Age Differences in STDs, Sexual Behaviors, and Correlates of Risky Sex Among Sexually Experienced Adolescent African-American Females

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Objective To explore age differences in factors associated with positive sexually transmitted diseases (STD) status among a sample of African-American adolescent females. **Methods** Data were collected via ACASI from 701 African-American adolescent females (14–20 years) seeking services at reproductive health clinics. Adolescents provided self-collected vaginal swabs assayed using NAAT to assess the prevalence of three STDs. **Results** Younger adolescents (14–17 years) had significantly higher rates of STDs than older adolescents (18–20 years), but older adolescents had significantly higher levels of STD-associated risk behavior. In controlled analysis, having a casual sex partner was the only variable significantly associated with a positive STD test for younger adolescents, and prior history of STD and higher impulsivity were significantly associated with testing STD positive among older adolescents. **Conclusions** These findings suggest that developmentally tailored STD/HIV prevention interventions are needed for younger and older subgroups of adolescent females to help reduce their risk of infection.

Key words   adolescents; females; sexual behaviors; sexually transmitted diseases.

At a time of life when adolescent females are just beginning their sexual decision-making, they are at greatest risk for contracting sexually transmitted diseases (STD), including HIV [Centers for Disease Control and Prevention (CDC), 2003; Gaydos et al., 1998; Ho, Bierman, Beardsley, Chang, & Burk, 1998; Fleming et al., 1997]. Recently, the CDC reported that one in four girls in the United States, ages 14–19 years, has an STD; and nearly half (48%) of the African-American girls had at least one of the most common STDs [e.g., Chlamydia, gonorrhea, and human papillomavirus (HPV)] (Forhan et al., 2008). Additionally, national case surveillance data indicate the burden of STD/HIV disproportionately affects African-American youth, particularly females, ages 13–24 years (Rangel, Gavin, Reed, Fowler, & Lee, 2006). Thus, developing age appropriate, gender and culturally tailored STD/HIV prevention programs, especially for sexually experienced adolescent African-American females, is a public health imperative.

The terms ''adolescent'' or ''youth'' are often used broadly in the STD/HIV and reproductive health literature, and can include persons 10 through 24 years of age. The World Health Organization (WHO) defines ''adolescents''

as individuals 10–19 years of age, and "youth" as 15–24 years of age. Despite being united by a common label, sexual health studies that treat all young women who fall within this broad age spectrum as a homogenous group fail to capture the enormous amount of physical, cognitive, social, emotional, and behavioral change (often which occur on differing timetables for these separate domains) occurring across this formative developmental stage of life. This can be especially problematic when designing age-appropriate sexual health programs and STD/HIV interventions for young women, as the needs of younger females within the broad age range referred to as "adolescents" may be markedly different, necessitating different content and/or areas of emphasis.

The impact of age related differences on sexual behaviors is of great concern because younger female adolescents are more susceptible to STD acquisition due to biological factors (e.g., cervical ectopy, maturing immune system) (Berman & Hein, 1999). Recently, longitudinal studies exploring age of sexual debut have highlighted the importance of considering the developmental trajectory of sexual risk behavior throughout adolescence (Bauermeister, Zimmerman, Caldwell, Xue, & Gee, 2010; Moilanen, Crockett, Raffaelli, & Jones, 2010). Furthermore, a recent review focused on predictors of age of sexual debut in U.S. adolescents suggests that predictors of sexual risk behavior, in this case, age of sexual debut, may vary across age groups (Zimmer-Gembeck & Helffand, 2008). Although informative, these studies primarily explore factors related to the age of onset of sex and do not explore age differences in other sexual behaviors among already sexually active youth.

Constructs such as partner communication skills, STD/HIV knowledge, condom attitudes, and psychosocial factors, like self-esteem and depression, are commonly the focus of STD/HIV prevention messages for youth because of their theoretical and/or empirical association with various sexual risk-taking behaviors in adolescents (Sales, Milhausen, & DiClemente, 2006). Despite the importance of assessing developmental differences between younger and older adolescents, the majority of prior research that has identified psychosocial factors (e.g., depression), communication skills, knowledge, and attitudes (i.e., the content of STD/HIV prevention intervention messages) predictive of risky sexual behaviors and STD acquisition among African-American adolescent females includes broad age ranges and does not assess or account for age differences (Black, Ricardo, & Stanton, 1997; Smith, 1997; St Lawrence, Brasfield, Jefferson, & Alleyene, 1994). Thus, it is important to examine age differences in sexual behaviors, partner sexual communication skills, STD/HIV

knowledge, psychosocial factors, and STD acquisition within adolescent samples encompassing a large age range in order to: (a) more accurately discern what content should be included in STD/HIV prevention programs for both younger and older adolescents, and (b) identify content/messages that are in need of greater emphasis within STD/HIV prevention programs for younger and older adolescents.

The purpose of the present study was to explore age differences (i.e., younger vs. older adolescents) in sexual behaviors, as well as explore age differences in an array of empirically derived constructs (i.e., prior history of STDs, current laboratory-confirmed STD status, sexual communication skills, STD knowledge, and psychosocial factors) associated with risky sexual behaviors among an adolescent African-American sample of sexually experienced females representing a broad age range; 14–20 years of age. The period of adolescence is often divided into three periods (early, middle, and late adolescence) because of differences in cognitive, emotional, and social abilities at each substage. Although differing age ranges have been proposed for these substages, middle adolescence often spans from ages 14 through 17 years and is a time when most teens show increased independence from parents, decreased time spent with family and more time with peers, a greater ability to sense right or wrong, a growing sense of identity and personality, along with increased interest in developing intimate relationships. However, these intimate relationships are typically short and change frequently. Late adolescence is the time of life from 18 to 20 years when teens are more self-reliant, show a greater ability to delay gratification, greater self-regulation, increased emotional stability, more interest in long-term intimate relationships, and are more capable of expressing feelings in words (American Academy of Child & Adolescent Psychiatry, 2011). For the purposes of this study, we grouped participants into two age groups based upon these developmental substages of adolescence. Specifically, we have defined younger adolescents as those in the middle-adolescence stage (14–17 years old) and older adolescents consisted of those in the late-adolescence stage, who were 18–20 years of age. Based on the aforementioned developmental differences, we hypothesize that the younger adolescent group will differ significantly from the older group in regards to their communication skills, condom-use self-efficacy, STD knowledge, psychosocial factors such as self-esteem and impulsivity, and sexual behaviors. Specifically, we expect that the younger group will have lower communication abilities, condom-use self-efficacy, and STD knowledge, as well as lower rates of risky sexual behavior compared to older adolescents. Furthermore, younger adolescents

will have higher levels of emotional instability (i.e., depressive symptoms) and impulsivity than the older group. Additionally, we hypothesize that because of these differences factors associated with testing positive for an STD might be different for the two age groups.

Methods

Setting

Participants were part of a larger study evaluating a sexual risk reduction intervention for young African-American females. Analyses reported in this study are based on data from the baseline assessment. From June 2005 to June 2007 African-American adolescent females, 14–20 years of age, were recruited from three sexual health clinics in downtown Atlanta, Georgia. A female recruiter approached adolescents in the clinic waiting area, described the study, solicited participation, and assessed eligibility. Eligibility criteria included: self-identifying as African-American, 14–20 years of age, and reporting vaginal intercourse at least once without a condom in the past 6 months. Adolescents who were married, currently pregnant, or attempting to become pregnant were excluded from the study. Adolescents returned to the clinic to complete informed consent procedures and the baseline assessment. Written informed consent was obtained from all adolescents with parental consent waived for those younger than 18 due to the confidential nature of clinic services. Of the eligible adolescents, 94% ($N = 701$) enrolled in the study, completed baseline assessments and were randomized to study conditions. The Emory University Institutional Review Board approved all study protocols.

Participants

The sample comprised 701 African-American participants, with a mean (SD) age of 17.6 (1.7) years. Most (65.3%) were full-time students; the remaining 34.8% had already graduated or were not in school. Many reported currently living in a mother-only headed household (42.5%). Most (79.5%) reported being in a current relationship [mean (SD) length of relationship, 14.4 (14.9) months].

Procedures

Data collection included a 60-min audio computer-assisted self-interview (ACASI) survey. Questions on the baseline survey included demographics, sexual history, and theoretical[1] and/or empirically derived constructs such as attitudes and outcome expectancies, psychosocial variables,

[1]The parent study was guided by Social Cognitive Theory and the Theory of Gender and Power.

HIV/STD knowledge, and peer norms. After completing the ACASI, participants provided a self-collected vaginal swab specimen (see Smith et al., 2001, for acceptability of this procedure). Trained monitors instructed participants on how to collect vaginal fluid using a lifelike model of a vagina and were available at all times if participants had questions or problems. Specimens were delivered to the Emory University Pathology Laboratory and assayed for bacterial pathogens, *Chlamydia trachomatis* and *Neisseria gonorrhoeae* using the BDProbeTec ET *C. trachomatis* and *N. gonorrhoeae* Amplified DNA assay (Becton Dickinson and Company, Sparks, MD, USA) (Van Der Pol et al., 2001). Specimens were also tested for *Trichomonas vaginalis* using a noncommercial real-time polymerase chain reaction assay (Caliendo et al., 2005). Participants with a positive STD test were provided directly observable single-dose antimicrobial treatment, risk-reduction counseling per CDC recommendations, and were encouraged to refer sex partners for treatment. The County Health Department was notified of reportable STDs. Participants were compensated $75 for their participation.

Measures

Age Groups

Current age was assessed by asking, ''How old are you (in years)?'' Participants 14 through 17 years of age were classified as ''younger adolescents'' (2), and those 18 through 20 years of age were classified as ''older adolescents'' (1).

Sociodemographic Measures

Receiving federal assistance for living expenses was assessed by four binary response format questions (Yes/No). Responses were summed to create an index of family aid.

Laboratory Confirmed STD Test

If participants tested positive for one of the three assessed STDs they were considered STD positive.

Sexual Behaviors

The behavioral measures examined in this study were: (a) frequency of vaginal sex during the past 6 months, (b) frequency of condom use during the past 6 months, (c) frequency of unprotected vaginal sex during the past 6 months, (d) number of partners during the past 6 months, (e) prior STD diagnoses, (f) having a current casual sex partner (defined as a person you have sex with who is not your boyfriend), and (g) general age of sex partners. Frequency of vaginal sex in the past 6 months was assessed by asking, ''In the past 6 months, how many times have you had vaginal sex?'' Condom use in the past

6 months was assessed by asking, ''Out of the xx times you've had vaginal sex, in the past 6 months, how many times did you use a condom?'' Frequency of unprotected vaginal sex in the past 6 months was determined by subtracting the number of times a condom was used during penile–vaginal sex in the past 6 months from the number of reported penile–vaginal sexual episodes in the same time period. The survey also included the question ''In the past 6 months, how many guys have you had vaginal sex with?'' History of prior STD diagnosis was measured by a single item, ''Have you ever had a positive STD test result?,'' with responses of no (0) and yes (1). Having a casual sex partner was assessed by asking, ''Do you currently have a casual sex partner(s)?,'' with response options of no (0) or yes (1). Finally, participants were asked about the general age of their sex partners. This was assessed by a single item: ''In general how old are the people you have sex with, are they….?'' Item responses included ''Much younger than you (4 or more years),'' ''Younger than you (2–3 years),'' ''About the same age,'' ''Older than you (2–3 years),'' and ''Much older than you (4 or more years partners)''.

Sexual Communication Ability, Condom Use Self-Efficacy, and STD Knowledge

All of the forth-mentioned measures have been successfully used in prior studies with African-American adolescent females and achieved adequate levels of reliability (DiClemente et al., 2004, 2009).

Fear of Consequences of Condom Negotiation.   Fear of consequences of condom negotiation with a sexual partner was assessed by a 7-item scale using a 5-point Likert rating (Wingood & DiClemente, 1997). Sample consequences were ''hit, push or kick me,'' ''leave me,'' and ''go out with other girls.'' Cronbach's α was .87.

Partner Communication Self-efficacy.   A 6-item scale assessed partner sexual communication self-efficacy using a 4-point Likert rating with responses ranging from *very hard* to *very easy* (Wingood & DiClemente, 1998). Sample items included ''With a sex partner, how hard is it for you to ask how many sex partners he has had?'' and ''With a sex partner, how hard is it for you to ask if he would use a condom?'' Responses were coded so that higher scores indicated greater sexual communication self-efficacy. Cronbach's α was .82.

Partner Communication Frequency.   This 5-item scale assessed adolescents' frequency of communicating with male sex partners (Milhausen et al., 2007). The stem for all items was: ''During the last 6 months, how often have you and your partner discussed….'' Sample items included,

''how to use condom,'' and ''how to prevent STDs.'' Each item required a response based on a 4-point Likert-type scale (''never'' to ''seven or more times''). Higher values indicate more frequent sexual communication. Cronbach's α was .85.

Refusal Self-Efficacy.   This 7-item scale assessed adolescents' ability to refuse sex with a partner (Wingood & DiClemente, 1998). Each item required a response based on a 4-point Likert-type scale: 1 (*Definitely can't say no*) to 4 (*Definitely can say no*). Higher values indicated greater self-efficacy to refuse sex. Cronbach's α was .82.

Parent–Adolescent Communication.   This 5-item scale assessed adolescents' frequency of communicating about sex-related topics with their parents (Sales et al., 2008). The stem for all items was: ''In the last 6 months, how often have you and your parent(s) talked about the following things?'' Sample items were: ''sex,'' and ''protecting yourself from STD.'' Each item required a response based on a 4-point Likert-type scale: 1 (*never*) to 4 (*often*). Higher values indicated more frequent parent–adolescent communication. Cronbach's α was .91.

Condom Use Self-Efficacy.   A 9-item scale assessed participants' confidence in their ability to properly use condoms. Each item required a response on a 5-point Likert-type scale: 1 (*None*) to 5 (*A lot*) (Wingood & DiClemente, 1998). Higher values indicated more difficulty using condoms properly. Cronbach's α was .87.

STD Knowledge.   Knowledge regarding STDs was assessed by an 11-item index (Sikkema et al., 2000). Response options were ''True,'' ''False,'' or ''Don't Know.'' Items that were answered ''Don't Know'' were coded as incorrect. Responses were coded so that higher scores indicated greater knowledge of STD.

Psychosocial Factors Associated With Risky Sexual Behaviors

Depressive Symptomatology.   Depressive symptoms were assessed with the 8-item Center for Epidemiological Studies-Depression scale (Melchior, Huba, Brown, & Reback, 1993; Radloff, 1991). The CES-D assesses the presence of depressive symptoms in the past 7 days. Cronbach's α was .91.

Perceived Interpersonal Stress.   We used 13 items modified from the African-American Women's Stress Scale to measure perceived interpersonal stress (Watts-Jones, 1990). Questions assessed the amount of stress an individual felt in various interpersonal relationships. Higher

scores indicate higher levels of stress. Cronbach's α was .87.

Self-Esteem.   The Rosenberg Self-Esteem Scale, a 10-item scale, measured global self-esteem (Rosenberg, 1979). Possible scores range from 10 to 40, with higher scores indicating higher levels of self-esteem. Cronbach's α was .86.

Impulsivity.   Impulsivity was assessed using Zimmerman's 15-item impulsivity scale (Zimmerman & Donohew, 1996). Possible scores range from 15 to 75, with higher scores indicating higher levels of impulsivity. Sample items include ''I like to do things as soon as I think about them'' and ''I act on the spur of the moment.'' Cronbach's α was .76.

Sexual Sensation Seeking.   Sexual sensation seeking was assessed by a 9-item scale (Spitalnick et al., 2007). Example items include: ''When it comes to sex, I'm willing to try anything,'' and ''Stopping to use a condom during sex takes the fun out of sex.'' Responses were, 1 (strongly disagree) to 4 (strongly agree), with higher scores indicated higher levels of sensation seeking. Cronbach's α was .73.

Locus of Control.   Locus of control was measured by an 8-item index. Each item was measured with a Yes (1) or No (0) response. Responses were coded so that higher scores indicated a more external locus of control.

Data Analysis

Descriptive statistics summarized ages of the groups. In addition, analyses examined differences between groups (younger verses older adolescents) on sociodemographic variables, sexual behaviors, STDs, sexual communication, STD knowledge, and psychosocial factors associated with risky sexual behaviors. Differences were assessed using independent samples t-tests for continuous variables and chi-square analyses for categorical variables. Correlations analyses conducted separately for younger and older adolescent groups explored associations between all study variables and testing positive for an STD. Separate multivariable logistic regressions predicting STD acquisition were conducted for each age group. Each model included variables significantly correlated with testing positive for an STD in the corresponding correlation analyses.

Results
Descriptive Analyses

Age of participants ranged from 14 to 20 years old. The mean (SD) age of the participants was 17.6 (1.7) years.

There were 318 participants in the younger age group (range 14–17 years, $M = 16.08$, $SD = 0.96$), and 383 participants in the older age group (range 18–20 years, $M = 18.93$, $SD = 0.82$). For all participants combined ($N = 701$), 120 (17.1%) tested positive for Chlamydia, 44 (6.3%) tested positive for gonorrhea, and 82 (11.7%) tested positive for trichomoniasis. Furthermore, 152 (21.7%) were positive for one STD, 41 (5.8%) were positive for two STDs, and four (0.6%) tested positive for all three STDs. There were significant age differences in testing positive for Chlamydia and gonorrhea, with the younger age group having more positive tests for each ($\chi^2 = 3.71$, $p = .05$, and $\chi^2 = 4.85$, $p = .03$, respectively), and the younger age group showed a trend toward more positive trichomoniasis tests than the older group ($\chi^2 = 3.39$, $p = .06$).

Group Differences in Study Variables

Age groups were compared in regards to the receipt of family aid. There was a significant difference between the younger and older adolescent groups [t (699) = −3.13 $p = .002$], such that younger adolescents lived in households that received more family aid ($M = 0.96$, SD = 0.96) than older adolescents ($M = 0.73$, SD = 0.98). Laboratory confirmed STD results, prior history of STDs, and several sexual behaviors were compared between the older and younger adolescent groups (Table I). Specifically, younger adolescents were significantly more likely to test positive for an STD, although older adolescents were more likely to report a prior history of STDs, have sex more frequently, and have more unprotected episodes of sex in the past 6 months.

Several aspects of sexual communication with partners, condom use self-efficacy, and STD knowledge were compared between the older and younger adolescent groups (Table II). Younger adolescents had significantly lower partner communication self-efficacy and sexual refusal self-efficacy compared to older adolescents. Although younger adolescents had significantly more discussions about sex with their parents (i.e., parent–adolescent communication), they reported less confidence in their ability to use a condom correctly (i.e., condom use self-efficacy), and had lower levels of STD knowledge when compared to older adolescents.

Additionally, psychosocial variables were compared between the older and younger adolescent groups (Table III). Compared to older adolescents, young adolescents were more impulsive and had more external locus of control, but lower levels of sexual sensation seeking.

Table I. *Differences in Laboratory Confirmed STDs, Prior History of STDs, and Sexual Behaviors Between Younger and Older Adolescents*

STDs and sexual behaviors	Younger adolescents (14–17 years)	Older adolescents (18–20 years)	Test statistic (95% CI)	p-value
Positive laboratory-confirmed STD[a,b]	102 (32.1)	95 (24.8)	4.55 (1.03 to 1.99)	.03
Prior history of STDs[a,c]	154 (51.6)	233 (60.8)	6.07 (0.51 to 0.93)	.01
Frequency of sex (past 6 months)[d,e]	17.13 (21.72)	35.97 (56.56)	6.01 (12.68 to 25.00)	.001
Frequency of UVS (past 6 months)[d,f]	10.02 (18.42)	25.15 (54.34)	5.11 (9.31 to 20.95)	.001
No. of sex partners (past 6 months)[d]	2.05 (3.14)	2.28 (1.86)	1.20 (−0.15 to −0.61)	.23
Has current casual sex partner[a]	107 (33.6)	135 (35.2)	0.20 (0.70 to 1.31)	.66
General age of sex partners[d]	3.73 (0.72)	3.80 (0.84)	1.14 (−0.05 to −0.18)	.26

[a]Frequency (%) presented, test statistic is chi-square.
[d]Mean (SD) presented, test statistic is t-test; sex refers to vaginal sex.
[b]Effect size calculated by $\phi = .08$ and OR $= 1.43$.
[c]Effect size calculated by $\phi = -.09$ and OR $= 0.69$.
[e]Effect size Cohen's $d = .45$
[f]Effect size Cohen's $d = .37$.
UVS = unprotected vaginal sex.

Table II. *Differences in Sexual Communication Ability and STD Knowledge Between Younger and Older Adolescents*

Communication, self-efficacy, STD knowledge	Younger adolescents (14–17 years)	Older adolescents (18–20 years)	Test statistic (95% CI)	p-value
Fear of condom negotiation[a]	8.26 (3.14)	8.25 (3.28)	−0.30 (−0.49 to −0.47)	.98
Partner communication self-efficacy[a,b]	20.25 (3.75)	20.83 (3.40)	2.11 (0.04 to 1.11)	.04
Partner communication frequency[a]	12.11 (4.36)	11.76 (4.28)	−1.08 (−0.99 to −0.29)	.28
Refusal self-efficacy[a,c]	24.29 (3.43)	24.79 (3.35)	1.93 (0.00 to 1.00)	.05
Parent–adolescent communication[a,d]	14.52 (4.67)	12.49 (5.09)	−5.48 (−2.75 to −1.30)	.001
Condom-use self-efficacy[a,e]	17.98 (7.56)	15.76 (6.31)	−4.18 (−3.27 to −1.18)	.001
STD knowledge[a,f]	7.36 (2.37)	8.83 (1.93)	8.83 (1.14 to 1.80)	.001

[a]Mean (SD) presented, test statistic is t-test.
[b]Effect size Cohen's $d = .16$.
[c]Effect size Cohen's $d = .15$.
[d]Effect size Cohen's $d = .42$.
[e]Effect size Cohen's $d = .32$.
[f]Effect size Cohen's $d = .68$.

Multivariable Logistic Regression Predicting STD Acquisition, Conducted Separately by Age Group

Correlations, run separately for younger and older adolescent groups, were conducted among all study variables and STD acquisition to determine factors significantly associated with testing positive for an STD for each age group.[2] For the younger group, only three variables were significantly associated with STD acquisition; prior history of STD ($r = .11$, $p = .04$), having a casual sex partner ($r = .17$, $p = .003$), and having a family who received higher levels of government assistance ($r = .13$, $p = .03$). For the older group, only three variables were significantly associated with STD acquisition; number of sex partners in the past 6 months ($r = .10$, $p = .05$), prior history of STD

[2]The complete set of correlations conducted for each age group can be obtained from the authors by request.

($r = .11$, $p = .03$), and higher levels of impulsivity ($r = .13$, $p = .009$). Factors identified as significant in correlation analyses were entered into a multivariable logistic regression (one for each age group) to determine which were significantly associated with testing positive for an STD after adjusting for the other variables in the model (see Table IV for each model). For younger participants, only having a current casual sex partner was predictive of testing positive for an STD in adjusted analyses. For older participants, those with a prior history of STDs and higher levels of impulsivity were more likely to test positive for an STD.

Discussion

Age differences were observed for current laboratory-confirmed STDs, self-reported history of STDs, and sexual behaviors in this sample of sexually experienced adolescent

Table III. *Differences in Psychosocial Ffactors Associated with Risky Sexual Behaviors Between Younger and Older Adolescents*

Psychosocial factors	Younger adolescents (14–17 years)	Older adolescents (18–20 years)	Test Statistic (95% CI)	p-value
Depressive symtomatology[a]	14.76 (6.50)	14.95 (6.52)	0.38 (−0.77 to 1.16)	.701
Perceived interpersonal stress[a]	28.11 (13.37)	28.61 (13.02)	0.49 (−1.47 to 2.45)	.625
Self-esteem[a]	33.56 (5.08)	34.23 (5.07)	1.73 (−0.09 to 1.42)	.085
Impulsivity[a,b]	39.83 (7.36)	37.78 (7.74)	−3.57 (−3.17 to −.92)	.001
Sexual sensation seeking[a,c]	18.64 (4.08)	19.74 (4.45)	3.38 (0.46 to 1.74)	.001
Locus of control[a,d]	2.59 (1.22)	2.34 (1.31)	−2.61 (−0.44 to −0.06)	.009

[a]Mean (SD) presented, test statistic is *t*-test.
[b]Effect size Cohen's $d = .27$.
[c]Effect size Cohen's $d = .26$.
[d]Effect size Cohen's $d = .20$.

Table IV. *Multivariate Logistic Regression Model Predicting Testing Positive for an STD, Separate for Each Age Group*

Predictors	β	SE	Odds ratio (95% CI)	p
Younger age group				
Has current casual sex partner	0.72	0.25	2.04 (1.25–3.35)	.005
Prior history of STDs	0.43	0.25	1.54 (0.94–2.51)	.085
Receipt of family aid	0.23	0.13	1.27 (0.99–1.62)	.058
Overall χ^2	15.99			.001
Older age group				
Number of sex partners (past 6 months)	0.08	0.06	1.09 (0.96–1.22)	.178
Impulsivity	0.03	0.02	1.04 (1.00–1.07)	.034
Prior history of STDs	0.46	0.18	1.66 (1.00–2.75)	.049
Overall χ^2	12.81			.005

African-American females (ages 14–20 years) seeking services at reproductive health clinics. In accordance with prior findings, older adolescents were more likely to report a prior history of STDs, greater frequency of vaginal sex in the past 6 months, and more unprotected sex in the same time period than younger adolescents (Grunmaum et al., 2002; Moore, Driscoll, & Lindberg, 1998). However, younger adolescents were more likely to test positive for a current STD. This finding suggests that although engaging in relatively lower levels of sexual risk-taking, younger adolescents are at increased risk for contracting STDs. Thus, determining factors that may uniquely place younger and older adolescent African-American females at increased risk for STDs is critical for designing effective STD/HIV prevention programs tailored to meet the needs of each age group.

One explanation for the observed age disparity in STDs is immature reproductive and immune systems in younger adolescents (Berman & Hein, 1999). Many cite cervical ectopy as a plausible reason for increased susceptibility in younger women. Cervical ectopy allows greater exposure of columnar epithelium to the vaginal environment. Columnar epithelium is thought to be more susceptible to sexually transmitted organisms including Chlamydia and HPV than is the squamous epithelium that replaces it with the maturation process. Sexual health and STD/HIV prevention programs should include education on the biology of the developing reproductive and immune systems, and how this places them at risk for contracting STDs. Often adolescents feel invincible, and hold the belief that it is unlikely adverse health events will happen to them (Sales & Irwin, 2009). Therefore, educating adolescent females early about their increased vulnerability to STDs, along with traditional messages on how STDs are contracted and spread, is also important.

Younger adolescents reported significantly less partner communication, lower sex refusal self-efficacy, lower condom use self-efficacy, and less STD knowledge than older adolescents. Although these factors have been identified in the empirical literatures as important for STD/HIV prevention among adolescents, and are included in many STD/HIV prevention programs for adolescent African-American females (Sales et al., 2006), our findings suggest that younger adolescents are especially lacking in these critical domains. Younger adolescents may require more extensive and intensive training in communication and condom use skills to become proficient in using these skills and in order to feel capable of discussing sexual topics, including condom use, with partners and, ultimately, correctly using condoms with their male sex partners. Of importance for prevention programs, younger adolescents reported more frequent discussions with parents about sex than older adolescents. Prior research has found that parent–adolescent communication about sex is protective for young African-American females (Hutchenson, 2002), thus, STD/HIV prevention efforts for younger adolescents may be strengthened by including a parent sexual communication component.

Although the aforementioned factors were not directly predictive of STD acquisition for either age group in multivariable models containing sexual behaviors, they may still be playing a critical but more indirect role through their potential association with the sexual behaviors themselves. For example, for the younger age group, having a casual sex partner was predictive of testing positive for an STD. Perhaps because of their lack of self-efficacy to communicate with male partners, lower STD knowledge, and condom-use self-efficacy, coupled with being in a developmental stage where it is normative to be in frequently changing short-term relationships (with varying levels of commitment), they are more likely to have a casual partner or have multiple sex partners within a short period of time (i.e., serial monogamy) which both increase the likelihood or being exposed to a sexually transmitted pathogen. Future studies employing path analyses, with adequately powered samples of younger and older adolescents should explore the potential indirect path between sexual communication, condom skills, and STD knowledge, subsequent sexual behaviors, and STD acquisition.

Furthermore, psychosocial factors may differentially contribute to adolescent females' prevalence of STDs by age group. Although older adolescents had higher levels of sexual sensation seeking than younger adolescents, we observed that the younger adolescents were more impulsive than the older adolescents. This is not surprising given recent neurocognitive findings. Advances in brain imaging science have allowed researchers to examine the brain across development and while engaged in problem solving, a key component of risk-taking, including sexual risk-taking. Neuroimaging studies have revealed that decision making in adult brains is composed of two networks: a highly interconnected cognitive–control network that biases decisions in favor of rational outcomes and a socioemotional network that biases decision making toward reward-based demands (Chein, 2008). The cognitive–control network can regulate the behavior of the socioemotional network, allowing for people to make rational, utilitarian decisions (i.e., less impulsive decisions). However, neither of these systems is fully matured during adolescence, and each one develops along different timetables (Giedd, 2008). In a recent review on the social neuroscience of adolescent risk-taking, Steinberg (2008) suggests that because of these differing timetables of brain development, mid-adolescence (the ages included in our "young adolescent group") is a time for heightened risk and vulnerability.

Interestingly, impulsivity was a significant predictor of STD acquisition for the older adolescent group, and was not associated with STDs among the younger adolescents. Perhaps highly impulsive older adolescents have not yet developed or are lacking adequate control or self-regulation abilities and therefore are more likely to engage in sexual risk behaviors (such as unprotected sex or having greater numbers of male sex partners) increasing their exposure to STDs. Thus, STD/HIV prevention programs for African-American females may benefit from emphasizing the role of impulsivity and consideration of potential consequences in sexual decision-making. This, coupled with teaching young women how to identify, and strategies to avoid situations where they are likely to behave impulsively (e.g., alone with boyfriend), could be especially beneficial for older adolescents. Additionally, discussions about personal control in sexual activities and inclusion of activities to encourage adolescents to feel in control of their sexual decision-making may be critical, and doing so would likely increase self-efficacy to both communicate with partners about sex and use condoms.

This study is not without limitations. First, the sample consisted of adolescents who were seeking services at sexual health clinics, and therefore may not generalize to individuals who are not accessing similar clinics, or to individuals who did not meet the eligibility criteria for the parent study. Additionally, given our definition of "younger" and "older" adolescents, our findings may not be comparable to other studies defining age groups differently. Also, the magnitude of effects observed in this study was generally small or very small. However, despite being small, it is not well known what constitutes clinically meaningful differences for many of the measured constructs in this study, thus even very small effects could actually be important in regards to STD/HIV outcomes. Finally, it is important to acknowledge that age is only a proxy for developmental level and it does not necessarily reflect the actual biological, cognitive, social, and emotional developmental level of individuals.

Conclusion

The examination of age differences in the sexual behaviors and correlates of risky sexual behaviors among young, sexually experienced African-American females has significant implications for the design of sexual health and STD/HIV prevention programs for this population. Given that younger adolescent females had higher rates of STDs than their older, more sexually risky counterparts, and that different behavioral and psychosocial factors were significantly associated with testing positive for an STD for the two age groups, future studies may benefit from considering age differences in key sexual health variables often targeted in STD/HIV prevention programs. Additionally, STD/HIV

programs may better equip adolescent females with the necessary skills to protect their sexual health by tailoring prevention messages to subgroups of adolescents based on their stage of adolescence as the prevention needs of these groups may vary remarkably across the protracted adolescent period.

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