



Racial disparity in bacterial vaginosis: the role of socioeconomic status, psychosocial stress, and neighborhood characteristics, and possible implications for preterm birth[☆]

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ABSTRACT

Racial disparity in preterm birth is one of the most salient, yet least well-understood health disparities in the United States. The preterm birth disparity may be due to differences in how women experience their racial identity in light of neighborhood factors, psychosocial stress, or the prevalence of or response to genital tract infections such as bacterial vaginosis (BV). The latest research emphasizes a need to explore all these factors simultaneously. This cross-sectional study of parous women in King County, Washington, USA investigated the effects of household income, psychosocial stress, and neighborhood socioeconomic characteristics on risk of BV after accounting for known individual-level risk factors. Relevant demographic, socioeconomic, and medical data were linked to U.S. census socioeconomic data by geocoding subjects' residential addresses. It was found that having a low income was significantly associated with an increased prevalence of BV among African American but not White American women. A higher number of stressful life events was significantly associated with higher BV prevalence among both African American and White American women. However, perceived stress was not related to BV risk among either group of women. Among White American women, neighborhood socioeconomic status (SES) was univariately associated with increased BV prevalence by principal components analysis, but was no longer significant after adjusting for individual-level risk factors. No neighborhood SES effects were observed for African American women. These results suggest that both the effects of individual- and neighborhood-level risk factors for BV may differ importantly by racial group, and stressful life events may have physiological effects independent of perceived stress.

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Introduction

Prematurity is the leading cause of infant mortality in the United States (Callaghan, MacDorman, Rasmussen, Qin, & Lackritz, 2006) and the racial disparity in preterm birth is one of the most salient, yet least well-understood health disparities. Even after adjustment for differences in known risk factors, African American women are consistently observed to be at approximately twice the risk of delivering prematurely compared to White American women (Behrman & Butler, 2006).

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The persistence of the preterm birth disparity is puzzling. Although reasons for preterm birth are complex, as a health disparity, preterm birth must be studied in relation to the social conditions that influence women's premature birth outcomes differentially and unequally. Preterm birth disparity may be due in part to social context differences in how women experience their racial identity in light of neighborhood factors (Stancil, Hertz-Picciotto, Schramm, & Watt-Morse, 2000), stress perception (Hogue & Bremner, 2005) or the prevalence of or response to genital tract infections such as bacterial vaginosis (BV) (Hitti et al., 2007; Royce et al., 1999). The latest research emphasizes a need to explore all these factors simultaneously to develop models for understanding preterm birth disparity (Reagan & Salsberry, 2005).

Here we review the theories about the preterm birth disparity in the context of BV, psychosocial stress, and neighborhood socioeconomic characteristics, and we then present results of a research study designed to further explore these relationships.

Background

Preterm birth and bacterial vaginosis

Bacterial vaginosis (BV) is often hypothesized as a potential mechanism to explain preterm birth disparity because it is consistently observed to occur more commonly in African American than White American women (Holzman, Leventhal, Qiu, Jones, & Wang, 2001; Ness et al., 2003; Royce et al., 1999). The Preterm Prediction Study observed that not only was BV more common, but the association between BV and preterm birth was stronger among African American women (Goldenberg et al., 1998). In that cohort, BV was estimated to account for 40% of spontaneous early preterm births. In the Vaginal Infections and Prematurity study, a significantly higher proportion of preterm births were related to lower genital tract infections (including BV) among African American women than among white women (Hitti et al., 2007). One author has estimated that racial differences in BV prevalence may explain up to 30% of the observed preterm birth disparity (Fiscella, 1996).

BV is an imbalance in normal vaginal microbiology, and is specifically characterized by a decrease in *Lactobacillus* species combined with an overgrowth of facultative organisms including *Gardnerella vaginalis* and *Mycoplasma hominis*, and anaerobes including various *Prevotella* and *Bacteroides* species (Eschenbach et al., 1988; Hillier, Krohn, Klebanoff, & Eschenbach, 1992). BV is observed in approximately 15%–40% of women of reproductive age and is associated with vaginal odor and discharge, although the majority of cases are asymptomatic (Eschenbach et al., 1988).

Although initially of uncertain clinical relevance, BV is now recognized as an important risk factor for preterm birth (Goldenberg et al., 1998; Hillier et al., 1995) as well as other adverse reproductive outcomes and diseases of the female reproductive tract (Watts, Krohn, Hillier, & Eschenbach, 1990). It is hypothesized that the imbalance in normal vaginal flora characteristic of BV, and the corresponding elevated vaginal pH, may result in ascending

genital tract infection and allow other organisms to invade and colonize the genital tract (Hill, 1998; Peipert, Montagna, Cooper, & Sung, 1997).

Predisposing factors for BV are not yet well understood, and findings have been inconsistent between studies. Some research suggests that BV exhibits characteristics of sexual transmission and is associated with traditional sexually transmitted infection (STI) risk factors including multiple sex partners, unprotected sex, early sexual debut, young age, being unmarried, and co-infection with other STIs (Bukusi et al., 2006; Hart, 1993; Ness et al., 2003; Nilsson, Hellberg, Shoubnikova, Nilsson, & Mardh, 1997). However, there is conflicting evidence on the extent to which BV can truly be considered an STI; numerous studies show that hygiene behaviors such as douching may be equally important (Morris, Rogers, & Kinghorn, 2001; Rajamohan, Low, Jones, & Pozniak, 1999; Zhang et al., 2004).

Bacterial vaginosis and socioeconomic status

Because of the large racial disparity in BV and the fact that race and socioeconomic status (SES) tend to be highly correlated, there has been significant interest in whether low SES is also associated with BV and whether this may at least partially explain the observed disparity. Studies in the United Kingdom and Kenya have observed associations between low socioeconomic status (SES) and the occurrence of BV (Bukusi et al., 2006; Morris et al., 2001). In contrast, a large study in the United States (the Preterm Prediction Study) found no such relationship (Meis et al., 2000) in either African American or white women, with the exception of a modest effect for women who reported not having a home telephone. There are several possible explanations for the discrepant results; most notably, each study measured SES using a slightly different metric. Additionally, Meis et al. stratified by race (African American and White American), while the other studies did not. Thus, further research is needed to definitively establish how SES may influence a woman's risk of BV and potentially mediate racial disparity in BV.

There are two hypothesized pathways through which SES may be related to BV risk. First, low SES is associated with higher exposure to chronic stressors (Adler & Rehkopf, 2008) which make women more vulnerable to BV via a neuroendocrine or immune pathway. Second, women of low SES may be more likely to be exposed to sexually transmitted infections either because of their own or their partners' risky behavior (Aral, 2001; Aral, Fenton, & Holmes, 2007), and socioeconomically disadvantaged women are also consistently more likely to engage in other unhealthy behaviors such as cigarette smoking (Graham, Inskip, Francis, & Harman, 2006), which has been associated with increased risk of BV (Cherpes, Hillier, Meyn, Busch, & Krohn, 2008; Ness et al., 2003).

Bacterial vaginosis and stress

BV has also been consistently associated with higher levels of psychosocial stress across studies (Culhane, Rauh, McCollum, Elo, & Hogan, 2002; Culhane, Rauh, McCollum, Hogan, Agnew, & Wadhwa, 2001; Harville,

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