

The current paper provided a comprehensive social ecological review of the past 14 years of literature examining risk for HIV and STI among heterosexual African American adolescents and young adults, who disproportionately experience these outcomes. The review supported the work of others, finding that not only individual sexual behaviors, but also individual psychological and biological factors are insufficient to explain the sexual health disparities faced by African American youth. Studies reviewed across disciplines identified contextual variables, such as structural disadvantage, interpersonal risk, and community dysfunction that interact with each other and with individual factors to contribute to the disparity in HIV/STI outcomes among this population. The model presented suggests that for African American youth, a) HIV/STI risk commonly begins at the structural level and trickles down to the community, social, and individual levels, b) risk works in a positive feedback system such that downstream effects compound the influence structural risks, and c) contextual and individual risk factors must be considered within the advanced stage of the epidemic facing this population. Despite the advanced epidemic, multisystemic interventions that target structural risk factors and their downstream effects may help chip away at the disparity in HIV/STI outcomes among heterosexual, African American youth.

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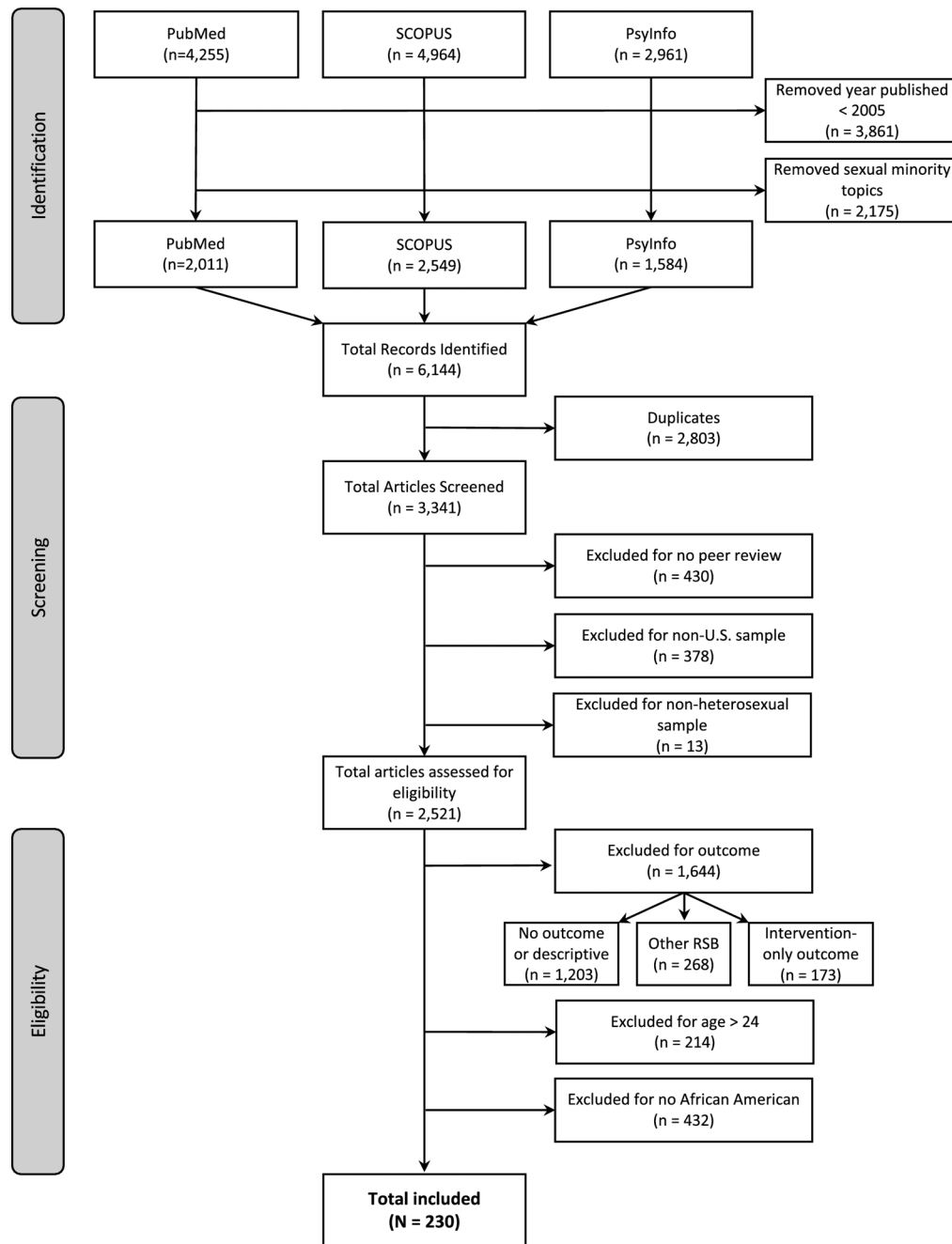


Fig 1. Selection of studies based on searches of three databases and inclusion/exclusion criteria.

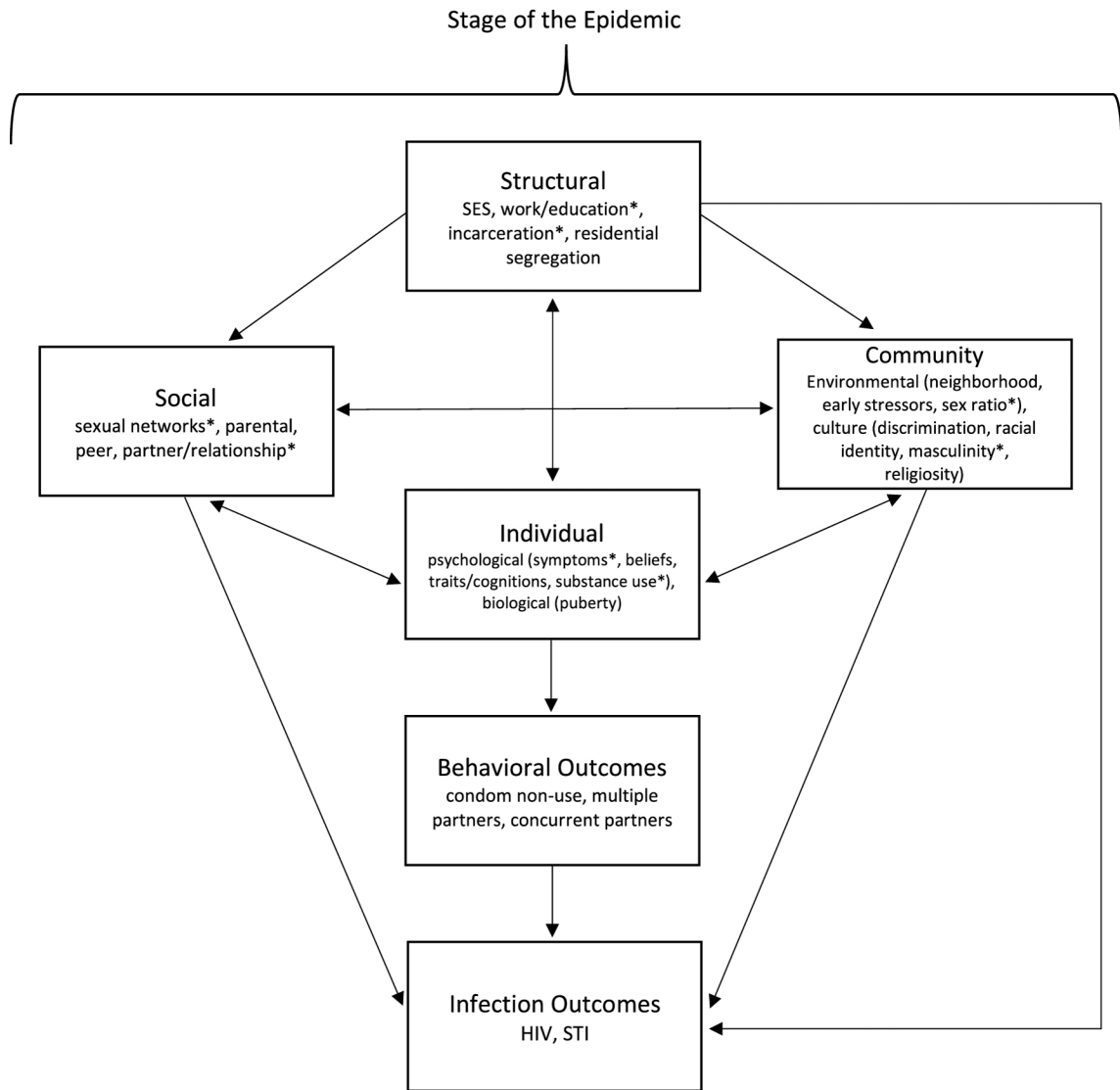


Fig 2. Customized social ecological model of HIV/STI risk for heterosexual African American youth. Straight arrows represent downward effects of structural and individual factors to risk. Asterisks indicate a factor that is likely to differ by gender.

Table 1

Literature search terms

| HIV/STI Risk | Race | Age |
|-----------------------|------------------|----------------|
| Risky sexual behavior | African American | Young |
| Sexual behavior | Black | Young adult |
| Sexual risk-taking | Black-White | Emerging adult |
| (Un)safe sex | | Youth |
| Sex(ual) risk | | Adolescent |
| Condom (non)-use | | Adolescence |
| Unprotected sex | | Student |
| Multiple partner | | |
| Serial partner | | |
| Concurrent partner | | |
| HIV/AIDS | | |
| STI (STD) | | |
| HIV/STI (STD) | | |

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