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Trends in factors indicating increased risk for STI among key subpopulations in the United States, 2002-2015

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Abstract

Objectives—Within the context of rising rates of reportable sexually transmitted infections (STIs) in the United States (US), we used national survey data to examine temporal trends in high risk factors that indicate need for STI/HIV preventive services among key subpopulations with disproportionate STI rates.

Methods—We used data from the 2002 (n=12,571), 2006-10 (n=22,682) and 2011-15 (n=20,621) National Survey of Family Growth (NSFG). NSFG is a national probability survey of 15-44 year olds living in US households. We examined STI risk factors among sexually active men who have sex with men (MSM) and Hispanic, non-Hispanic black, 15-19 year old, 20-24 year old, and 25-29 year old women who have sex with men (WSM) and men who have sex with women (MSW). Risk behaviours included: received money or drugs for sex, gave money or drugs for sex, partner who injected drugs, partner who has HIV, nonmonogamous partner (WSM, MSW only), and male partner who had sex with other men (WSM only). Endorsement of any of these behaviours was recoded into a composite variable focusing on factors indicating increased STI risk (yes/no). We used chi-squares and logistic regression (calculating predicted marginals to estimate adjusted prevalence ratios) to examine STI risk factors over time among the key subpopulations.

Results—From 2002 to 2011-2015, reported STI risk factors did not change or declined over time among key subpopulations in the US. In adjusted analyses comparing 2002 to 2011-2015, we identified significant declines among WSM: Hispanics (aPR=0.84(0.68-1.04), non-Hispanic blacks (aPR=0.69(0.58-0.82), adolescents (aPR=0.71(0.55-0.91), and 25-29 year olds (aPR=0.76(0.58-0.98); among MSW: Hispanics (aPR=0.53(0.40-0.70), non-Hispanic blacks (aPR=0.74(0.59-0.94), and adolescents (aPR=0.63(0.49-0.82); and among MSM (aPR=0.53(0.34-0.84).

Conclusions—While reported STIs have increased, STI risk factors among key subpopulations were stable or declined. Condom use related to these risk factors, sexual mixing patterns, and STI testing should be examined.

Keywords

STI risk factors; national survey; temporal trends

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Introduction

Cases of sexually transmitted infections (STIs) that are reported to the Centers for Disease Control and Prevention (CDC) have been increasing in the United States (US).[1] STIs in the US disproportionately impact some groups including men who have sex with men (MSM), non-Hispanic black and Hispanic persons and younger persons (those aged 15-29 years old depending on the STI).[1] A few US national-level studies have examined temporal trends in sexual behaviour. Studies comparing 2002 and 2006-10, found a decline in sexual and injection drug risk among men and women aged 15-44 years[2] and a decline in mean number of sex partners among MSM.[3] From 2002 to 2011-2013, research found no changes in median number of sex partners for females and males with opposite-sex partners.[4] Finally, a study focusing on 2002 to 2011-15 found an increase in condom use among men while condom use did not change among women.[5] Many of these factors are indicators of recommended preventive services (e.g., screening or pre-exposure prophylaxis) for STIs or human immunodeficiency virus (HIV); however, other indicators for these services have not been assessed.[6–8] Thus, we sought to examine national-level trends in factors indicating increased risk for STIs that are indicators for CDC recommend STI/HIV preventive health services and lack published recent trend data among subpopulations with a disproportionate STI burden.

Methods

We analysed data from several surveys of the National Survey of Family Growth (NSFG) including 2002 (n=12,571; response rate=79%), 2006-10 (n=22,682; response rate=77%) and 2011-15 (n=20,621; response rate=71%). NSFG is a multistage national probability sample of 15-44 year olds in US households and includes a section administered by audio computer assisted self-interview (ACASI).[9] Respondents 18 years and older provided informed consent and those 15-17 years old provided assent after parental consent. The surveys were approved by the National Center for Health Statistics ethics review board. Details of the survey design and methodology have been previously published.[9] All analyses were conducted separately for sexually active women who had sex with men (WSM, n=25,076), men who had sex with women (MSW, n=18,942), and men who had sex with men (MSM, n=760). Sexually active was defined as having sex with an opposite-sex partner in the past 12 months for WSM and MSW and having sex with a same-sex partner in the past 12 months for MSM. Respondents who had both opposite-sex and same-sex partners were included in the appropriate groups. For example, a man who had sex with both men and women was included in MSW and MSM. We focused on the following subpopulations: MSM (15-44 years) as well as Hispanic (15-44 years), non-Hispanic black (15-44 years), 15-19 year old, 20-24 year old, and 25-29 year old WSM and MSW.

Using ACASI data, we created a composite variable from available factors indicating increased STI risk that were highlighted in CDC STI/HIV preventive services recommendations[6–8] (also referred to as “STI risk factors”) with opposite-sex (WSM, MSW) and same-sex (MSM) partners in the past 12 months: received money or drugs for sex, gave money or drugs for sex, partner who injected drugs, partner who has HIV,

nonmonogamous partner (WSM, MSW only), and male partner who had sex with other men (WSM only; included given high risk for STIs among MSM). The composite "STI risk factors" was dichotomous where an endorsement of any of the specific STI risk factors was coded as 'yes' and those who reported none of the behaviours were coded as 'no' for the key subpopulations. We used Rao-Scott chi-squares with post-hoc significance testing to compare the composite factor across all survey years. Finally, we used logistic regression for the composite "STI risk factors" for each subpopulation adjusting for race-ethnicity or age, education, poverty, and marital status (WSM, MSW only). Specifically, we estimated average marginal predictions to calculate model-adjusted prevalence ratios accounting for our covariates. We used SAS (Release 9.4, SAS Institute, Cary, NC) and SUDAAN (11.0.1, Research Triangle Institute, Research Triangle Park, NC) for data analyses to account for complex sampling and we used survey weights for all analyses. Although data from 2015-17 have been released, the sample size was not large enough to use for some subpopulations included in this analysis.

Results

Over time, the prevalence of composite factors indicating increased STI risk either declined or remained the same for all sexually active persons in key subpopulations (Table 1). From 2002 to 2011-15, composite STI risk factors significantly declined among the following subpopulations of sexually active WSM: non-Hispanic black (27.0%, 95% CI, 23.9-30.2 vs. 19.8%, 95% CI, 17.5-22.4) and 15-19 years (26.3%, 95% CI, 22.9-30.1 vs. 19.1%, 95% CI, 15.5-23.4; Table 1). Among men, significant declines in composite STI risk factors from 2002 to 2011-15 occurred among Hispanic MSW (18.7%, 95% CI, 15.5-22.4 vs. 10.8%, 8.9-13.1), 15-19 year old MSW (24.3%, 95%CI, 20.5-28.6 vs. 15.9%, 95% CI, 13.0-19.2) and MSM (25.9%, 95% CI, 18.2-35.4 vs. 13.1%, 95% CI, 9.4-18.0). From 2006-10 to 2011-15, the only declines were among 15-19 year old (21.8%, 95%CI, 18.6-25.3 vs. 15.9%, 95% CI, 13.0-19.2) and 25-29 year old (17.0%, 95%CI, 14.5-19.9 vs. 13.2%, 95% CI, 11.0-15.9) MSW.

As demographic patterns can shift over time, we also examined composite STI risk factors for each of our key subpopulations in models that used 2002 as the reference group and adjusted for race-ethnicity or age (race-based models adjusted for age; age-based models adjusted for race-ethnicity), education, poverty and marital status (WSM and MSW only). We found similar patterns as bivariate analyses – trends either remained the same or declined (Supplementary Table S1). Among sexually active WSM, we found significant declines in composite STI risk factors for the following groups: Hispanic (2006-2010), non-Hispanic black (2006-2010; 2011-2015), 15-19 years (2011-2015), 20-24 years (2006-2010), and 25-29 years (2011-2015). Among sexually active MSW, we found significant declines in composite STI risk factors for the following groups: Hispanic (2006-2010; 2011-2015), non-Hispanic black (2011-2015), and 15-19 years (2011-2015). We also found a significant decrease in STI risk factors among MSM (2011-2015).

Discussion

While reported STIs increased in the US, factors indicating increased STI risk were largely stable or declined among key subpopulations with disproportionate STI rates. In adjusted analyses, we continued to observe stable or decreasing reports of STI risk factors suggesting that changes in population demographics are not contributing to the significant declines. Our findings are similar to previous research that has not found increases in various sexual behaviours since 2000.[2–4] Correspondingly, a national survey of 16 to 44 year olds in Britain found no change in reports of paying for sex in the past five years among males from 1999-2001 to 2010-2012.[10] It would be useful to examine similar STI risk factors in other high income countries to see if they have changed over time as well.

Our study has some limitations. First, we included STI risk factors that are indicative of needed STI/HIV services where data were available, but these measures likely do not encompass the universe of enhanced risk factors for STIs. Also, NSFG did not ask about condom use for the risk factors we examined. The measure “partner who has HIV” is limited as we do not have information about HIV viral load. Some factors required respondent knowledge of sex partner’s behaviours, and it is possible that willingness to report sensitive information may have changed over time. Also, NSFG is a household-based survey, so the sampling frame does not include homeless or incarcerated persons who may have higher STI risk including for some of the factors we examined. Although the individual risk factors have been previously associated with STIs, we do not have research linking our composite variable to STI. Finally, NSFG does not include STI biomarkers so we were not able to directly examine trends in the association between STI risk factors and STIs over time. However, our purpose was to examine trends in selected STI risk factors and not their direct role in STI prevalence over time.

Our findings suggest that research into other factors, such as condom use for these STI risk factors, sexual mixing patterns, anatomic site-specific acquisition and transmission risk, and access to and use of STI health services (e.g., STI testing or screening), is needed to explain the increases in reported STIs. Other subpopulations may also be important to examine in relation to the STI increases. Although some of the risk factors we examined focused on sex partners’ behaviour, these factors likely would not provide sufficient information on changes in sexual networks over time. Thus, research that examines possible changes in sexual networks when STIs are increasing may be beneficial. Our findings may be of interest to other countries who may be seeing a recent increase in STIs. For instance, The European STI Surveillance Network identified an increase in gonorrhoea incidence from 8.2 per 100,000 in 2008 to 23 per 100,000 in 2017.[11] Finally, STIs reported to the national surveillance system assess prevalence; thus, we do not know if STI incidence is also increasing. Therefore, research is needed to estimate STI incidence in the US during this time.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Key Messages

- Reported STIs are increasing in the United States, but little is known about changes in national-level STI risk factors among key subpopulations.
- National survey data shows that factors indicating increased STI risk did not change or declined over time among key subpopulations.
- Consideration of key demographics suggests that changes in demographics over time did not explain the trends in STI risk factors among key subpopulations.

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Table 1.

Prevalence of factors indicating increased STI risk among sexually active women who have sex with men (WSM), men who have sex with women (MSW) and men who have sex with men (MSM) in the past 12 months by subpopulations at highest risk for STD

	2002	2006-10	2011-15	Pairwise comparisons, p values		
	% (95%CI)	% (95%CI)	% (95%CI)	2002, 2006-10	2002, 2011-15	2006-10, 2011-15
	n=6265	n=9805	n=9006			
All sexually active WSM						
Race/ethnicity						
Hispanic	12.8 (10.9, 14.8)	10.8 (9.2, 12.7)	12.2 (10.3, 14.3)	0.142	0.683	0.311
Non-Hispanic black	27.0 (23.9, 30.2)	20.0 (17.8, 22.3)	19.8 (17.5, 22.4)	0.023	0.040	0.728
Age						
15-19	26.3 (22.9, 30.1)	23.1 (19.8, 26.8)	19.1 (15.5, 23.4)	0.207	0.009	0.138
20-24	22.0 (18.3, 26.2)	16.8 (14.9, 19.0)	18.3 (16.0, 20.9)	0.023	0.120	0.367
25-29	15.0 (12.3, 18.1)	13.0 (11.1, 15.2)	12.2 (10.2, 4.5)	0.275	0.127	0.585
	n=3741	n=7987	n=7214			
All sexually active MSW						
Race/ethnicity						
Hispanic	18.7 (15.5, 22.4)	13.8 (11.6, 16.3)	10.8 (8.9, 13.1)	0.020	<0.001	0.059
Non-Hispanic black	24.3 (20.8, 28.3)	23.0 (20.4, 25.8)	19.4 (16.3, 23.0)	0.571	0.056	0.100
Age						
15-19	24.3 (20.5, 28.6)	21.8 (18.6, 25.3)	15.9 (13.0, 19.2)	0.333	0.001	0.012
20-24	22.7 (19.3, 26.6)	23.4 (19.9, 27.4)	22.8 (19.0, 27.1)	0.800	0.975	0.833
25-29	15.0 (11.6, 19.3)	17.0 (14.5, 19.9)	13.2 (11.0, 15.9)	0.404	0.428	0.044
	n=197	n=272	n=291			
All sexually active MSM	25.9 (18.2, 35.4)	16.4 (10.7, 24.3)	13.1 (9.4, 18.0)	0.089	0.009	0.413

Note. Includes only respondents who reported one or more sex partners in past 12 months. Percentages and 95%CIs are weighted. Denominator n's are unweighted and may vary by sexual risk behaviour due to missing values. CI = confidence interval. Composite = respondent reported >=1 of the following: male partner who had sex with other men (WSM only), nonmonogamous partner, received $/drugs for sex, gave $/drugs for sex, partner who injected drugs or partner who has HIV. CI = confidence interval.