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Original article

Associations between county-level voter turnout, county-level felony voter disenfranchisement, and sexually transmitted infections among women in the Southern United States

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A R T I C L E I N F O

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A B S T R A C T

Purpose: Voting may play a critical role in the allocation of social and structural resources to communities, which in turn shapes neighborhood environments, and ultimately, an individual's sexually transmitted infection (STI) risk. We assessed relationships among county-level voter turnout and felony voter disenfranchisement, and STIs.
Methods: This cross-sectional multilevel analysis included 666 women in Alabama, Florida, Georgia, Mississippi, and North Carolina enrolled in the Women's Interagency HIV Study between 2013 and 2015. Having a baseline bacterial STI (chlamydia, gonorrhea, trichomoniasis, or early syphilis) was determined by laboratory testing. We used generalized estimating equations to test relationships between county-level voter turnout in the 2012 general election, county-level percentage of felony disenfranchised voters, and STI prevalence.
Results: Eleven percent of participants had an STI. Higher voter turnout corresponded to lower STI prevalence (prevalence ratio = 0.84, 95% confidence interval = 0.73–0.96 per 4 percentage point higher turnout). Greater felony voter disenfranchisement corresponded to higher STI prevalence (prevalence ratio = 1.89, 95% confidence interval = 1.10–3.24 per 4 percentage point higher disenfranchisement).
Conclusions: STI prevalence was inversely associated with voter turnout and positively associated with felony voter disenfranchisement. Research should assess causality and mechanisms through which civic engagement shapes sexual health. Expanding political participation, including eliminating discriminatory voting laws, could influence sexual health.

Introduction

The United States has experienced a dramatic increase in the rate of reportable sexually transmitted infections (STIs) in the past decade, despite advances in diagnosis and treatment [1]. STIs contribute to comorbidities (e.g., pelvic inflammatory disease) and facilitate transmission of HIV [1]. The burden of STIs is especially notable in the South, which consistently reports higher rates of STIs than other regions of the United States [1,2].

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African American women are at greater risk of acquiring STIs, including HIV, than non-African American women, despite engaging in the same or lower levels of sexual risk behavior [3,4]. Features of the social and built environment are powerful determinants of racial disparities in STIs, including HIV. Specifically, living in areas with comparatively greater poverty, a shortage of men relative to women, and more social disorder (e.g., violent crime) is associated with higher risk sexual networks (e.g., sexual partnerships that overlap in time) which facilitate the spread of STIs [5–9]. Social and political factors may differentially allocate fiscal and structural capital to communities, which in turn reduce residents' access to resources needed to support sexual health (e.g., health care services, educational opportunities), while simultaneously overexposing residents to community phenomena (e.g., violent crime, illicit drug use) associated with greater sexual risk [2,10–12]. In the United States, the legacy of segregation, coupled with ongoing discriminatory macroeconomic and social forces, has produced community environments that vary by race [2,4,13,14]. Nationally representative samples demonstrate stark contrasts in area socioeconomic and social (e.g., ratio of men to women) contexts by race, highlighting potential pathways between social inequities and racial disparities in HIV/STIs [9].

Political parties and the policies elected officials implement have important downstream implications for resource allocation and resulting health disparities [11,12,15]. For example, the implementation of the Patient Protection and Affordable Care Act has the potential to ameliorate inequities in health care access, including STI screening and treatment, by decreasing the number of low-income people who lack health insurance. Yet, implementation of the Patient Protection and Affordable Care Act, especially in the South, has been limited by many states' refusal to expand Medicaid [16]. Because laws and policies are shaped by elected officials, voting plays a critical role in determining the allocation of social and structural resources to communities, which in turn shapes community environments and, ultimately, an individual's risk of acquiring an STI.

Nonvoters are more likely to be poor, have less formal education, be in poor health, and report unmet needs for medical care [15,17,18]. Living in areas with socioeconomic inequalities in voter turnout is associated with poorer self-rated health [15]. Systematic restrictions on voting which disproportionally and negatively impact racial and ethnic minorities and the poor may promote health disparities by excluding substantial portions of the population from participating in the political process [2,10,15,19]. Over 6 million Americans are prohibited from voting due to felony disenfranchisement laws restricting voting rights for individuals convicted of felony offenses [20,21]. The length of voting prohibitions varies by state, with the period of disenfranchisement for persons convicted of a felony offense ranging from the duration of the sentence to lifetime prohibition [20,21]. The potential impact of felony disenfranchisement varies substantially across states and racial and ethnic groups [2,10,19,21,22]. One in every 13 African American adults is disenfranchised, as compared to 1 in 56 non-African American adults [21]. The South has some of the strictest (e.g., lifetime prohibition) and highest rates of felony disenfranchisement, with as many as 1 in 4 African Americans in some states prohibited from voting [2,20].

The objective of this cross-sectional multilevel study was to assess the relationship between two related constructs capturing county-level political participation (i.e., voter turnout and felony voter disenfranchisement) and having a bacterial STI, among a predominantly African American cohort of women living in the South. We hypothesized that county-level voter turnout would be inversely associated with having an STI, whereas county-level voter disenfranchisement would be positively associated with having an STI.

Materials and methods

The Women's Interagency HIV Study (WIHS) is a multisite, prospective cohort study designed to characterize the natural history, clinical, and behavioral impact of HIV among U.S. women [23,24]. The WIHS includes HIV-seronegative women whose sociodemographic characteristics are similar to those of the HIV-seropositive women in the cohort, who, in turn are representative of the race/ethnicity of HIV-seropositive U.S. women [23–26]. Between October 2013 and September 2015, WIHS clinical research sites in five states in the South (Alabama, Florida, Georgia, Mississippi, and North Carolina) enrolled HIV-seropositive and HIV-seronegative women, aged 25–60 years. HIV-seropositive women were antiretroviral therapy (ART)-naïve or began taking highly active antiretroviral therapy only after December 31, 2004 and had never been on non–highly active antiretroviral therapy ART (except possibly when pregnant). All had documented CD4 counts and HIV viral load before initiation of ART. HIV-seronegative women reported that either they or a sexual partner met at least one criterion associated with increased risk of HIV acquisition in the last five years (e.g., illicit drug use).

Participants were recruited by WIHS using multiple strategies, including community-based organization referrals. Institutional review board approval was obtained at each institution and written informed consent was obtained before study procedures. Methods are described in detail elsewhere [23,24]. This secondary analysis, approved by the University of North Carolina Institutional Review Board, was restricted to Southern site participants providing written informed consent to collect and geocode their residential addresses.

Measures

Outcome: current bacterial sexually transmitted infection

The binary outcome, having a current bacterial STI, was defined as a laboratory-confirmed diagnosis (Appendix A) at baseline of chlamydia, gonorrhea, trichomoniasis, or early syphilis (titer and confirmatory test results consistent with primary, secondary, or early latent [<1 year duration] infection). Participants with an STI were referred to medical providers for treatment.

County-level exposures: voter turnout and felony voter disenfranchisement

Our county-level exposures captured two dimensions of political participation: voter turnout (the percentage of voting age residents casting a vote in the general election) and felony voter disenfranchisement (the percentage of voting age residents excluded from voting due to a felony conviction).

County-level percentage voter turnout (continuous, mean-centered) was calculated as the percentage of the voting age population (aged 18 years and older, based on American Community Survey [ACS] 2010–2014 5-year estimates) casting a vote for any presidential candidate in the 2012 general election. Total votes cast per county were obtained from Dave Leip's Atlas of U.S. Presidential Elections [27].

County-level percentage of felony disenfranchised voters was estimated by applying 2010 state-level felony disenfranchisement rates for African Americans, as calculated by Uggen et al [20], to counties based on ACS 2010–2014 5-year estimates of voting age African American county residents. All states included in these analyses have voter disenfranchisement laws, with estimates of disenfranchised African Americans ranging from 2.8% in North Carolina to 23.3% in Florida [20].

Because past research suggests that area socioeconomic conditions are associated with STIs and voter turnout, we also evaluated whether the relationships between our county-level exposures (voter turnout, felony voter disenfranchisement) and having an STI were independent of county-level socioeconomic advantage [5–8,15,28]. Measures of county socioeconomic advantage (i.e., median household income, percentage of residents 25 or older with a college degree or greater, and percentage of residents over age 16 who were employed) were created using ACS 2010–2014 5-year estimates. Because these socioeconomic measures were correlated, we used principal component analysis with orthogonal rotation (varimax) to capture underlying constructs and avoid multicollinearity [5,29–31]. The principal component analysis produced one component with eigenvalue >1, which accounted for 88% of the variability explained by these factors. Continuous, standardized component scores were extracted for each participant and included in multivariable models. County-level political participation measures were not correlated with county-level socioeconomic advantage (Pearson's $r < 0.60$).

Covariates

The WIHS collected all demographic and behavioral data using interviewer-administered questionnaires. We adjusted for the following participant-level demographics and behaviors in the past six months, which were binary unless otherwise noted, and included age in years (continuous, mean-centered), non-Hispanic African American race/ethnicity, annual household income of $18,000 or less, less than a high school education or equivalent (e.g., GED), and being HIV-seropositive (i.e., reactive serologic enzyme-linked immunosorbent assay test and a confirmed positive Western blot or a detectable plasma HIV-1 ribonucleic acid). Given the geographic diversity of our sample and the relationship between voter turnout and travel distance, we also controlled for population density (continuous, mean-centered), defined as persons per square mile, using ACS 2010–2014 5-year estimates [32].

Analysis

All analyses were conducted using SAS 9.4 (SAS Institute Inc., Cary, NC). We used descriptive statistics to assess distributions of variables and to compare these distributions by HIV status and missingness. We modeled bivariable and multivariable relationships using generalized estimating equations (GEEs; PROC GENMOD) with a binomial distribution and log link (to estimate prevalence ratios [PRs] and 95% confidence intervals [CIs]), and an exchangeable correlation structure. We selected PRs over odds ratios because (1) odds ratios overstate effect sizes relative to PRs, and this overstatement occurs to a greater extent with increasing prevalence of the outcome and (2) PRs are more easily interpretable because they represent a ratio of proportions rather than a ratio of odds [33–35]. We selected GEEs over mixed models because our goal was to generate population-average estimates of the associations between county-level political participation and STIs [36]. Because of the study design of WIHS, which consists predominantly of HIV-seropositive women, we tested statistically for multiplicative interactions between county-level political participation and having an STI by HIV status (e.g., HIV status*voter turnout, HIV status*felony voter disenfranchisement), retaining terms with $P < .05$ in the final multivariable model.

We conducted sensitivity analyses to test the robustness of findings. First, to test whether relationships between our county-level exposures (voter turnout, felony voter disenfranchisement) and STI prevalence were independent of county-level socioeconomic advantage, we compared PR estimates for each county-level exposure in models with and without county-level socioeconomic advantage. We determined a priori that less than 10% difference in county-level PR estimates between models suggested that the relationship between each county-level exposure and having an STI was independent of county-level socioeconomic advantage. Second, to examine whether the contribution of felony voter disenfranchisement to having an STI was distinct from underlying racial composition of counties, we compared PR estimates for models assessing relationships between voter disenfranchisement and having an STI to PR estimates for models assessing relationships between percentage of voting age African American residents and having an STI. We determined a priori that more than 10% difference in PR estimates in county-level voter disenfranchisement, as compared to the percentage of voting age African American residents suggested that these exposure variables were capturing different underlying constructs. Third, parallel analyses were conducted using random effects models (PROC GLIMMIX) to evaluate the robustness of findings. PRs for our county-level exposures (voter turnout, felony voter disenfranchisement) generated using random effects models, as compared to PRs generated using GEEs, were within 7%. Furthermore, the random effect for the intercept in unconditional models was near zero, suggesting low intracounty variability and further supporting the use of GEEs.

Results

Participant characteristics

A total of 845 women enrolled at WIHS sites in the South. One hundred seventy-nine women were excluded from these analyses because they (1) did not have geocoded address data ($n = 116$; most of these women did not consent for geocoding [$n = 65$]) or (2) were missing one or more STI laboratory test results ($n = 63$). Participants excluded because they were missing geocoded address data were more likely to report annual household incomes less than or equal to $18,000 (83.2% vs. 69.0%; chi-square Fisher's Exact Test, $P < .05$). Participants enrolled at study sites other than Georgia were more likely (Chi-square Fisher's Exact Test, $P < .05$) to have missing STI data, as were participants with HIV. We controlled for income, site, and HIV status in all multivariable models to minimize potential bias.

The 666 participants (Table 1) included in these analyses lived in 61 unique counties, with a median of 2 participants per county and first [Q1] and third [Q3] quartiles of 2 and 5, respectively. Across the 666 participants in the final analytic sample, the distribution of county median household income had a median of $50,596 (Q1: $43,099, Q3: $56,642). County voter turnout percentage in the 2012 general election ranged from 41.0% to 79.4% (median: 57.0%, Q1: 53.8%, Q3: 60.2%); felony disenfranchisement percentages ranged from 0.22% to 11.8% (median: 3.9%, Q1: 1.6%, Q3: 5.6%). Eleven percent of participants ($n = 76$) tested positive for at least one bacterial STI at the baseline. The mean age of participants was 43.5 years (SD = 9.4), 70.7% were HIV-seropositive, and 84.6% identified as non-Hispanic African American. HIV-seropositive and HIV-seronegative participants, respectively, were similar for both the outcome (having an STI: 11.7% vs. 10.7%) and exposures (voter turnout: 56.7% vs. 57.5%, felony voter disenfranchisement: 3.9% vs. 3.9%).

Relationships between voter turnout and having a bacterial STI

County-level voter turnout was associated with lower STI prevalence. In bivariable analyses (Table 2), county-level voter turnout was modestly associated with having a bacterial STI (PR = 0.87, 95% CI = 0.77–1.00). In the multivariable model controlling for participant- and county-level characteristics (model A), a four-percentage point higher county-level voter turnout (e.g., from 57 to 61) corresponded to a lower STI prevalence (model A; PR = 0.84, 95% CI = 0.73–0.96). County-level socioeconomic advantage was

Table 1
Distributions of county and participant characteristics among 666 women enrolled in the Women's Interagency HIV Study sites in Alabama, Florida, Georgia, Mississippi, and North Carolina between 2013 and 2105

Characteristics of participants and counties	Overall n (%) or median (interquartile range) $n = 666$	HIV-seropositive n (%) or median (interquartile range) $n = 471$	HIV-seronegative n (%) or median (interquartile range) $n = 195$
Outcomes			
Laboratory-confirmed sexually transmitted infection	76 (11.4)	55 (11.7)	21 (10.8)
Chlamydia	8 (1.2)	4 (0.8)	4 (2.0)
Gonorrhea	6 (0.9)	5 (1.1)	1 (0.5)
Trichomoniasis	44 (6.6)	32 (6.8)	12 (6.1)
Syphilis	21 (3.2)	17 (3.6)	4 (2.0)
County-level characteristics			
Percentage voter turnout	57.0 (53.8–60.2)	56.7 (53.8–60.2)	57.5 (53.8–60.2)
Percentage felony voter disenfranchisement	3.9 (1.6–5.6)	3.9 (1.4–6.1)	3.9 (1.7–5.1)
Percentage of African American residents 18 y and older	40.5 (20.2–48.9)	40.5 (20.4–52.5)	40.5 (24.8–42.9)
Socioeconomic advantage*	−0.18 (−0.7 to 0.8)	−0.5 (−0.8 to 0.8)	0.4 (−0.7 to 0.8)
Median household income*	$50,596 ($43,099-$56,642)	$45,239 ($43,099-$56,642)	$52,038 ($44,409-$56,642)
Percentage of residents ≥16 who are employed*	58.8 (55.5–60.2)	56.6 (55.2–60.2)	59.8 (55.6–61.9)
Percentage of residents ≥25 with a college degree or greater*	30.3 (26.4–48.3)	30.3 (26.4–45.6)	40.3 (27.5–48.3)
Population density (residents per square mile)	1140.4 (496.7–1836.4)	1140.4 (283.3–1836.4)	1140.4 (592.9–1836.4)
Participant-level characteristics			
Age in years	44.5 (35.8–51.5)	44.7 (36.5–51.8)	43.6 (34.1–50.4)
Non-Hispanic African American†	554 (83.2)	388 (82.4)	166 (85.13)
Annual household income ≤$18,000‡	443 (68.7)	325 (70.8)	118 (63.4)
Less than a high school education or equivalent	202 (30.3)	147 (31.2)	55 (28.2)
HIV-seropositive	471 (70.7)	—	—

* Statistically significantly different distribution by HIV status ($P < .05$) using Wilcoxon median tests.
† Race/ethnicity missing for 11 (1.6%) participants.
‡ Annual household income missing for 21 (3.1%) participants.

not associated with having an STI in the bivariable (PR = 1.19, 95% CI = 0.97–1.47) and multivariable models (model A; PR = 1.33, CI = 0.91–1.95), providing insufficient evidence of an association between county-level socioeconomic advantage and having an STI. PRs for county-level voter turnout in models controlling for and not controlling for county-level socioeconomic advantage were within 10% (results not shown), suggesting that relationships between county-level voter turnout and having a bacterial STI were

Table 2
Bivariable and multivariable relationships between county-level voter turnout and having a current sexually transmitted infection among women enrolled in Women's Interagency HIV Study sites in Alabama, Florida, Georgia, Mississippi, and North Carolina between 2013 and 2105 ($n = 666$) [1,2]

Characteristics of counties and participants	Bivariable PR (95% CI)	Multivariable model A aPR (95% CI)*	Multivariable model B aPR (95% CI)†	Multivariable model C adjusted prevalence ratio (95% CI)‡
County-level exposures				
Voter turnout*	0.87 (0.77–1.00)	**0.84 (0.73–0.96)**	—	—
Felony voter disenfranchisement§	1.18 (0.90–1.54)	—	**1.89 (1.10–3.24)**	—
Voting age African American residents§	1.05 (1.01–1.10)	—	—	1.06 (0.99–1.14)
Socioeconomic advantage‖	1.19 (0.97–1.47)	1.33 (0.91–1.95)	1.36 (0.94–1.97)	1.16 (0.85–1.58)
Covariates				
Age¶	1.03 (1.00–1.05)	1.01 (0.99–1.03)	1.01 (0.99–1.04)	1.01 (0.99–1.04)
Non-Hispanic African American	1.54 (0.76–3.12)	1.31 (0.68–2.51)	1.17 (0.59–2.31)	1.20 (0.61–2.33)
Annual household income of $18,000 or less	1.15 (0.76–1.74)	1.02 (0.59–1.75)	1.06 (0.61–1.86)	1.05 (0.60–1.82)
Less than a high school education or equivalent	1.26 (0.78–2.06)	1.14 (0.69–1.89)	1.21 (0.75–1.96)	1.22 (0.76–1.97)
HIV-seropositive	1.08 (0.70–1.68)	1.17 (0.72–1.92)	1.18 (0.72–1.93)	1.17 (0.71–1.94)
Population density#	1.00 (1.00–1.01)	1.00 (0.99–1.00)	1.00 (1.00–1.01)	1.00 (0.99–1.00)
Model fit				
QIC	—	458.70	457.75	460.99
QICu	—	458.27	456.68	459.71

Bold indicates $P < .05$.
aPR = adjusted prevalence ratio; QIC = quasi-likelihood under the independence model criterion.
1 We modeled bivariable and multivariable relationships using generalized estimating equations with a binomial distribution and log link (to estimate prevalence ratios [PRs] and 95% confidence intervals [CIs]) and an exchangeable correlation structure in SAS 9.4.
2 Multivariable models restricted to participants with no missing covariates ($n = 632$).
* Model assessing multivariable relationships between county-level voter turnout, controlling for county-level socioeconomic advantage and other individual and area-level covariates.
† Model assessing multivariable relationships between county-level felony voter disenfranchisement, controlling for county-level socioeconomic advantage, and other individual and area-level covariates.
‡ Model assessing multivariable relationships between county-level voting age African American residents, controlling for county-level socioeconomic advantage, and other individual and area-level covariates.
§ Per 4 percentage points.
‖ Per SD.
¶ Per year.
\# Per 10 residents per square mile.

independent of county-level socioeconomic advantage. There was no statistically significant interaction between county-level voter turnout and HIV status on the multiplicative scale ($P > .05$).

Relationships between voter disenfranchisement and having a bacterial STI

In the multivariable model controlling for participant- and county-level characteristics (model B), a four-percentage point higher county-level felony voter disenfranchisement (e.g., from 0 to 4 percent) corresponded to a greater STI prevalence (PR = 1.89, 95% CI = 1.10–3.24). The bivariable association (PR = 1.18, 95% CI = 0.90–1.54) was much weaker or absent, suggesting that the association was obscured by confounding. County-level socioeconomic advantage was not associated with having an STI in the bivariable (PR = 1.19, 95% CI = 0.97–1.47) and multivariable models (model B; PR = 1.36, CI = 0.94–1.97), providing insufficient evidence of an association between county-level socioeconomic advantage and STI prevalence. PRs for county-level voter disenfranchisement in models not controlling for county-level socioeconomic advantage were shifted toward the null (PR = 1.46, CI = 0.99–2.14). Given that more socioeconomically advantaged areas experience less crime and incarceration, it logically follows that adjusting for this factor would result with an effect estimate with a higher magnitude. There was no statistically significant interaction between county-level felony voter disenfranchisement and HIV status on the multiplicative scale ($P > .05$).

The percentage of county-level voting age African American residents was weakly associated with STI prevalence in the bivariable model (PR = 1.05, 95% CI = 1.01–1.10), but not in the multivariable model controlling for participant- and county-level characteristics (model C; RR = 1.16, 95% CI = 0.85–1.58). We compared PR estimates for models assessing relationships between felony voter disenfranchisement and having an STI (model B; PR = 1.89, 95% CI = 1.10–3.24) to PR estimates for models assessing relationships between percentage of voting age African American residents and having an STI (model C; PR = 1.16, 95% CI = 0.85–1.58) and concluded county-level felony voter disenfranchisement and county-level percentage of African American residents captured distinct underlying constructs, with county-level felony voter disenfranchisement being the more powerful explanatory variable. There was no statistically significant interaction between the percentage of county-level voting age African American residents and HIV status on the multiplicative scale ($P > .05$).

Discussion

In this multilevel analysis controlling for participant-level characteristics, we found that greater county-level voter turnout was associated with a lower prevalence of having a bacterial STI among women living in the Southern United States. Moreover, greater county-level felony voter disenfranchisement, but not county-level percentage of African Americans, was associated with greater prevalence STIs. These relationships did not vary by HIV status.

The ability to vote is a symbol of inclusion that affirms one's sense of collective identity and provides opportunities to shape policy [15,19,22,37]. Politically active neighborhoods promote politically active citizens [28]. Communities with higher levels of civic engagement may be more effective in garnering human and physical resources needed to forward agendas and policies with positive community health benefits. For example, natural experiments exploring relationships between voter turnout, alcohol availability, and gonorrhea rates before and after the 1992 civil unrest in Los Angeles, California found that areas with increased voter turnout had fewer alcohol outlets (businesses such as liquor stores or convenience stores that sell alcohol for off-premise consumption) reopen following the unrest [38], and subsequently, areas with lower alcohol availability also had lower neighborhood gonorrhea rates [39]. These findings support the possibility that voter turnout can change neighborhood characteristics in ways that improve health.

The disproportionate incarceration of people of color in the United States, combined with felony voting restrictions, has resulted in the exclusion of substantial portions of African Americans from the political process [2,20]. Our finding that a 4 percentage point higher felony voter disenfranchisement was associated with a nearly 2-fold greater prevalence of having a bacterial STI is notable, especially because in over 50% of U.S. states, greater than 4% of the African American adult population is disenfranchised due to a felony conviction [21]. Racial and socioeconomic inequalities in political participation result in detrimental policies for financially vulnerable groups [11,12,15]. Political participation has the potential to determine policies and policy makers, which in turn dictates resource allocation; systematic exclusion of African Americans from voting promotes inequitable distribution of assets and subsequent health disparities [2,10,15,19]. Research by Uggen and Manza demonstrated that felony voter disenfranchisement skews elections in favor of more conservative parties [22,37]. This electorate imbalance is further heightened when simultaneously accounting for excess mortality among African Americans [10]. U.S. states with more liberal leanings also have policies supporting positive reproductive health outcomes for women (e.g., fewer teen births, more human papillomavirus vaccination coverage) [40,41].

Findings are subject to limitations. Although the WIHS provides high-quality data concerning women who have or are at risk for HIV infection in the Southern United States, participants agree to long-term follow-up and therefore may not be representative of the general population. Participants excluded from this analysis due to a lack of geocoded address data may have lived in qualitatively different communities. However, participants with and without geocoded address data were not different with respect to our outcome (STIs). We did not have a sufficient sample size to assess relationships between county-level political participation and each STI type (e.g., chlamydia alone). However, past research demonstrates that high incidence areas of reportable STIs overlap geographically [42]. Due to the cross-sectional nature of our study, we have not attempted to draw conclusions regarding the causality of the relationship between county-level political participation and having an STI. We assessed the relationship between two related constructs capturing county-level political participation and bacterial STI prevalence, controlling for a mixture of individual and area-level covariates. It is possible that the county-level measures of political participation do not adequately represent the individual under study (ecologic fallacy). Findings may also be subject to residual confounding. Our measures of political participation may be markers for social conditions (e.g., incarceration rates, ratio of men to women) not included in the analysis that are strong predictors of STIs [9,43–45]. County-level felony voter disenfranchisement data are not publicly available. Our measure of disenfranchisement represents a proxy based on best available data. The fact that the association of STI prevalence with our constructed measure of felony disenfranchisement (based on percentage of voting age African Americans) is much stronger than the corresponding association with percentage of African American voting age residents itself suggests that felony disenfranchisement is highly informative, highlighting once again that inequities in STIs are a function of social and structural inequities, and of racism rather than of race [2,13,14].

This study found an inverse association between county-level voter turnout and having an STI and a positive association between county-level felony voter disenfranchisement and having an STI. Additional research is needed to assess causality and to elucidate the mechanisms through which community-level political participation is linked to STIs among women living in the Southern United States. Additional research examining the relationships between area-level civic engagement and sexual health using nationally representative samples with geographically linked information is warranted. Expanding opportunities for civic engagement, including voter registration campaigns and eliminating discriminatory voting laws, could provide positive benefits for individual- and community-level sexual health.

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Appendix A

Specimen type, test, and sensitivity and specificity for sexually transmitted infection evaluation at The Women's Interagency HIV Study sites in Alabama, Florida, Georgia, Mississippi, and North Carolina between 2013 and 2015

STI	Specimen type	Test (sensitivity, specificity) by site				
		Alabama	Florida	Georgia	North Carolina	Mississippi
Chlamydia	Cervical swab*	APTIMA Nucleic Acid Amplification Test (NAAT) (94.30, 98.00)	Becton Dickinson (BD) ProbeTec ET System (93.80, 99.80)	Aptima Combo 2 for CT/NG (96.60, 98.50)	Gen Probe Aptima (98.30, 96.10)	ROCHE Cobas polymerase chain reaction (PCR) (94.90, 99.40)
Gonorrhea	Cervical swab*	APTIMA NAAT (92.00, 99.80)	BD ProbeTec ET System (88.00, 99.80)	Aptima Combo 2 for CT/NG (96.60, 98.50)	Gen Probe Aptima (97.30, 99.00)	ROCHE Cobas PCR (96.60, 99.90
Trichomoniasis	Vaginal swab†	APTIMA NAAT (100.00, 98.10)	Wet mount‡ (N/A)	Wet mount‡ (N/A)	Wet mount‡ (N/A)	Wet mount‡ (N/A)
Early Syphilis§	Serum	BD Screening rapid plasma regain (RPR) with confirmatory Treponema pallidum hemagglutination assay or Treponema pallidum particle agglutination assay (Screening: 3.00–100.00, 98.00, Confirmatory: 99.40, 100.00)	Arlington Scientific RPR Card (95.00, 98.00)	BD RPR titer, with confirmatory IgG enzyme immunoassay if reactive (N/A)	LabCorp Screening RPR with Confirmatory Quantitative RPR (Screening: 99.00, 98.40; Confirmatory: 100.00, 99.80)	BD RPR (86.00, N/A)

* Urine was used for testing at Alabama site.
† Cervical swab was used for testing at Alabama site.
‡ Trichomoniasis is defined as the presence of motile trichomonads on a vaginal wet mount.
§ Titer and confirmatory testing results consistent with primary, secondary, or early latent (<1 year duration) infection.