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Trends in Long-Acting Reversible Contraceptive (LARC) Use, LARC Use Predictors, and Dual-Method Use among a National Sample of College Women

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Trends in Long-Acting Reversible Contraceptive (LARC) Use, LARC Use Predictors, and Dual-Method Use among a National Sample of College Women

Abstract

5 **Objective:** Assess long-acting reversible contraceptive (LARC) and other contraceptive use trends, identify LARC use predictors, and examine dual method use. **Participants:** Females in the American College Health Association-National College Health Assessment (ACHA-NCHA) II, aged 18-24 years, who reported having vaginal sex (N=37,899). **Methods:** Secondary analyses of Fall 2011-2014 ACHA-NCHA II data. **Results:** Statistically significant increases in
10 LARC usage and, specifically, implant usage, were found. Characteristics associated with LARC use included age; race/ethnicity; relationship status; and school type. Students reporting LARC use had lower odds of condom usage compared with non-LARC hormonal method users.

Conclusion: This analysis of LARC predictors and dual LARC/condom use has implications for research and health promotion efforts. Findings suggest that college health services are well
15 positioned to meet the sexual and reproductive health needs of diverse populations of students. College health professionals should elicit students' individual and/or relationship priorities to tailor messaging/services offered for pregnancy/STI prevention.

Keywords: Contraception; Contraceptive Agents, Female; Intrauterine Devices; Condoms; Young Adult

Unintended pregnancy is a major public health priority in the United States.¹

Approximately half of all pregnancies among women of reproductive age are considered unintended, a figure that is substantially higher than rates reported by other highly industrialized Western nations.² Disparities in rates are persistent, and have been reported by income, socioeconomic status, and relationship status, disproportionately affecting low-income women and those from racial and/or ethnic minority groups.^{2,3} Additionally, college-aged women—those between the ages of 18 and 24 years—experience some of the highest rates of unintended pregnancy (59-76% in 2011) among all age groups, reflecting unique environmental, developmental, and social factors that may shape reproductive health decisions for young adults.^{2,4-6}

Unintended pregnancies are attributed to both non-use of contraception and inconsistent or incorrect use of methods.^{4,7} Factors associated with inconsistent or nonuse of contraception are multidimensional and intersecting, involving individual attributes, partner dynamics, social networks, and features of the health system, including: infrequent sexual activity; low knowledge about and negative attitudes toward contraception; concerns about contraceptive side effects; fear about parents finding their contraceptive method; depression; desiring a pregnancy or being currently pregnant; cohabitating with a sexual partner; being married; lack of insurance coverage; and the cost of various methods.^{5,8-12} Moreover, some studies have shown differences in contraceptive uptake and use by racial or ethnic group, an association that remains poorly understood but is likely a proxy measure for broader social phenomena, such as disparities in access, structural vulnerability, social deprivation, and variation in socio-cultural attitudes towards contraception.^{5,13}

On a national scale, relatively little has been studied about the contraceptive behaviors of college-aged women or of the particular aspects of college settings that may influence reproductive health decision-making. Recent data from the American College Health Association (ACHA) demonstrate that, while 47% of college students reported having had vaginal sex in the 30 days prior to being surveyed, approximately half (52%) used a method of contraception at last vaginal sex.¹⁴ Of those who reported contraceptive use, male condoms and oral contraceptive pills (OCPs) represented the most commonly used reversible methods, a trend observed more broadly across other samples of sexually active women of reproductive age.^{15,16}

In recent years, long-acting reversible contraception (LARC)—intrauterine devices (IUDs) and the hormonal implant—have been advocated by leading health organizations such as the American Congress of Obstetricians and Gynecologists and American Academy of Pediatrics as “first-line” contraceptive options for most women, including adolescents and nulliparous women.^{17,18} IUDs and implants are highly effective, last from 3 to 10 years, and do not require daily user attention.^{18,19} Moreover, they carry low failure rates associated with typical use and high rates of user satisfaction.^{12,19,20}

Due in part to professional medical organization endorsements, policy level changes in contraceptive coverage and provider reimbursement, improvements in provider training, and direct-to-consumer advertisements,²¹ LARC use has increased among all groups of reproductive-age women in the U.S. over the past decade. In a recent analysis of data from 2 cycles of the National Survey of Family Growth (NSFG), LARC use increased from 8.5% in 2009 to 11.6% in 2012 among all women using contraception, with the largest increases observed among women with private insurance, nulliparous women, Latina women, and women with no more than one sexual partner within the previous year.²² Within the broader context of contraceptive method

uptake, however, OCPs, sterilization, and male condoms remain the most commonly used methods.¹⁵

Research examining characteristics associated with LARC use have primarily relied on data collected through the NSFG to identify a range of socio-demographic factors and

5 reproductive characteristics. In studies conducted with all women of reproductive age (15-44 years), becoming sexually active before age 18, being foreign born, having at least one previous birth, and a history of discontinuing non-LARC hormonal methods have been reported as correlates of LARC use.^{4,22,23} Among young women specifically, Dempsey et al.⁸ found that

LARC use was associated with earlier first sex, in addition to older age and having previous
10 knowledge of LARC methods. Whitaker et al.'s study,²⁴ examining correlates of LARC use among adolescent and young women, also found that parity was strongly associated with IUD use, as well as cohabitating, being married, and identifying as Latina. In several studies among adult and young adult populations, Black women have been identified as less likely to report LARC use, compared with White women and Latina women, and in 2 studies, educational
15 attainment of respondents' mothers was found to be positively associated with IUD use.^{15,23,25}

While LARC have been touted for their potential to reduce rates of unintended pregnancy,³ concerns about their impact on the use of condoms and subsequent impacts on sexually transmitted infection (STI) and HIV rates have also been raised in the literature, particularly in young adult populations.²⁶⁻²⁸ Dual method use, defined as the use of a barrier
20 method for STI prevention and a hormonal/LARC method for pregnancy prevention, has relatively low uptake in the U.S.,²⁹ with reported rates ranging from 12% to 23% among sexually active young women.³⁰ Moreover, in several studies, self-reported dual method use among LARC users is statistically significantly lower than among women using non-LARC hormonal

methods.^{26,31} For example, Steiner et al.'s analysis of Youth Risk Behavior Survey (YRBS) data²⁶ found that LARC users were 60% less likely to report condom use at last sex as compared with OCP users.

Previous national studies examining trends in LARC use have primarily employed data from the NSFG and YRBS. However, enrollment in degree-granting postsecondary (2- or 4-year) institutions is at its highest point in U.S. history—enrollment increased 20% from 2003 to 2013, and 57% of college students in 2013 were female.³² Moreover, as 40% of 18- to 24-year-olds in the U.S. are enrolled in such an institution,³² and since these women experience some of the highest rates of unintended pregnancy, it is critical that attention is paid to understanding contraceptive trends among this population. Accordingly, this study analyzed data from the American College Health Association-National College Health Assessment II (ACHA-NCHA II) to assess trends in LARC and other contraceptive use, identify predictors of LARC use in a sample of college women, and examine the relationship between hormonal/LARC method use and condom use among sexually active female U.S. college students.

Methods

Participants and Procedures

The ACHA-NCHA II is conducted annually in both the fall and spring semesters across public and private colleges and universities in the U.S.³³ The survey assesses a variety of health outcomes and behaviors relevant to college-aged populations. While colleges and universities self-select to participate, students or classrooms are randomly selected within each institution. Evidence in support of the reliability and validity of data collected via the ACHA-NCHA are reported elsewhere.³⁴

Data from 4 ACHA-NCHA II survey periods, which included 186 post-secondary institutional data sets—44 campuses in Fall 2011, 51 in Fall 2012, 57 in Fall 2013, and 34 in Fall 2014—representing each region of the U.S., were utilized for the current study. The analytic sample (N = 37,899) included female students, aged 18-24 years, who reported having vaginal sex—9,313 respondents in Fall 2011, 9,631 in Fall 2012, 10,437 in Fall 2013, and 8,518 in Fall 2014. Students identifying as heterosexual, gay/lesbian, bisexual, and unsure were included (as long as they reported having had vaginal sex). The overall response proportions for students was 24% in Fall 2011, 20% in Fall 2012 and 2013, and 17% in Fall 2014.

Measures

Sexual activity and contraceptive use. Sexual activity was assessed with one question: Within the last 30 days, did you have vaginal intercourse? Respondents answering “No, have done this sexual activity in the past but not in the last 30 days” or “Yes” were categorized into a binary variable (yes vs. no) indicating at least one instance of vaginal sex. Contraceptive use was measured with single item indicators: Please indicate whether or not you or your partner used each of the following methods of birth control to prevent pregnancy the last time you had vaginal intercourse. Methods included “birth control pills (monthly or extended cycle)” (OCPs), “birth control shots,” “birth control implants,” “birth control patch,” “vaginal ring,” “intrauterine device (IUD),” “male condom,” and “female condom” (yes vs. no). A *LARC* variable was created for respondents indicating they used either “birth control implants” or an “intrauterine device (IUD)” at last sex. A *condom* variable was created for respondents indicating they used either a “male condom” or “female condom” at last sex. A *patch, shot, ring* variable was created for respondents indicating they used either “birth control shots,” a “birth control patch,” or the

“vaginal ring” at last sex. A single hormonal/LARC contraceptive method variable was then created to delineate *birth control pill* users, *patch*, *shot*, *ring* users, and *LARC* users.

Demographic and other characteristics. Individual-level variables included age (in years), year in school (e.g., 1st year undergraduate, graduate/professional), enrollment status (e.g., full-time), international student status (yes vs. no), sorority member (yes vs. no), varsity athlete (yes vs. no), current residence (campus residence hall; other campus housing; parent/guardian’s home; other off-campus housing; or other), primary source of health insurance, relationship status (not in a relationship; in a relationship but not living together; or in a relationship and living together), and past 12-month pregnancy history (none; unintentional pregnancy, intentional pregnancy, don’t know), assessed directly from respondents.

Race/ethnicity was assessed with the question: How do you usually describe yourself? (Mark all that apply): White; Black; Latino/a; Asian or Pacific Islander; American Indian, Alaskan Native, or Native Hawaiian; Biracial or Multiracial; and Other. From these “mark all that apply” responses, we created a single race variable with the following racial/ethnic categories: White only; Black only; Latina only; Asian or Pacific Islander only; American Indian, Alaskan Native, or Native Hawaiian only; Biracial or Multiracial; and Other. Campus-level variables included in the dataset were 2-year vs. 4-or-more-year college/university, public vs. private college/university, religious vs. non-religious school, campus size (e.g., less than 2,500 students, 2,500-4,999 students), campus setting (e.g., very large city [population at or over 500,000], large city [population 250,000-499,999]), and U.S. geographical area (region; i.e., Northeast, Midwest, South, West).

Analysis

Basic frequencies and descriptive statistics (i.e., means, standard deviations, percentages) were calculated using IBM® SPSS® Statistics (Release 22.0.0.0), and additional analyses were conducted as outlined below. To assess trends in LARC and other hormonal contraceptive use, 6 cross-tabulations with chi-square were conducted, assessing usage of OCPs, condoms, patches, 5 shots, and rings, IUDs, implants, and IUDs and implants combined (LARC) across 4 ACHA-NCHA II survey periods. We also ran these same cross-tabulations for each of the 5 racial/ethnic groups (e.g., White, Black), for an additional 30 tests. To help aid in result interpretation, we report Cramer's V, a chi-square based measure of association (used with nominal data). To examine the predictors of LARC use, 2 binary logistic regression models were conducted: one 10 model examining the combined sample of females, aged 18-24 years, who reported having vaginal sex in the last year and one model examining only respondents from the most recent survey period (Fall 2014). Lastly, to assess the relationship between hormonal/LARC method use and condom use (i.e., dual method use), 2 binary logistic regression models were conducted, among respondents from the most recent survey period (Fall 2014). Following the analysis plan 15 employed by Steiner and colleagues,²⁶ we ran the same models twice to make comparisons with 2 different reference groups: 1) birth control pill users, and 2) LARC users. Both models were adjusted for self-reported age and race/ethnicity. Adjusted odds ratios (AORs) and their corresponding 99% confidence intervals (CIs) were reported. To control for multiple comparisons, a Bonferroni correction was applied (0.05/40), setting the statistical significance 20 level at 0.001. Because this analysis involved de-identified, publicly available data, it does not constitute human subjects research as defined at 45 CFR 46.102 and, thus, it did not require IRB review.

Results

Demographic and other characteristics of female respondents, combined and in each of the 4 ACHA-NCHA II survey periods, are displayed in Table 1. In the combined sample, respondents averaged 20.2 years of age ($SD = 1.70$), and were evenly distributed in terms of year in school (20-23% per year), save for the composition of undergraduate students in their fifth year (5.5%) and graduate or professional students (7.1%). Approximately three-quarters of the combined sample (75.7%) identified as White, while 12% identified as Latino, 8% as Asian or Pacific Islander, 7% as Black or African American, and 2% as American Indian, Alaskan Native, or Native Hawaiian. Most students were enrolled full-time (95.6%), and reported living in a campus residence hall (38%) or off-campus housing (not with parents; 36.4%). Fewer respondents were members of a sorority (15.1%), varsity athletes (8.6%), and international students (6.5%). Very few (4.9%) respondents were without health insurance. Almost half of respondents (48.9%) reported being in a relationship, but not living together. The majority of respondents (97.3%) did not experience a pregnancy in the past 12 months.

- Insert Table 1 here -

15 *Trends in LARC and other hormonal contraceptive use*

Across each of the 4 ACHA-NCHA II survey periods, OCPs and male or female condoms were the most commonly used contraceptive methods (Figure 1). In Fall 2011, 65% of sexually active females, aged 18-24 years, reported using OCPs at last vaginal sex; 64% reported using condoms. By Fall 2014, however, the percentage reporting condom use at last vaginal sex (66.5%) surpassed the percentage reporting OCP use (62.3%). The increase in reported condom use at last vaginal sex, across the 4 survey periods, was not statistically significant ($\chi^2 [3, N = 31,041] = 12.02, p=.007$, Cramer's $V = .02$), after applying the Bonferroni correction; the

downward trend for OCP use (χ^2 [3, N = 31,201] = 11.61, $p=.009$, Cramer's V = .02) was also not statistically significant.

- Insert Figure 1 here -

Across each of the 4 survey periods, a shift occurred in sexually active females' reported use of patches, shots, or rings, as well as LARC (Figure 2). In Fall 2011, 8% of respondents reported using patches, shots, or rings at last vaginal sex, while 6% reported using LARC (of which 4.4% were IUD users). By Fall 2014, however, the percentage of sexually active females reporting LARC use at last vaginal sex (7.9%) surpassed the percentage reporting use of patches, shots, or rings (6.9%). The increase in reported LARC use at last vaginal sex, across the 4 survey periods, was statistically significant (χ^2 [3, N = 30,663] = 43.67, $p<.001$, Cramer's V = .04), but the downward trend for use of patches, shots, or rings (χ^2 [3, N = 30,631] = 8.09, $p<.05$, Cramer's V = .02) was not after applying the Bonferroni correction. The increase in LARC appears to be driven by a substantial increase among Black students, from 4% in Fall 2011 to 12% in Fall 2014 (χ^2 [3, N = 1,827] = 16.98, $p=.001$, Cramer's V = .10), and a smaller but statistically significant increase in use among White students, from 6% in Fall 2011 to 8% in Fall 2014 (χ^2 [3, N = 24,302] = 32.79, $p<.001$, Cramer's V = .04). The increase in LARC use was driven primarily by increases in reported use of implants (χ^2 [3, N = 30,686] = 85.63, $p<.001$, Cramer's V = .05), rather than IUDs (χ^2 [3, N = 30,708] = 6.73, $p=.08$, Cramer's V = .02) and, again, the upward trend appears to be due to a substantial increase of reported implant use among Black students, from 2% in Fall 2011 to 9% in Fall 2014 (χ^2 [3, N = 1,827] = 23.71, $p<.001$, Cramer's V = .11), and a smaller but statistically significant increase in use among White students, from 2% in Fall 2011 to 3% in Fall 2014 (χ^2 [3, N = 24,318] = 52.11, $p<.001$, Cramer's V = .05).

- Insert Figure 2 here -

Predictors of LARC use

A binary logistic regression analysis was conducted to determine the predictors of LARC use among females, aged 18-24 years, who reported having vaginal sex (responding at any of the 4 survey periods; Table 2). Older females; Blacks; American Indians, Alaska Natives, or Native Hawaiians; those in a relationship and living together; and those attending 2-year schools had greater odds of reporting LARC use at last vaginal sex (compared with younger females; Whites; those not in a relationship; and those attending 4-year schools). Females on campuses located in the Midwest, South, and Western parts of the country had greater odds of LARC use (compared with females attending Northeast campuses).

- Insert Table 2 here -

Association between hormonal/LARC method use and condom use

Two final binary logistic regression models were conducted to predict whether hormonal/LARC method use is related to condom use (i.e., dual method use), among respondents from the most recent survey period (Fall 2014). The same models were run twice to make comparisons with 2 different reference groups: 1) OCP users, and 2) LARC users (Table 3). Just under two-thirds (60.4%) of OCP users, half (52.2%) of patch, shot, or ring users, and 40% of LARC users reported condom usage at last vaginal sex. While controlling for demographic factors, compared with females who reported using OCPs at last sex, LARC-using females had lower odds of condom use. Compared with LARC-using females, females who reported using patches, shots, or rings had greater odds of condom use at last sex.

- Insert Table 3 here -

Comment

In this analysis across 4 survey years of the ACHA-NCHA II, we observed several important shifts in the proportion of sexually active female students using various contraceptive methods. While OCPs and condoms remained the most commonly used methods in each survey year, there was an increase in reported condom use at last vaginal sex and a concurrent decline in OCP use (although these trends were not statistically significant after applying the Bonferroni correction). Additionally, while patch, shot, or ring users surpassed LARC users in the Fall of 2011, by 2014, greater use of LARC was reported than these other non-daily hormonal methods. This shift towards greater LARC use as compared with patch, shot, or ring use has been found in other recent large national research among all women of reproductive age.¹⁵

Additionally, our analysis found that hormonal implants are primarily driving the increase of LARC, rather than IUDs, across the 4 survey cycles. This finding diverges with studies conducted using data from the NSFG. For example, Daniels et al.¹⁵ reported that, since 2002, IUDs accounted for the largest proportion of LARC use among their sample, and although implant use tripled between 2006-2010 and 2011-2013, they were still only used by 0.8% of respondents. Finer, Jerman, and Kavanaugh³⁵ also found that IUDs were largely responsible for increases in LARC use in their analysis of 2002, 2007, and 2009 cycles of NSFG data.

A notable finding in our study is that increases in overall implant use were largely driven by Black college students. While IUD use among Black women fluctuated between 3% and 6% over the 4 survey cycles, implant use steadily increased each year, from 2% in Fall 2011 to 9% in Fall 2014. By contrast, findings from the NSFG conducted in 2011-2013 demonstrated that IUD and implant use among Black women were 7% and 2%, respectively.¹⁵ However, in Kavanaugh et al.'s study²² of population-level changes in LARC method use, authors found that implant users tended to be younger, low-income, and Black. Data from the ACHA-NCHA II do not allow

us to determine the causes of such trends; however, it may be potentially due to a number of intersecting factors, including patient-level preferences for various methods, availability of implants in settings where college students access reproductive health services, availability and ease of provider training in implant insertion relative to IUD insertion, and provider bias in contraceptive method recommendations. Several studies have found that family planning recommendations and receipt of methods differ based on both provider characteristics (age, type of practice, specialty) and patient characteristics such as race/ethnicity and socioeconomic status (SES).³⁶ For example, Dehlendorf et al.'s study using standardized patients to examine the effects of race/ethnicity and SES on recommendations for IUDs found that providers were more likely to recommend this method for low-income women of color than low-income White women.³⁶ Alternatively, another study³⁷ found that White women were more likely than Black, Latina, or Asian women to receive the pill, ring, or IUD, demonstrating that the interplay between race/ethnicity and SES is nuanced and complex. The particular intersection of race/ethnicity, educational attainment, and social class among college students and its influence on contraceptive decision-making warrants further study.

Overall, our analysis found that Black and American Indian, Alaskan Native, and Native Hawaiian women were more likely than White women to report using LARC at last sex, an important finding that is both supported by and contrasts with the available literature. Kavanaugh et al.,²² for example, found that LARC use was increasing among all groups of women and did not appear to be concentrated in any one population in their analysis of NSFG data. Other researchers, however, point out that LARC prevalence has increased dramatically among White women, a group that has historically used LARC at the lowest rates of all racial/ethnic groups.³⁸ Previous studies examining racial/ethnic differences in method selection have found that Black,

Latina, and Asian Pacific Islander women are more likely to prefer methods that are user-controlled, allow for a quick return to fertility upon discontinuation, and do not interfere with menstrual cycles, features that are more associated with lower efficacy methods.^{39,40} Reasons for such preferences include concerns about safety and side effects associated with hormonal

5 contraception among these groups, at least in part owing to the legacy of forced sterilization and coercive family planning policies targeting communities of color.^{37,39,40} While we are not able to ascertain the circumstances surrounding respondents' decisions to use particular methods in this study, it is important to consider these trends within this historical context. Additionally,

10 evidence of inequities in family planning care between more and less socially and economically disadvantaged groups have been observed, with some research suggesting that women of color and those of lower socio-economic status may experience pressure from physicians to initiate contraception and/or limit their family size.⁴⁰

After controlling for demographic factors, being in a relationship and being older emerged in our study as the strongest predictors of LARC use, echoing findings from earlier

15 studies examining predictors of LARC use among adolescent and young women.^{8,24} Additionally, of particular relevance for college health, sexually active females attending 2-year schools were more likely to report LARC use than those attending 4-year schools, perhaps reflecting unique characteristics of community, technical, and/or junior college settings and the students who attend them. In 2013, White students comprised more than 59% of 4-year college

20 undergraduate enrollment, whereas Black and Latino students made up 13% and 12%, respectively.³² Among 2-year colleges, however, White students made up 52% of their total enrollment, compared with 15% and 21% for Black and Latino students, respectively.³² Lastly,

sexually active females on campuses located in the Midwest, South, and West were also more likely to report LARC use, a finding that warrants additional research.

In our study sample, reported rates of dual method use for both LARC and non-LARC users were higher than previously reported national rates (40%-60% compared with 12%-23%).

5 Female college students reporting LARC use at last vaginal sex had lower odds of condom usage, compared with non-LARC hormonal method users, a finding that has been reported elsewhere.^{26,31} Previous research has demonstrated that dual method use, regardless of hormonal/LARC method, declines as relationship duration and levels of intimacy increase, and among cohabitating or married couples.³⁰ As LARC users in our sample were more likely to be
10 older and in cohabitating relationships, this finding affirms those from earlier studies and may reflect the fact that LARC use tends to occur more often in relationships that are more enduring and intimate.

A prominent and as yet untested hypothesis underlying research examining lower rates of condom use among LARC users as compared with non-LARC hormonal method users is that
15 decreased condom use among LARC users will lead to increased rates of STIs and HIV, particularly among adolescent and young adult populations. As Rattray et al.⁴¹ pointed out, few studies actually evaluate biological STI risk, and instead rely on self-reported data. In their randomized clinical trial with over 400 women, Rattray et al.⁴¹ assessed whether uptake of the hormonal implant reduced condom use through the measurement of a biomarker of recent semen
20 exposure. The authors found that unprotected sex, as reflected by the presence of semen, was not higher among women who received the implant as compared with those who did not in the 3-month study period. While it is critical for messages about sexual risk to include strategies addressing both pregnancy and STI prevention that are tailored to individuals and couples, more

research is needed to understand the dual method use decision-making processes negotiated within a variety of relationships. In addition, more methodologically rigorous studies demonstrating the biological risk posed by a reduction in condom use among hormonal method and LARC users are needed. Lastly, it is important to note that dual method use, as currently defined in the literature, does not include withdrawal, despite the fact that it is a widely used method of pregnancy prevention, particularly among young adults. In the combined sample (all 4 waves) from the most recent ACHA-NCHA II, approximately one-third of sexually active females reported using withdrawal at last sex. Expanding the definition of dual method use to consider withdrawal alongside hormonal/LARC methods, in addition to STI risk reduction strategies such as condoms, HPV vaccines, and pre- and post-exposure prophylaxis, may represent an important future area of study.

Our study findings have several practical implications for college health. First, although we are unable to determine where college students in the study sample obtained contraception, the percent of those using a method suggests that the availability of full spectrum contraceptive services in college health settings would be beneficial to accommodate the diverse contraceptive needs and preferences of students. Accordingly, the use of campus-wide social marketing and media campaigns about contraceptive services can be used to promote accurate information about available options. Given the increased interest in LARC methods among college-age women, clinical training for providers on how to insert and remove devices may also be needed. In addition, it may be necessary to establish robust referral networks to community-based healthcare and clinical protocols that ensure the preservation of patient confidentiality in instances where students are on their parents' health insurance.

Moreover, clinicians and health promotion educators on college campuses should be familiar with how to adequately counsel students about the range of contraceptive methods, even if they are not available onsite, in order to provide recommendations and referrals. While it is unclear from this study why trends in LARC and other methods were observed, previous research has demonstrated the importance of providing sexual health information in ways that are patient-centered and respect autonomy.^{42,43} Moreover, although LARC users were less likely to use condoms than users of other hormonal contraceptive methods, individuals have different needs with regard to pregnancy and STI prevention, which often evolve over the course of sexual partnership(s). Thus, we recommend that college health professionals elicit students' priorities with regard to both contraception and STI prevention in order to tailor messages and services offered. For example, while campus-based STI risk reduction messaging should continue to include condom usage, as it is the one barrier method helpful for reducing disease transmission, emphasizing condom use promotion messages may be particularly useful for sexually active students who are not in mutually monogamous relationships and those who are in non-monogamous relationships. Lastly, while relationship status, age, and race/ethnicity were predictors of LARC use in this study, these methods are appropriate and highly effective options to prevent pregnancy for virtually all women who desire them, and counseling should be inclusive of this fact.

Limitations

This research is not devoid of limitations. Although the Fall ACHA-NCHA II includes 186 institutional data sets—44 campuses in Fall 2011, 51 in Fall 2012, 57 in Fall 2013, and 34 in Fall 2014—reflecting responses from 37,899 participants in the current analysis, our findings may not be fully generalizable to all college students in the U.S. Because these analyses were

conducted with students' survey data, self-report bias also remains a concern. Additionally, since the sample was not randomly drawn from the population of U.S. postsecondary institutions, self-selection of institutions into the ACHA-NCHA II also remains a concern. Further, the low response proportion may be a limitation, as well as the fact our sample over-represents Whites and under-represents Latina and Black students (compared with national college enrollment statistics). However, previous formative research indicates that the ACHA-NCHA is somewhat comparable to other large national health risk behavior surveys.³⁴ Also, due to the manner in which the vaginal intercourse question was asked, we were unable to determine whether respondents exclusively reported sex that was consensual. Regarding our analysis of contraceptive use trends, while we found statistically significant increases in reported LARC and implant use, the effect size was relatively small (Cramer's $V = .04$ and $.05$, respectively). This may be due in part to the large sample size in this analysis. Lastly, the ACHA-NCHA II does not collect data on socioeconomic status or income; therefore, we were unable to examine the relationship between these factors, other demographic characteristics, and contraceptive use.

Future quantitative and qualitative research is needed to understand the landscape of contraceptive decision-making and dual method use among a diverse sample of U.S. college students, including individual, relationship, provider, and policy-level factors that may shape them. More broadly, research that examines the availability and utilization of contraceptive services on college campuses of any type is lacking, and without knowing what students have access to and where they obtain contraception limits our ability to understand trends in method selection and uptake. In particular, studies examining characteristics of the college setting, such as geographic location, size, and type of degree-seeking institution, and their effects on the

delivery and receipt of contraceptive services, would also make important contributions to this body of research.

Additionally, given the important concerns raised by several scholars about the potential for reproductive coercion in the context of LARC promotion,^{44–46} research should continue to monitor contraceptive use among all racial/ethnic and SES groups and explore explanations for variation in method uptake trends. Lastly, while increasing the availability of highly effective methods is an important clinical and public health priority, efforts must be made to ensure that contraceptive counseling is delivered in patient-centered ways that respect women’s autonomy, and that options for removal of LARC devices upon patient request are accessible.

Conclusions

This study employed data from a national survey to assess trends in LARC and other contraceptive use, identify predictors of LARC use, and examine the relationship between hormonal/LARC method use and condom use among sexually active female U.S. college students. In this large national sample, we found an increase over a 4-year period in reported LARC use at last vaginal sex. Moreover, increases in LARC uptake were predominantly driven by implant use among Black students. We also found that students reporting LARC use at last vaginal sex had lower odds of condom usage, compared with non-LARC hormonal method users. Such findings, on the surface, may cause concern about the potential for increased STIs among LARC users; however, we urge caution in drawing this conclusion from our findings. Scant research exists connecting LARC use with actual increases in biological STI results. Additionally, as LARC users in our study were more likely to cohabitate and be older, decreased condom use may suggest a prioritization of pregnancy over STI prevention in these relationships. For these students, LARC usage may facilitate women maintaining positive sexual relationships

with little worry of an unintended pregnancy that might compromise their academic and other life goals. We recommend that college health services routinely include access to a full range of methods onsite or by referral and that staff elicit sexually active students' individual and/or relationship priorities with regard to contraception and STI prevention in order to provide effective and tailored counseling and services.

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TABLE 1. Demographic and other characteristics of female respondents, aged 18-24 years, who reported having vaginal sex in the last year—ACHA-NCHA Fall 2011, Fall 2012, Fall 2013, and Fall 2014

	Fall 2011	Fall 2012	Fall 2013	Fall 2014	Total
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Age (in years) (<i>N</i> = 37,899)	20.2 (1.69)	20.2 (1.68)	20.3 (1.72)	20.2 (1.71)	20.2 (1.70)
	% (n)	% (n)	% (n)	% (n)	% (n)
Year in school (<i>N</i> = 37,561)*					
1st year UG	23.9% (2206)	22.5% (2144)	23.3% (2402)	21.3% (1806)	22.8% (8558)
2nd year UG	19.9 (1839)	21.5 (2048)	19.9 (2054)	20.9 (1772)	20.5 (7713)
3rd year UG	23.3 (2152)	23.9 (2276)	23.0 (2365)	22.8 (1938)	23.2 (8731)
4th year UG	20.1 (1855)	20.2 (1926)	20.3 (2090)	21.1 (1786)	20.4 (7657)
5th year or more UG	5.5 (506)	5.9 (558)	5.6 (574)	5.1 (435)	5.5 (2073)
Graduate/Professional	6.8 (628)	5.7 (543)	7.6 (786)	8.5 (723)	7.1 (2680)
Enrolled full-time (<i>N</i> = 37,638)	94.5 (8754)	95.9 (9147)	95.5 (9878)	96.7 (8214)	95.6 (35993)
Race/ethnicity (<i>N</i> = 37,899)*					
White	80.5 (7493)	75.9 (7307)	73.7 (7691)	72.7 (6190)	75.7 (28681)
Black/African American	4.9 (457)	6.6 (640)	8.6 (900)	8.7 (738)	7.2 (2735)
Hispanic or Latina	11.1 (1034)	11.9 (1149)	14.1 (1471)	11.6 (987)	12.2 (4641)
Asian or Pacific Islander	6.0 (556)	8.0 (769)	7.0 (9711)	10.3 (874)	7.7 (2925)
AI, AN, or NH	2.0 (186)	1.7 (167)	1.6 (171)	2.9 (248)	2.0 (772)
International student (<i>N</i> = 37,542)	6.6 (609)	7.0 (666)	7.4 (759)	4.7 (401)	6.5 (2435)
Sorority member (<i>N</i> = 37,534)	13.2 (1218)	15.5 (1476)	16.1 (1658)	15.4 (1309)	15.1 (5661)
Varsity athlete (<i>N</i> = 37,377)	9.2 (849)	9.2 (873)	8.5 (878)	7.3 (614)	8.6 (3214)
Current residence (<i>N</i> = 37,701)*					
Campus residence hall	33.7 (3126)	41.0 (3922)	38.5 (3994)	38.8 (3296)	38.0 (14338)
Other campus housing	7.5 (699)	5.8 (552)	5.4 (562)	7.7 (656)	6.5 (2469)
Parent/guardian's home	12.1 (1121)	16.2 (1548)	16.0 (1662)	11.3 (958)	14.0 (5289)
Other off-campus housing	40.5 (3759)	33.0 (3161)	34.1 (3530)	38.5 (3268)	36.4 (13718)
Primary health insurance (<i>N</i> = 37,718)					
College/university plan	9.0 (840)	8.7 (836)	11.3 (1168)	12.1 (1028)	10.3 (3872)
Parent's plan	77.0 (7146)	79.9 (7651)	76.2 (7894)	78.7 (6694)	77.9 (29385)

Another plan	6.4 (596)	5.4 (521)	5.7 (587)	6.1 (519)	5.9 (2223)
Do not have health insurance	6.5 (603)	5.0 (477)	5.6 (577)	2.3 (198)	4.9 (1855)
Not sure if I have health insurance	1.1 (101)	0.9 (90)	1.3 (130)	0.7 (62)	1.0 (383)
Relationship status (<i>N</i> = 37,685)					
Not in a relationship	36.5 (3385)	39.1 (3738)	37.9 (3927)	39.7 (3377)	38.3 (14427)
In relationship, not living together	48.3 (4473)	49.5 (4739)	49.2 (5094)	48.4 (4117)	48.9 (18423)
In relationship, living together	15.2 (1410)	11.4 (1091)	12.8 (1330)	11.8 (1004)	12.8 (4835)
Past 12-month pregnancy (<i>N</i> = 36,201)					
None	97.0 (8663)	97.5 (8959)	97.1 (9669)	97.9 (7943)	97.3 (35234)
Unintentional pregnancy	1.8 (163)	1.6 (148)	1.9 (189)	1.3 (101)	1.7 (601)
Intentional pregnancy	0.7 (59)	0.4 (36)	0.4 (43)	0.4 (28)	0.5 (166)
Don't know	0.6 (51)	0.5 (49)	0.6 (56)	0.5 (44)	0.6 (200)
Abbreviations: UG=Undergraduate; AI, AN, or NH=American Indian, Alaskan Native, or Native Hawaiian *‘Other’ options allowed, but not reported here					

TABLE 2. Binary logistic regression of predictors of long-acting reversible contraception (LARC) use among females, aged 18-24 years, who reported having vaginal sex in the last year—ACHA-NCHA Fall 2011, Fall 2012, Fall 2013, and Fall 2014 (N = 29,746)

Independent variables	B	SE	Wald	P-value	AOR	99% CI
Age	.110	.014	59.734	<.001*	1.117	1.076-1.158
Race/ethnicity						
White	-	-	-	-	-	REF
Black	.463	.102	20.422	<.001*	1.589	1.220-2.069
Hispanic or Latina	.232	.090	6.641	.010	1.261	1.000-1.591
Asian or Pacific Islander	-.277	.125	4.938	.026	0.758	0.550-1.045
AI, AN, or NH	.892	.269	10.961	.001*	2.440	1.219-4.885
Biracial	.160	.077	4.353	.037	1.174	0.963-1.431
Other	-.101	.270	0.141	.707	0.904	0.451-1.810
International student	-.063	.100	0.391	.532	0.939	0.725-1.216
Sorority member	.064	.067	0.904	.342	1.066	0.897-1.266
Varsity athlete	-.272	.101	7.283	.007	0.762	0.588-0.988
Relationship status						
Not in a relationship	-	-	-	-	-	REF
In relationship, not living together	.036	.053	0.457	.499	1.037	0.903-1.190
In relationship, living together	.471	.071	44.317	<.001*	1.602	1.335-1.922
Private school	-.048	.078	0.368	.544	0.954	0.779-1.167
Non-religious school	.002	.086	<0.001	.986	1.002	0.803-1.248
Campus size (in students)						
Less than 2,500	-	-	-	-	-	REF
2,500-4,999	-.220	.108	4.161	.041	0.802	0.607-1.060
5,000-9,999	-.244	.110	4.937	.026	0.783	0.590-1.040
10,000-19,999	-.174	.115	2.295	.130	0.841	0.626-1.129
20,000 or more	-.300	.136	4.873	.027	0.740	0.521-1.051
2-year (vs. 4-or-more-year college/university)	.475	.111	18.443	<.001*	1.608	1.209-2.139
Campus setting (community						

population)						
Rural community (<2,500)	-	-	-	-	-	REF
Small town (2,500-9,999)	.156	.216	0.525	.469	1.169	0.671-2.038
Large town (10,000-49,999)	.178	.215	0.682	.409	1.194	0.686-2.079
Small city (50,000-249,999)	.137	.208	0.436	.509	1.147	0.671-1.960
Large city (250,000-499,999)	.082	.210	0.151	.697	1.085	0.632-1.864
Very large city ($\geq 500,000$)	.341	.209	2.658	.103	1.407	0.820-2.413
Region						
Northeast	-	-	-	-	-	REF
Midwest	.345	.080	18.589	<.001*	1.412	1.149-1.736
South	.224	.069	10.661	.001*	1.251	1.048-1.493
West	.558	.074	56.604	<.001*	1.747	1.443-2.115
Constant	-4.904	.475	106.552	<.001*	0.007	
Abbreviations: AOR=Adjusted odds ratio; AI, AN, or NH=American Indian, Alaskan Native, or Native Hawaiian. *Indicates a statistically significant finding after applying the Bonferroni correction ($0.05/40=0.001$).						

TABLE 3. Two binary logistic regression models of condom use by contraceptive type among females, aged 18-24 years, who reported having vaginal sex in the last year—ACHA-NCHA Fall 2014 (N = 5,259)	
	Condom Use
Contraceptive Type	AOR (99% CI)
LARC and patch, shot, or ring vs birth control pills	
Birth control pill use	REF
LARC use	0.469 (0.367-0.600)*
Patch, shot, or ring use	0.732 (0.565-0.949)
Birth control pills and patch, shot, or ring vs LARC	
LARC use	REF
Birth control pill use	2.131 (1.667-2.722)*
Patch, shot, or ring use	1.560 (1.115-2.181)*
<p>Abbreviations: AOR=Adjusted odds ratio; LARC= long-acting reversible contraception</p> <p>¹The same models were run twice to make comparisons with 2 different reference groups: 1) birth control pill users, and 2) LARC users.</p> <p>²Adjusted models include self-reported age and race/ethnicity.</p> <p>*Indicates a statistically significant finding after applying the Bonferroni correction (0.05/40=0.001).</p>	

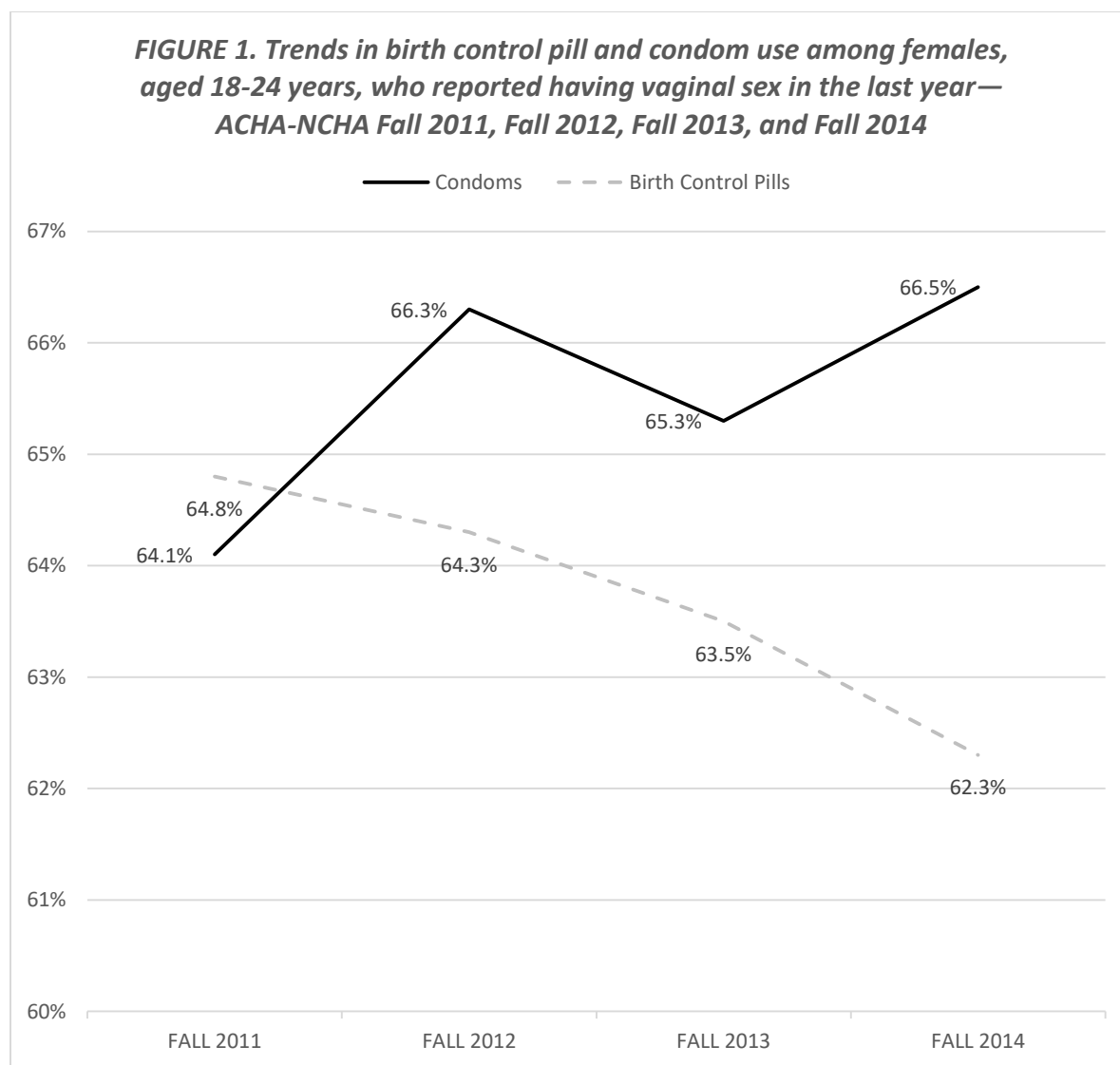


FIGURE 2. Trends in long-acting reversible contraception (LARC) use among females, aged 18-24 years, who reported having vaginal sex in the last year—ACHA-NCHA Fall 2011, Fall 2012, Fall 2013, and Fall 2014

