

Original Research

Sexually Transmitted Infection Rates and Patterns of Condom Use Among Young Adult Females at an Urban Emergency Department as Compared to College Students

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ABSTRACT

Introduction

Despite months of shelter-in-place orders and two years of heavily cautious person-to-person contact, the rates of sexually transmitted infections (STIs) continue to rise (Conference on Decision and Control and Prevention (CDC), 2022). A recent survey of females presenting to an urban emergency department (ED) had a higher rate of STI and unplanned pregnancy than those in a nearby college. This study further investigated patterns of male condom use by these populations.

Methods

Females aged 18-22 who reported vaginal intercourse at least once were surveyed in 2022 by an urban women's hospital emergency department and a large urban-based public university. The survey addressed STI rates, number of partners, demographics of self and partners, and the use of condoms.

Results

Seventeen point one percent (17.1%) of university students and 43.8% of the ED patients reported a lifetime STI ($p=0.034$). The ED population was more non-white and poorer. University students reported a similar likelihood of condom use, 3.63, and ED patients 3.38 ($p=0.557$). Within the ED, African American-identifying individuals reported similar condom use, 3.54 versus 3.23, $p=0.572$. College students who reported STI had more partners, 16 versus 6.4 in the college population ($p=0.0475$); a trend not seen in the ED population.

Conclusion

STI rate remained higher in the ED population. Individuals identifying as African American represented 30.7% of the ED cases and trended towards more condom use. High-risk behavior does not directly correlate with income or non-white race. Risk per partner is higher in the ED population, suggesting more frequent exposure.

Keywords

Condom use, Urban; Females; STI; Sexual behavior.

INTRODUCTION

It is reported that sexually transmitted infections (STIs) rapidly fell during shelter-in-place orders from March to April 2020¹ presumably due to limited person-to-person contact and thus limited sexual activity. Propaganda posted in public places by state health departments during the pandemic recommended masturbation and virtual platforms for sexting, with condoms and dental dams highly encouraged to keep safe.² Despite this recommenda-

tion, condom access and usage were unchanged.³ During this time frame and while resources for asymptomatic screening during preventative care visits rebooted for several months following, there was likely testing and treatment only for symptomatic individuals and only those who maintained disproportionate access to care. By the end of 2020, reported cases of gonorrhea and syphilis increased by 10% and 7%, respectively, when compared to 2019's close. Often those with chlamydia have no signs and symptoms,

with most cases identified through asymptomatic screening at routine preventative care visits. Therefore, it is likely chlamydia diagnosis and treatment were even more disproportionately affected during the pandemic, forwarding more long-term consequences for the individual (pelvic inflammatory disease, infertility, ectopic pregnancy, chronic pelvic pain) and for their partners and vertical transmission unknowingly spreading the disease.⁴ As a proxy, year-end data for 2020 demonstrated increases in the number of women reported with syphilis of all stages and congenital syphilis by 15.7% and 14.6%, respectively. This is superimposed upon a 128.3% and 235.1% increase in four years from 2016 alone.¹

Postulating reasons and actionable interventions to alter the continued rise in STIs is now a more important venture than ever before. Human behavior is complex and nuances in sexual behavior are likely even more so. Factors commonly associated with STI include social networks, testing, and contextual factors (i.e. social determinants). There is a higher burden among adolescents and young adults and by race-ethnicity with more affected subgroups other than non-Hispanic whites and non-Hispanic Asians. But within this, high school students in the United States and Britain reporting sex before thirteen years of age, four or more sexual partners, or currently sexually active decreased. Condom use in this population increased from 46.2-54.3%. Even income inequality, violent crime, and illicit drug use in adolescents remained even.⁵⁻⁷ However, in men with STI risk factors (non-monogamy, men who have sex with men or in exchange for money/drugs, human immunodeficiency virus (HIV)), there were significant declines in condom use, especially those aged 15-19 and non-Hispanic whites. In contrast, trends in condom use among men with no STI risk factors remained stable or increased.⁸ It seems this is just one example of those at baseline higher-risk escalating that risk without barriers to contraception.

METHODS

Participants/Materials

The study was performed by surveying two distinct samples of females ages 18-22 from January to December 2022 who reported at least one-lifetime instance of sexual intercourse. The study size was determined by those who fit the inclusion criteria and were either seen in the emergency department (ED) or enrolled in the study during the January-December 2022 timeframe. No participants were excluded if the aforementioned inclusion criteria were met. The Qualtrics, Utah, USA survey was presented to the University group, and the emergency department survey was completed on paper. The emergency department group was patients at an urban emergency department located in a women's hospital. These participants were surveyed during their stay in the emergency department in the privacy of their patient rooms. The participants in the college group were enrolled at a large urban-based public university. IRB approval was obtained from both the University and the hospital where the study took place. Participant informed consent was obtained before the start of the survey for both groups. There were no identifiers used and the participants had the opportunity to exit the survey at any time. Neither group received financial compensation for participating in this study. There were no risks to participation. The survey questions and responses can

be found the Appendix.

Covariates

Demographic information included race (Black/African American, White, Asian/Pacific Islander, Hispanic/Latino, Native American), age, setting (urban ED or an urban university), educational status (any schooling up to General Educational Development (GED)/high school diploma, some college, college degree), sexual orientation (heterosexual, gay/lesbian, bisexual, other), and childhood household income.

Outcomes

Several male partners, reported STI by type, condom use and provision by partner type and ethnicity, and condom failures and failure types were compared between the two study groups. When the likelihood of behavior was assessed, a Likert scale of 1-7 was used (1=very unlikely, 7=very likely).

Statistical Analyses

Our analysis set included all survey respondents who consented and completed the demographic questions. Descriptive statistics were calculated overall and by group. Sample means and standard deviations were used for continuous measures, while sample proportions were used for categorical variables. Between-group comparisons were facilitated by two-sample *t*-tests and chi-square tests when appropriate; otherwise, non-parametric tests were used.

RESULTS

Eighty-nine women were surveyed: 48 participants from the emergency department group and 41 participants from the college group. Three individuals in the college group did not complete question 14. Twelve individuals in the ED group did not complete either questions 14 or 16. All responses were included in the dataset.

Seven out of forty-one (17.1%) university students and 21/48 (43.8%) of the ED patients reported a lifetime STI ($p=0.034$). The ED population had less family income on average. Education status was similar. On a scale from 1-very unlikely to 7-very likely, university students reported a likelihood of 3.63 and, ED patients 3.38 to use condoms in general ($p=0.557$), and if there is no condom available, university students reported a likelihood of 3.85 to proceed with sex versus ED patients reporting 3.93 ($p=0.793$). If it is a casual partner, 2.02 versus 2.37 ($p=0.303$), and if a long-term partner 4.05 versus 3.74 ($p=0.359$). Within the ED, African-American-identifying individuals reported similar condom use in general (3.54 versus 3.23, $p=0.572$). Those with lower childhood income trended towards more condom use, except for the lowest category (<\$15,000). On average the risk per partner of contracting STI is 6 in the ED versus 8.2 in university students ($p=0.2931$) (Tables 1-4).

DISCUSSION AND CONCLUSION

Generally, people who are already at higher baseline risk for STI and

Table 1. Demographics

Factor p	Level	ED	University
N		48	41
Age (Q1), Mean (SD) (0.87), 0.116		20.1(1.4)	20.5
Race (Q5) (may include more than one)		0(0%)	6(15%)
0.001	White	17(35%)	34(83%)
<0.0001	Black/African American	1(2%)	30(73%)
	Hispanic/Latino	4(8%)	0(0%)
	Native American	1(2%)	3(7%)
Childhood Household Income (Q4) <0.0001	<\$15,000/yr	8 (17%)	0(0)
	\$15,000-45,000/yr	16 (35%)	1(2%)
	\$45,000-75,000/yr	9 (20%)	8(20%)
	\$75,000-105,000/yr	9 (20%)	9(22%)
	>\$105,000/yr	4 (9%)	23(56%)
	Some High School	4(8%)	0(0%)
Highest Education (Q3)	High School Diploma or GED	26(54%)	10(24%)
	Some College	16(33%)	26(54%)
	College Degree	2(4%)	5(12%)

Table 2. Sexual Health History

Factor (p)	Level	ED	University
N		48	41
Sexual Orientation (Q2) <0.0001	Bisexual	17(35%)	3 (7%)
	Heterosexual or straight	27(56%)	36 (88%)
	Gay or Lesbian	2 (4%)	0 (0%)
	Other	2 (4%)	2 (5%)
Total report of STI in general (Q13) 0.34		21 (43.8%)	7 (17%)
History of Chlamydia (Q13) <0.0001		20(42%)	7 (17%)
History of Gonorrhea (Q13) <0.0001		8(17%)	0(0%)
History of Trichomoniasis (Q13) 0.0133		7(15%)	1(2%)
Number of Lifetime Partner (Q14) 0.329		9.28(16.6)	6.43(9.05)

Comparing sexual health history of females 18-22-years-old presenting to an urban emergency department or attending an urban university. The emergency department population was more likely to be bisexual, have a history of STI in general, and for each individual STI including chlamydia, gonorrhea and trichomoniasis. Total number of lifetime partners were similar.

Table 3. Condom Use

Factor (p)	Level	ED	University
N		48	41
How often do you use a condom (1-7 from never to always) (Q7) <0.557		3.38(2.02)	3.63(2.21)
If you do not have a condom How likely will you have sex without a condom (Q7) (1-5 very unlikely to very likely) 0.793	In General	3.93(1.32)	3.85(1.55)
When you use a condom, who provides it? (Q9)	You	2(5%)	0(0%)
<0.0001	Your Partner	18(43%)	31(78%)
<0.0001	Both	22(52%)	9(23%)
Have you ever had a condom break or slip? (Q12) 0.473		19(42%)	15(37%)

Comparing condom use behavior between females 18 to 22-years-old presenting to an urban emergency department or attending an urban university. The ED population was more likely to provide their own condoms or to share the responsibility, as opposed to expecting their partner to provide it. While there was no statistical significance, there was a trend for the ED population to use condoms less often in general both with casual and long-term partners. There was no difference in how often condom failure occurred between the groups

Table 4. STI by Race/Income/Number of Partners

Factor p	Level	ED	University
Population	N	48	41
Population Racial Identity(Q4)			
<0.0001	White	13(27%)	33(80%)
<0.0001	Non-White	30(63%)	8(20%)
Diagnosis of STI by (Q13): Racial Identity (Q4)			
0.1176	White	11(52%)	6(86%)
0.0168	Non-White	14(67%)	1(14%)
Population Childhood Household Income (Q4)			
		2.61(1.2)	4.3(0.87)
Income(Q5) 0.0005		2.80(1.32)	4.85(0.37)
Number of Lifetime Partner (Q14)			
Total population			
0.329		9.28(16.6)	6.43(9.05)
How many partners for one STI (Q14)			
0.4995		10.1(18.1)	16 (19.3)
How many partners for one STI (Q14)			
Remove any Greater than 3D Mean			
0.2931		6(4.21)	8.2(3.19)
Condom use by income in the ED compared to total ED population p value			
0.260	<\$15,000	2.5(1.86)	
0.117	\$15,000-45,000	4.35(2.19)	
0.867	\$45,000-75,000	3.5(2.06)	
0.235	\$75,000-105,000	2.42(1.40)	
0.560	>\$105,000	2.75(2.36)	
Condom used by racial group in the ED(Q8)			
Race (Q5) (may include more than one)			
0.572	African Americans	3.54(2.08)	
	Others	3.23(2.11)	

The ED cohort is more non-white and poorer. Condom use in the ED was income independent but trends towards more use. The college cohort with reported STI report more partners than average whereas ED cohort with STI reported average number of partners.

other unwanted consequences of unprotected sex will engage in riskier behavior, perpetuating transmission. A study by Caruso et al³ in 2020 demonstrated that 50% of individuals not cohabitating or single discontinued contraceptives as opposed to 0% of married or who were cohabitating during the coronavirus disease-2019 (COVID-19) pandemic. However, 46% of those individuals who discontinued contraceptive use still engaged in sexual activity, resulting in 15% discovering an unplanned pregnancy and 15% of those unplanned pregnancies desiring a termination. Though as evidenced by our study and the several that attempted to characterize this phenomenon previously, we can presume those with known risky baseline factors (e.g. single, men who have sex with men (MSM), HIV, multiple partners, drug and alcohol use, etc.) will have a higher rate of STI, but determining a target at-risk population to intervene upon outside of and between these is not straightforward.

In general, it is thought that non-white race and lower income are risk factors for STI. Our ED population is made up of a higher proportion of individuals meeting these criteria and does report a higher STI rate. However, African-American-identi-

fying individuals did not contribute to most of the cases and also used condoms more often. Likewise, those with lower childhood income used condoms more often except those at the lowest level (<\$15,000). This is an interesting dynamic. To take it a step further, and to try to discover an intervenable at-risk group, we calculated “relative risk per partner”. This is a covariation between the number of reported partners and the rate of reported STI. The ED population (adjusted) risk per partner is 6 versus 8.2 in university students. Therefore, while the ED population can engage in the same frequency and barrier contraceptive behavior, they will be more likely to contract an STI. Perhaps earlier education regarding the use of barrier contraceptives in groups with high-risk per partner would help by focusing on high-risk males.

This study does have limitations due to the relatively small survey data set. Statistical significance would require a larger data set and may allow for more helpful covariation analysis. We did not address the perceived risk of STI directly, which may provide insight into whether individuals seem to engage in risky behavior despite informed consent or whether it is an intervenable

knowledge gap. We also surveyed females only, limiting the look into to some of the highest-risk populations and ascertaining a male perspective. Male influence on partner's behaviors and barrier contraceptives certainly has the potential to be a substantial component of decision-making for the female in their shared sexual encounter. Males also have an important role in the transmission of STI, particularly asymptotically.^{9,10} Lastly, the study does not address familial or cultural thoughts on birth control and barrier contraceptives, that anecdotally within our research team's clinical encounters are an important influence on behavior.

In 2017, approximately 12% of married or in-union women all over the world already had an unmet need for contraception; this precedes the supply being severely affected by the pandemic, with manufacturing and transportation having been on lockdown.¹¹ Add this to a subset of the population who do not utilize potentially available resources, and STIs remain rampant.¹² Further research is necessary to determine actionable interventions for persons at higher-risk.

INSTITUTIONAL REVIEW BOARD PERMISSION

Yes.

CONSENT

Yes.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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APPENDIX

Condom Use Survey

The complete survey as administered to participants is below. Sources of material use in this study are indicated following the question item by a superscript with the coinciding source at the end of the appendix. Survey items from outside sources in some instances were modified to fit the current study objectives. All other items were created by the researchers of the current study.

1. What is your current age (in years) _____?
2. Do you consider yourself to be: (Sexual Minority Assessment Research Team (SMART))¹³
 - a) Heterosexual or straight
 - b) Gay or lesbian
 - c) Bisexual
 - d) Other _____
3. What is the highest degree or level of school you have completed? If currently enrolled, highest degree received.
 - a) Some high school
 - b) High school diploma or equivalent (for example: GED)
 - c) Some college credit (no degree) OR trade/technical/vocational training
 - d) College degree (Associate, Bachelor's, Master's, Professional, or Doctorate degree)
4. In your childhood household, what was the approximate combined income of the providers
 - a) <\$15,000
 - b) \$15,000-\$45,000
 - c) \$45,000-\$75,000
 - d) \$75,000-\$105,000
 - e) >\$105,000
5. Ethnicity origin (or Race): Please specify your ethnicity. (May select more than one)
 - a. White
 - b. Hispanic or Latino
 - c. Black or African American
 - d. Native American or American Indian
 - e. Asian / Pacific Islander
 - f. Other
6. The ethnic origins of your male partners are similar to your ethnic origins: Always not racially similar Mostly not racially similar Somewhat not racially similar equal number of racially similar and non racially similar partners somewhat racially similar mostly racially similar always racially similar
7. How often do you use condoms during vaginal or anal intercourse?¹⁴
Never Seldom Sometimes About half the time Often Most of the time Always
8. If you and your partner are about to have penetrative sex however you do not have a condom, How likely will you still have sex without one?¹⁴
Very Unlikely Somewhat Unlikely Neither likely or unlikely Somewhat likely Very likely
 - A. If you have a new or casual partner?
Very Unlikely Somewhat Unlikely Neither likely or unlikely Somewhat likely Very likely
 - B. If you are in a long term relationship with this partner?¹⁴
Very Unlikely Somewhat Unlikely Neither likely or unlikely Somewhat likely Very likely
9. When you use a condom, who provides it?
You Your Partner Both

10. If your partner is a male, who do you think should provide a condom:
Male partner Female partner Both

11. Do you use anything else for birth control other than condoms? Y/N
If so what? _____

12. Have you had any issues with condoms breakage or slippage? Y/N

A. If you responded yes to the previous, do you think the condom failed because of a size issue?
Yes?No

B. If yes, was the condom too small or too big?
Too small Too big

13. Have you ever been diagnosed with any of the following?¹⁴
Select all that apply Trichomonas (Trich) Gonorrhea Chlamydia Pelvic inflammatory disease (PID)

14. Number of lifetime (voluntary) partners involving vaginal or anal sex: _____?¹⁴

15. If free condoms were available would you and your partner use them? Y/N