Trends in Sexual Activity, Condom Use, and Use of Pregnancy Prevention Methods Among Female Adolescents: United States, 2007–2023

Rachel Slimovitch, MPH, Joshua A. Salomon, PhD, and Alyssa Bilinski, PhD

Objectives. To examine trends in sexual behaviors, condom use, and pregnancy prevention methods among female adolescents.

Methods. We analyzed national and state Youth Risk Behavior Surveillance System data (2007–2023) among US female high school students (≥ 14 years). Outcomes included current sexual activity, condom use, and use of pregnancy prevention methods. We estimated weighted prevalence and trends overall and by region, age, and race/ethnicity and examined adolescent birthrates using Centers for Disease Control and Prevention data.

Results. The proportion of respondents who were currently sexually active declined (2007–2011: 35.1%; 2019–2023: 23.8%; $P < .01$). Among those sexually active, nonuse of condoms increased (45.8% to 52.4%; $P < .01$), whereas nonuse of moderately or highly effective pregnancy prevention decreased (73.0% to 63.0%; $P < .01$), reflecting increased uptake of effective methods. The proportion using no pregnancy prevention method remained stable. Declines in sexual activity reduced population-level sexual risk indicators. Racial/ethnic disparities persisted. Birthrates declined substantially.

Conclusions. Declines in adolescent birthrates are driven largely by reduced sexual activity, whereas condom use has declined and disparities in contraceptive use persist, indicating uneven improvements in sexual health behaviors.

Public Health Implications. Efforts should strengthen comprehensive sexual health education and access to effective contraception and condoms, with targeted strategies for younger adolescents, the South, and non-Hispanic Black and Hispanic populations. (*Am J Public Health*. Published online ahead of print July 2, 2026:e1–e10. https://doi.org/10.2105/AJPH.2026.308511)

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Adolescent birthrates reached a record low in 2022 in the United States,[1] following more than a decade of continuous decline.[2] This trend has been widely reported and attributed to a combination of factors, with particular emphasis on decreased sexual activity and increased use of effective contraceptives among female adolescents.[3,4] Despite the decline in adolescent birthrates, the United States continues to have higher rates of adolescent pregnancy and birth than other high-income countries.[5] Furthermore, within the United States, regional and racial disparities in birthrates and sexually transmitted infections (STIs) persist.[6,7] Understanding patterns in sexual behavior among female adolescents, including the prevalence of sexual activity and contraceptive use, is important for guiding healthy sexual development and implementing effective prevention measures to reduce the risk of STIs and HIV infections and adolescent birth.

Population-level trends among female adolescents are mixed, with increasing prevalence of contraceptive nonuse and some STIs alongside decreasing prevalence of sexual activity.

A report from the Centers for Disease Control and Prevention (CDC) highlighted an increase in nonuse of condoms during last sexual intercourse among currently sexually active female high school students between 2013 and 2023,[8] and limited data on STIs indicate some increases among female adolescents from 2011 through 2019.[9,10] In contrast, the percentage who were currently sexually active or had 4 or more sexual partners decreased through 2021 and then remained stable from 2021 through 2023.[8]

Analyses of all adolescents indicate that the largest declines in sexual activity from 2013 through 2023 occurred among non-Hispanic Black and Hispanic individuals, but trends among female adolescents have not been stratified by race/ethnicity.[8] Notably, changes in female adolescent sexual activity and contraceptive nonuse were particularly pronounced during the first years of the COVID-19 pandemic, with sharp decreases in the percentage of high school students reporting ever having had sex or being currently sexually active and sharp increases in using no contraceptive method to prevent pregnancy from 2019 through 2021.[11] Although regional variations in birthrates are documented, with rates lowest in the US Northeast and highest in the US South,[12] variations in adolescent sexual behaviors by region have been less explored.

We used national and state-level Youth Risk Behavior Survey (YRBS) data (2007–2023) to describe and compare trends in current sexual activity among all female high school students and condom use and pregnancy prevention methods among those who were currently sexually active, stratifying by region, race/ethnicity, and age. We then synthesized these estimates to characterize trends in births in relation to adolescent population group sizes categorized by sexual activity and use of pregnancy prevention.

METHODS

We analyzed state and national YRBS data (2007–2023), restricting our analyses to female high school students aged 14 years and older. The YRBS is a biennial survey conducted during the spring of odd-numbered years that monitors health behaviors and experiences in the United States.[13] The national YRBS survey uses a 3-stage cluster sample design to identify a representative sample of students who attend public and private schools. State surveys employ a 2-stage cluster sample design to identify representative samples of students in each participating state.[14] For state analyses, we included states with publicly available data from at least 5 of 9 biennial survey rounds from 2007 through 2023 (n = 38). Data were available for 32 to 36 states in each round from 2007 to 2021, and 20 states had data available in 2023 (Appendix, available as a supplement to the online version of this article at http://www.ajph.org). National analyses include between 6500 and 9900 female high school students each survey year (Table A, available as a supplement to the online version of this article at http://www.ajph.org).

We used birth and population data for females aged 15 to 19 years from CDC Wide-ranging Online Data for Epidemiologic Research (WONDER).[15]

Measures

We extracted 5 measures from YRBS data: being sexually active in the past 3 months ("currently sexually active"), using no method to prevent pregnancy during last sexual intercourse with an opposite sex partner ("no pregnancy prevention method"), not using a condom during last sexual intercourse ("no condom use"), not using a moderately or highly effective method (e.g., intrauterine device [IUD], implant, pill, ring, patch, or shot) as the only method to prevent pregnancy in last sexual intercourse with an opposite sex partner ("no moderately or highly effective pregnancy prevention method"), and not using long-acting reversible contraceptive (LARC; e.g., IUD or implant) as the only method to prevent pregnancy in last sexual intercourse with an opposite sex partner ("no LARC use"). We used the YRBS definition of currently sexually active, calculated by dividing the number of female high school students reporting sexual intercourse in the past 3 months by all female respondents, including those who had never had sex or had not had sex in the past 3 months. We calculated the remaining measures as percentages among those who were currently sexually active to best understand trends among sexually active adolescents. (Tables B and C provide additional description of YRBS's measures and analytic sample [available as a supplement to the online version of this article at http://www.ajph.org].)

We also examined demographics, including region, age (14–16 years, ≥ 17 years) and race/ethnicity. We categorized region using the US Census Bureau's definition (Northeast, Midwest, South, and West). We categorized race/ethnicity as non-Hispanic Asian, non-Hispanic Black/African American (hereafter non-Hispanic Black), Hispanic/Latino (hereafter Hispanic), non-Hispanic White, or multiracial. We categorized those of Hispanic origin as Hispanic, regardless of race. Subgroup

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analyses are not shown for American Indian/Alaska Native and Native Hawaiian/Pacific Islander students because of small sample sizes. The number of participants in each analyzed subgroup is presented in Table A.

Imputation

We performed single imputation of state-level outcome values using a random forest model for states included in the analysis but missing data for specific years. Random forests are a machine-learning method that aggregates multiple decision trees to enhance prediction accuracy and minimize overfitting.[16] For each outcome measure, we fit a random forest model to estimate survey-weighted point estimates using state and year as predictors. We trained the model using 5-fold cross validation, varying tree depths from 1 to 10 and considering 1 to 5 variables at each split. After selecting the best model based on lowest root mean square error, we predicted values for each state-year combination. When a point estimate was missing, we applied the random forest prediction; otherwise, we retained the survey-weighted point estimate. This approach allowed us to impute missing state-level outcome values by using observed temporal and geographic patterns in the available data. We validated the random forest imputation using a leave-1-out approach for each available state-year combination and found that predicted values closely matched observed data, with low root mean square error (3–4 percentage points).

Analysis

We calculated weighted prevalence and 95% confidence intervals (CIs) in 3 periods (2007–2011, 2013–2017, 2019–2023) for current sexual activity, no pregnancy prevention method, no condom use, and no moderately or highly effective pregnancy prevention method (Table 1). We used these 3 periods to summarize patterns across 9 survey rounds and to quantify prevalence nationally and among regional, age, and race/ethnicity subgroups for which we could achieve sufficient precision. To obtain region-level estimates, we calculated weighted averages of state-level estimates by using the population of females aged 15 to 19 years in each state as the weight. We also calculated weighted prevalence and 95% CIs for LARC nationally and by age and race/ethnicity subgroups for each year from 2013 through 2023, as LARC data were unavailable before 2013 (Table D, available as a supplement to the online version of this article at http://www.ajph.org).

To visualize state-level changes, we compared weighted prevalence estimates for current sexual activity, no condom use, and no pregnancy prevention by state in 2007 to 2011 and 2019 to 2023 (Figure A, available as a supplement to the online version of this article at http://www.ajph.org).

We calculated the biennial weighted prevalence and 95% CI nationally and by region for the percentage of female high school students who were currently sexually active, and among those sexually active, the percentages reporting no condom use and no pregnancy prevention method from 2007 through 2023 (Figure 1). By estimating prevalence for each available survey round during this period, we were able to visualize the temporal trend and more clearly identify changes that occurred during the COVID-19 pandemic. We also operationalized marginal estimates for no condom usage and no method of pregnancy prevention during last sexual intercourse, with a numerator of currently sexually active female high school students who did not use (1) a condom, or (2) any method of pregnancy prevention during their last sexual encounter and a denominator of all female respondents in the YRBS (Figure 2). To formally assess trends, we conducted linear tests for change over time in the national data (Appendix).

We calculated 3 ratio measures to characterize trends in adolescent births, with the numerator defined as births among females aged 15 to 19 years and the denominator defined as (1) the population, (2) those currently sexually active, or (3) those currently sexually active and not using any pregnancy prevention method (the Appendix contains equations used; Figure 3). We aligned outcomes from YRBS (current sexual activity and no pregnancy prevention method) with births and populations reported in the subsequent year (2008–2024).

Uncertainty Estimation

To estimate SEs and associated CIs, we applied a cluster bootstrap method that accounted for survey sampling and weighting, conducting imputation and estimation on each bootstrap replicate.[17,18] We assessed significant differences between each group and 2007 to 2011 (or 2013 for no LARC).

We conducted all analyses in R version 4.3.1.[19]

RESULTS

Table 1 summarizes prevalence of current sexual activity and related behaviors across 3 periods. Nationally, the

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TABLE 1— Trends in Adolescent Sexual Activity, Contraceptive Use, and Birthrates: United States, 2007–2023

Characteristic	Sexually Active, % (95% CI)			No Pregnancy Prevention Method,[a] % (95% CI)			No Condom at Last Intercourse,[a] % (95% CI)		
	2007–2011	2013–2017	2019–2023	2007–2011	2013–2017	2019–2023	2007–2011	2013–2017	2019–2023
National	35.1 (33.8, 36.4)	35.2 (32.2, 38.3)**	23.8 (22.5, 25.1)**	14.2 (13.1, 15.3)	15.6 (13.4, 18.1)*	14.1 (12.6, 15.8)	45.8 (44.1, 47.4)	46.9 (43.3, 50.5)**	52.4 (50.0, 54.8)**
Region									
Northeast	33.2 (31.9, 34.6)	27.1 (26, 28.4)**	22.2 (21.1, 23.2)**	12.4 (11.4, 13.5)	12.9 (11.7, 14.3)	12.2 (10.8, 13.7)	40.7 (39.0, 42.3)	45.3 (43.3, 47.4)**	48.3 (45.8, 51.5)**
West	31.5 (30.3, 33.0)	27.9 (26.5, 29.6)**	23.5 (22.0, 25.1)**	15.7 (14.1, 17.3)	15.5 (14.1, 16.6)	14.2 (12.3, 16.5)	46.9 (45.1, 48.9)	47.9 (45.8, 49.8)	54.1 (51.1, 57.2)**
Midwest	35.8 (34.9, 36.7)	29.8 (28.7, 30.9)**	25.1 (23.7, 26.6)**	12.1 (11.2, 13.0)	12.5 (11.6, 13.6)	11.4 (10.2, 12.9)	44.2 (42.9, 45.5)	47.1 (45.6, 48.5)**	51.1 (48.7, 53.4)**
South	37.2 (36.1, 38.3)	29.4 (28.3, 30.5)**	25.0 (23.8, 26.1)**	16.4 (15.6, 17.1)	18.2 (17.0, 19.4)*	16.7 (15.1, 18.2)	46.3 (45.3, 47.4)	50.8 (49.4, 51.9)**	54.4 (52.4, 56.4)**
Age, y									
14–16	26.6 (25.2, 27.9)	22.7 (21.0, 24.4)**	16.3 (15.3, 17.4)**	14.4 (12.8, 16.2)	16.5 (14.7, 18.5)*	15.9 (13.8, 18.2)	41.2 (38.8, 43.7)	45.8 (42.8, 48.9)*	49.5 (46.0, 53.1)**
≥ 17	49.9 (48.2, 51.7)	45.4 (43.0, 47.9)*	38.2 (36.1, 40.3)**	14.0 (12.7, 15.4)	15.0 (13.1, 17.1)	12.7 (10.3, 15.6)	49.9 (47.9, 51.9)	51.7 (49.6, 53.9)	54.8 (52.1, 57.4)*
Race/ethnicity									
Non-Hispanic Asian	15.6 (12.1, 19.9)	13.7 (10.8, 17.3)	9.1 (6.7, 12.4)**	12.3 (7.4, 19.6)	17.0 (10.0, 27.4)	10.3 (3.9, 24.4)	40.1 (26.0, 56.1)	57.3 (44.1, 69.6)	54.9 (41.9, 67.3)
Non-Hispanic Black	41.8 (39.4, 44.2)	30.7 (27.9, 33.7)**	21.6 (18.1, 25.5)**	17.8 (15.7, 20.0)	23.6 (20.4, 27.2)**	25.4 (20.1, 31.5)**	44.7 (41.3, 48.2)	49.9 (45.8, 54.0)	59.0 (53.4, 64.5)**
Hispanic	33.4 (31.6, 35.4)	30.8 (28.4, 33.3)**	23.5 (21.5, 25.6)**	22.8 (20.1, 25.6)	22.6 (19.4, 26.1)	18.2 (14.9, 22.1)*	48.9 (46.0, 51.8)	51.0 (47.1, 54.8)	52.5 (47.5, 57.4)
Multiracial	35.7 (31.8, 39.7)	33.4 (29.3, 37.7)	24.8 (20.9, 29.1)**	13.7 (9.8, 19.0)	18.2 (13.1, 24.7)	15.9 (11.0, 22.6)	43.7 (36.3, 51.4)	55.7 (49.3, 62.0)	56.2 (49.6, 62.6)
Non-Hispanic White	35.2 (33.5, 36.9)	32.5 (30.1, 34.9)**	25.9 (24.3, 27.6)**	10.6 (9.2, 12.2)	11.3 (9.7, 13.1)	9.7 (8.2, 11.3)	45.5 (43.0, 48.0)	47.7 (45.0, 50.4)	50.0 (47.1, 52.9)*

Characteristic	No Moderately/Highly Effective Method,[a] % (95% CI)			Birthrate[b]		
	2007–2011	2013–2017	2019–2023	2008–2012	2014–2018	2020–2024
National	73.0 (71.1, 74.9)	70.0 (65.9, 73.8)**	63.0 (60.7, 65.2)**	35	21	14
Region						
Northeast	72.3 (70.6, 74.0)	64.4 (62.3, 66.5)**	63.8 (60.8, 66.8)**	22	13	9
West	72.7 (70.9, 74.5)	65.8 (63.3, 68.3)**	60.6 (58.2, 63.9)**	34	19	11
Midwest	68.1 (66.8, 69.3)	61.3 (59.7, 63.5)**	56.8 (54.9, 59.1)**	32	20	13
South	75.3 (74.2, 76.3)	70.3 (69.1, 71.6)**	65.6 (63.5, 67.7)**	43	25	18
Age, y						
14–16	79.9 (77.8, 81.8)	72.8 (70.2, 75.2)**	70.5 (67.7, 73.2)**	10	5	3
≥ 17	66.8 (64.1, 69.3)	62.9 (59.9, 65.8)*	56.8 (53.8, 59.7)**	24	15	10

Continued

TABLE 1— Continued

Characteristic	No Moderately/Highly Effective Method,[a] % (95% CI)			Birthrate[b]		
	2007–2011	2013–2017	2019–2023	2008–2012	2014–2018	2020–2024
Race/ethnicity						
Non-Hispanic Asian	85.3 (75.8, 91.5)	78.3 (67.2, 86.4)	70.9 (57.7, 81.2)*	NA	NA	2
Non-Hispanic Black	80.5 (77.2, 83.4)	79.1 (74.6, 82.9)	72.0 (65.8, 77.5)**	52	30	21
Hispanic	85.4 (82.7, 87.8)	80.9 (77.5, 83.9)*	73.7 (69.9, 77.2)**	57	32	22
Multiracial	78.2 (72.0, 83.3)	61.7 (53.0, 69.6)**	65.8 (58.8, 72.1)*	NA	NA	14
Non-Hispanic White	66.3 (63.7, 68.7)	60.0 (57.5, 62.5)**	55.5 (52.9, 58.1)**	24	15	9

Note. CI = confidence interval; NA = not available. Annual national YRBS samples included approximately 6500–9900 respondents. Estimates of sexual activity and contraceptive behaviors are based on high school females aged 14 years and older. We compared all estimates with 2007–2011 values. We defined "currently sexually active" as having had sexual intercourse in the past 3 months among all respondents (including those who have never had sexual intercourse or had not had sexual intercourse in the past 3 months). Measures of contraceptive use and pregnancy prevention were calculated among currently sexually active respondents. Geographic regions are defined according to US Census Bureau classifications. Data for American Indian/Alaska Native and Native Hawaiian/Pacific Islander students are not shown because of small sample sizes. Birthrates represent births per 1000 female population and are presented as 1-year lagged estimates relative to survey periods. Birth data for Asian and multiracial students were not available before 2016.

Source. Youth Risk Behavior Survey (YRBS) and Centers for Disease Control and Prevention (CDC) Wide-ranging Online Data for Epidemiologic Research (WONDER).

[a]We calculated measures of contraceptive use and pregnancy prevention among respondents who reported being currently sexually active.

[b]Birthrates represent births per 1000 female population from CDC WONDER and reflect 1-year lagged estimates relative to survey periods.

*$P < .05$; **$P < .01$.

percentage of female high school students who were currently sexually active was significantly lower in 2019 to 2023 than in 2007 to 2011 (23.8% vs 35.1%; $P < .01$). Among those sexually active, the percentage not using pregnancy prevention was similar (14.2% vs 14.1%), whereas nonuse of condoms increased (45.8% to 52.4%; $P < .01$). By contrast, nonuse of moderately or highly effective pregnancy prevention decreased by 10 percentage points (73.0% to 63.0%; $P < .01$), and nonuse of LARC decreased from 98.2% in 2013 to 89.9% in 2023 ($P < .01$). Birthrates among females aged 15 to 19 years declined over the study period (from 35 per 1000 in 2008–2012 to 14 per 1000 in 2020–2024; Table 1).

Patterns across regions, age, and race/ethnicity generally mirrored national trends, with declines in current sexual activity and nonuse of moderately or highly effective contraception across all groups and increases in condom nonuse across most groups. Non-Hispanic Black female high school students had the largest decline in current sexual activity from 2007 through 2011 to 2019 through 2023 (41.8% to 21.6%; $P < .01$) but also experienced increases in use of no pregnancy prevention method and condom nonuse (both $P < .01$). In 2019 through 2023, among those sexually active, non-Hispanic Black and Hispanic adolescents had the highest levels of nonuse of effective contraception. Patterns were similar across age groups, although those aged 14 to 16 years had a larger increase in condom nonuse than those aged 17 years or older (41.2% to 49.5%; $P < .01$).

Changes in sexual behaviors were similar across regions. The South had the largest decrease in current sexual activity (from 37.2% in 2007–2011 to

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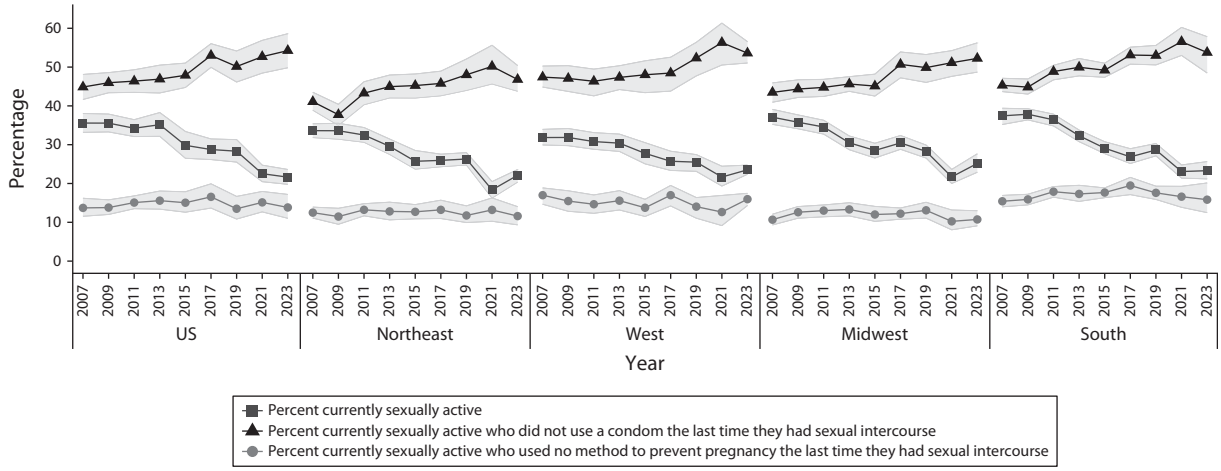

FIGURE 1— Trends in Adolescent Sexual Activity and Contraceptive Nonuse Among Sexually Active Female High School Adolescents, Stratified by US Region: Youth Risk Behavior Survey, 2007–2023

Note. Estimates are among female high school students aged 14 years and older. "Currently sexually active" is defined per Youth Risk Behavior Survey criteria. The figure shows the percentage currently sexually active, percentage sexually active who did not use a condom at last sexual intercourse, and percentage sexually active who used no method to prevent pregnancy at last sexual intercourse. We defined geographic region subgroups according to the US Census Bureau's classifications. Linear test for trend in national data identified a significantly decreasing trend in the percentage reporting being currently sexually active (–1% per year; $P < .01$), a statistically significant increasing linear trend in the percentage currently sexually active who did not use a condom the last time they had sexual intercourse (0.6% per year; $P < .01$), and no statistically significant trend in the percentage currently sexually active who used no method to prevent pregnancy the last time they had sexual intercourse (0.03% per year; $P = .7$).

25.0% in 2019–2023; $P < .01$) and the largest increase in condom nonuse among those sexually active (from 46.3% to 54.4%; $P < .01$), and it retained the highest levels of condom nonuse.

By contrast, the West had the largest decrease in nonuse of moderately or highly effective pregnancy prevention among those sexually active (72.7% to 60.6%; $P < .01$; Table 1).

Conditional and Marginal National Trends

Figure 1 displays time trends in current sexual activity and conditional trends in

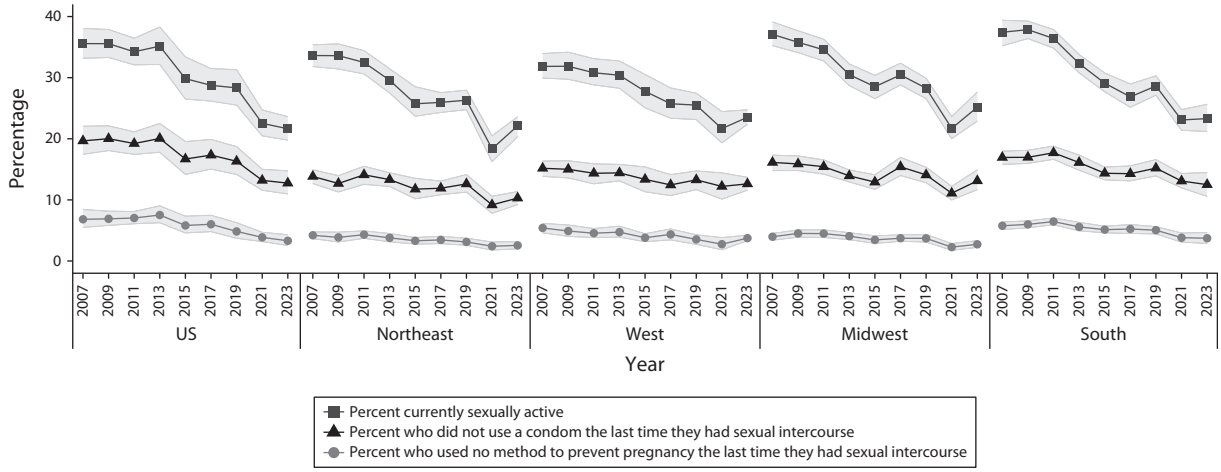

FIGURE 2— Trends in Adolescent Sexual Activity and Contraceptive Nonuse Among All Female High School Adolescents, Stratified by US Region: Youth Risk Behavior Survey, 2007–2023

Note. Estimates are among female high school students aged 14 years and older. "Currently sexually active" is defined per Youth Risk Behavior Survey criteria. The figure shows the percentage currently sexually active, percentage not using a condom at last sexual intercourse, and percentage using no method to prevent pregnancy at last sexual intercourse. We defined geographic region subgroups according to the US Census Bureau's classifications. Linear test for trend in national data identified a significantly decreasing trend in the percentage reporting being currently sexually active (–1% per year; $P < .01$), the percentage who did not use a condom the last time they had sexual intercourse (–0.4% per year; $P < .01$), and the percentage who used no method to prevent pregnancy the last time they had sexual intercourse (–0.2% per year; $P < .01$).

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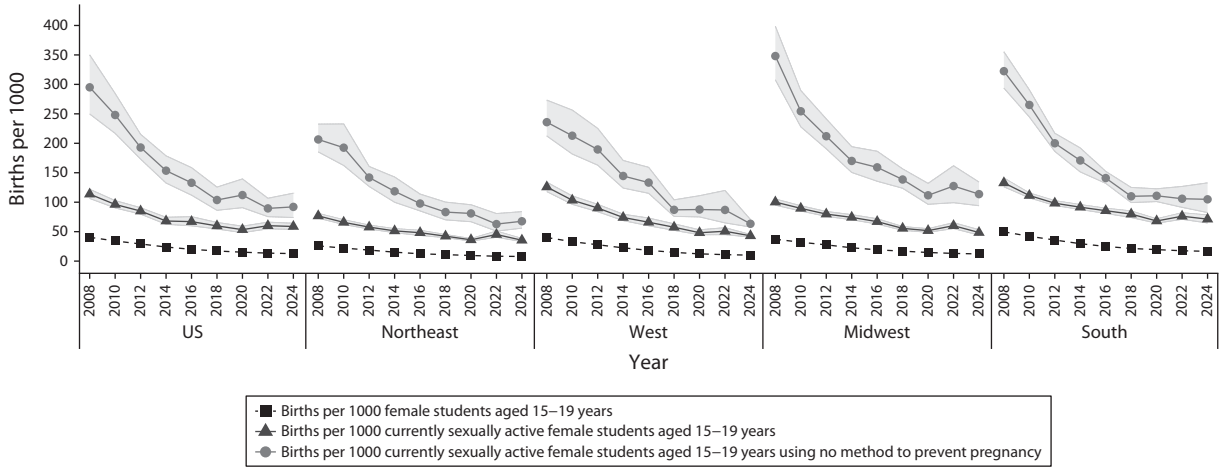

FIGURE 3— Trends in Adolescent Birthrates by Sexual Activity and Contraceptive Nonuse, Stratified by US Region: Youth Risk Behavior Survey and Wide-ranging Online Data for Epidemiologic Research, 2008–2024

Note. We expressed rates per 1000 among female high school students aged 15–19 years, per 1000 who were currently sexually active, and per 1000 currently sexually active using no method to prevent pregnancy. We calculated the 3 ratio measures as the number of births among females aged 15–19 years divided by (1) total number of females aged 15–19 years, (2) estimated number of currently sexually active females aged 15–19 years, and (3) estimated number of currently sexually active females aged 15–19 years using no method to prevent pregnancy. Births and population data were obtained from CDC WONDER, and data on sexual activity and pregnancy prevention methods are from YRBS. YRBS outcomes (2007–2023) are aligned with birth and population data from the subsequent year (2008–2024). Geographic region subgroups are defined according to the US Census Bureau's classifications.

condom nonuse and no pregnancy prevention method among those who were sexually active, and Figure 2 presents marginal trends for these behaviors. From 2007 through 2023, the percentage who were currently sexually active declined by 39%, with an approximately 1% decrease per year ($P < .01$; Figure 1). This decline contributed to a decrease in the proportion of the overall population engaging in condomless sex (−0.4% per year; $P < .01$), although condom nonuse among those who were sexually active increased (from 44.9% in 2007 to 54.3% in 2023; Figures 1 and 2). Similarly, the percentage of the population using no pregnancy prevention method declined (6.8% to 3.3%; $P < .01$), reflecting reductions in sexual activity, whereas use of no method among those sexually active remained relatively stable (Figures 1 and 2).

Trends During the COVID-19 Pandemic

Nationally, the percentage of currently sexually active female high school students decreased sharply from 2019 to 2021 (from 28.3%; 95% CI = 25.5, 31.3 to 22.5%; 95% CI = 20.5, 24.7), with similar declines observed across all regions. The decrease was particularly pronounced in the Northeast, which dropped nearly 8 percentage points (from 26.3%; 95% CI = 24.8, 27.9 to 18.4%; 95% CI = 16.3, 20.5). Regional patterns in sexual activity from 2021 to 2023 suggest increases between 3 and 4 percentage points in the Northeast and Midwest; however, 2023 regional estimates should be interpreted cautiously because of greater reliance on imputation (Appendix). Among currently sexually active female high school students, the percentage not using a condom increased nationally from 2019 to 2021, with largest increases observed in the South and West (Figure 1).

Trends in Births

Figure 3 illustrates trends in birthrates per 1000 population aged 15 to 19 years and in ratios of births to (1) those currently sexually active, and (2) those currently sexually active and not using pregnancy prevention. Nationally, births per 1000 population declined from 40.5 in 2008 to 12.7 in 2024, with similar declines across regions. From 2008 to 2020, ratios of births to those sexually active decreased nationally (113.6; 95% CI = 106.5, 121.8 to 53.4; 95% CI = 48.3, 59.3) and regionally and then increased from 2020 to 2022 (60.2; 95% CI = 54.8, 66.1). From 2022 to 2024, these ratios plateaued (58.9; 95% CI = 53.9, 64.2). Similarly, ratios of births to those sexually active not using

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pregnancy prevention plateaued from 2022 to 2024 (89.7; 95% CI = 75.7, 106.6 to 92.2; 95% CI = 74.0, 115.6). In 2024, these ratios were highest in the Midwest (113.7; 95% CI = 94.1, 134.2) and the South (104.9; 95% CI = 82.4, 132.8).

DISCUSSION

We evaluated factors contributing to adolescent births, focusing on changes in current sexual activity, condom use, and pregnancy prevention methods among female high school students. By examining these measures across regions, age groups, and race/ethnicity, we highlight the complex interplay of behaviors and adolescent birthrates. Notably, although adolescent birthrates have decreased over the past decade, we observed contrasting trends in pregnancy prevention methods and condom use among currently sexually active female high school students. Although more are using moderately or highly effective pregnancy prevention methods, there has been a sharp decrease in condom use, particularly among those who are younger (aged 14–16 years) and non-Hispanic Black. These findings suggest that recent declines in the adolescent birthrate may be driven by reduced current sexual activity rather than changes in contraceptive use alone.

We identified an increase in the percentage of currently sexually active female high school students using moderately or highly effective pregnancy prevention methods and no change in not using a pregnancy prevention method. This pattern indicates a shift away from less effective pregnancy prevention methods, such as condoms, which is consistent with our results and data among currently sexually active adults in the United States.[10] The increase in moderately or highly effective pregnancy prevention methods alongside a decrease in less effective methods may reflect adolescents' perceptions regarding sexual and reproductive health. Adolescents often express more concern about unplanned pregnancy than about STIs, so those relying on moderately or highly effective contraception, such as an IUD, may forgo using condoms because of convenience or stigma.[20]

We observed persistent racial disparities in multiple sexual behaviors, with higher prevalence of pregnancy risk factors among non-Hispanic Black students. Although nonuse of moderately or highly effective pregnancy prevention decreased across all racial and ethnic groups from 2007 through 2011 to 2019 through 2023, levels among those sexually active remained more than 16 percentage points higher for non-Hispanic Black and Hispanic adolescents than for non-Hispanic White adolescents in 2019 through 2023. These disparities may reflect structural and social barriers to sexual health education and services, including lower-quality care.[21,22]

Our study also provides regional estimates in current sexual activity, condom use, and pregnancy prevention methods before and during the COVID-19 pandemic. Across all regions, we found that current sexual activity decreased after 2019, whereas the percentage of sexually active female high school students not using a condom increased from 2019 through 2021. These trends may reflect pandemic-related disruptions. The decline in current sexual activity from 2019 through 2021 may reflect increased parental monitoring and reduced physical interaction and privacy.[23] The pandemic also limited adolescents' access to confidential sexual and reproductive health care, and research indicates that adolescents with concerns about confidentiality are less likely to use sexual health services and contraceptives.[23]

Beyond the COVID-19 pandemic, other structural changes may have contributed to birth control and sexual behavior trends, including the increase in births per 1000 among currently sexually active female high school students after 2020. For example, the 2019 Title X rule change, which required clinics to be physically and financially separate from abortion services, resulted in 8.7% of minors losing access to confidential family planning services between 2018 and 2020.[24]

Limitations

Our study has several limitations. First, YRBS respondents could select only 1 pregnancy prevention method, and response options changed over time. Second, the survey does not define "sexual intercourse," and respondents may interpret this question differently. Third, our estimates of current sexual activity and sexual behaviors are representative only of high school students, excluding those not enrolled in school. This contributed to a misalignment of populations when examining trends in births in relation to current sexual activity, as WONDER data includes all adolescents. However, because we focused on rates and trends when combining birth data and sexual behaviors, and the dropout rate for females aged 16 to 24 is low (4.4%), bias from misalignment should be minimal. Fourth, limited state-level data were available for 2023, raising the possibility of selection bias in region-level annual trend analysis.

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Although we did not identify systematic differences between states with and without 2023 data, national analyses are more comprehensive, and the state-level data should be interpreted as preliminary. Finally, although regional data offer important insight into resource allocation and program planning, patterns by region may reflect underlying variation in racial and ethnic composition, but we were unable to examine race/ethnicity subgroups within regions because of small sample sizes. Despite these limitations, this study fills a critical gap in the literature, providing timely and comprehensive surveillance of female adolescents' sexual health behaviors and offering a deeper understanding of the metrics behind adolescent birthrates during a pivotal period.

Public Health Implications

Our findings reveal a complex picture of adolescent sexual health. Although births and current sexual activity continue to decline, the rise in condomless sex among currently sexually active female high school students and stagnant contraception use in certain regions, particularly the South, point to a sexually active population at risk for pregnancy or STIs or HIV. Continued efforts in pregnancy prevention and sexual health promotion are essential, especially as STI rates remain more than 30% higher than they were in 2014 and the percentage of adolescent pregnancies that are unintended remains at approximately 70%.[7,25] These findings underscore the importance of age-appropriate sexual education and improving access to contraceptive methods, particularly for younger adolescents, those in the South, and non-Hispanic Black adolescents. AJPH

ABOUT THE AUTHORS

Rachel Slimovitch is with the Department of Epidemiology, Boston University School of Public Health, Boston, MA. Joshua A. Salomon is with the Department of Health Policy, Stanford University School of Medicine, Stanford, CA. Alyssa Bilinski is with the Department of Health Services, Policy, and Practice and the Department of Biostatistics, Brown School of Public Health, Providence, RI.

CORRESPONDENCE

Correspondence should be sent to Rachel Slimovitch, 715 Albany St, 580-Suite 3W, Boston, MA 02118 (e-mail: rslimovi@bu.edu). Reprints can be ordered at https://www.ajph.org by clicking the "Reprints" link.

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ORCID iD:

Rachel Slimovitch https://orcid.org/0009-0004-8461-9114

CONTRIBUTORS

R. Slimovitch obtained the data, led the formal analysis, and wrote the original draft of the article. A. Bilinski conceptualized and supervised the study. All authors reviewed and edited the article.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest related to this work to disclose.

HUMAN PARTICIPANT PROTECTION

No protocol approval was necessary because study data were de-identified and publicly available.

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Supplement

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States included in regional analyses.

The states with publicly available data (N=38) in the YRBS state analyses from 2007-2023 are the following:

> Alabama, Alaska, Arizona, Arkansas, Colorado, Connecticut, Delaware, Florida, Hawaii, Illinois, Indiana, Iowa, Kansas, Kentucky, Maine, Maryland, Michigan, Mississippi, Missouri, Montana, Nebraska, Nevada, New Hampshire, New Jersey, New Mexico, New York, North Carolina, North Dakota, Oklahoma, Pennsylvania, Rhode Island, South Carolina, South Dakota, Texas, Vermont, West Virginia, Wisconsin, Wyoming.

Among these 38 states, the number of states with data for each year are the following:

2007	32
2009	34
2011	33
2013	32
2015	32
2017	32
2019	35
2021	36
2023	20

Of the 38 states included in the analysis, the following states had data from 2023:

	States with data in 2023	States where data was imputed in 2023
Northeast	New Jersey Pennsylvania Vermont	Connecticut Maine New Hampshire New York Rhode Island
Midwest	Illinois Indiana Michigan North Dakota Wisconsin	Iowa Kansas Missouri Nebraska South Dakota
South	Arkansas Kentucky Maryland Mississippi North Carolina Oklahoma Texas	Alabama Delaware Florida South Carolina West Virginia
West	Alaska Hawaii	Arizona Colorado

	Montana Nevada New Mexico	Wyoming

Linear test for trends in Figure 1.
Following CDC guidance for trend analysis in YRBS data,[1] we test for linear trends in national data in Figure 2 and Figure 3 using survey-weighted linear regression models accounting for the 2-stage cluster sample design.

$$Y = \beta_0 + \beta_1 X + \epsilon \quad (1)$$

Where X represents the sexual behavior measure (current sexual activity, no condom use, or no pregnancy prevention method).

Figure 2:
We found a statistically significant decreasing trend in the percent identifying as currently sexually active ($p<0.01$), a statistically increasing linear trend in the percent currently sexually active who did not use a condom the last time they had sexual intercourse ($p<0.01$), and no statistically significant trend in the percent currently sexually active who used no method to prevent pregnancy the last time they had sexual intercourse.

Figure 3 (Marginal trends):
We found statistically significant decreasing trends in the percent of high school females who did not use a condom the last time they had sexual intercourse ($p<0.01$) and the percent of high school females who used no method to prevent pregnancy the last time they had sexual intercourse ($p<0.01$).

1. Conducting Trend Analyses of YRBS Data. Published online September 2024. https://www.cdc.gov/yrbs/media/pdf/2023/2023_yrbs_conducting_trend_analyses.pdf

Description of equations in Figure 3.

The following equations describe how each subgroup was operationalized:

Births per 1000 females aged 15-19:

$$Y = \frac{births}{(population/1000)}$$

Births = number of births to mothers aged 15-19 years (CDC WONDER)
Population = population of females aged 15-19 years (CDC WONDER)

Births per 1000 currently sexually active females aged 15-19:

$$Y = \frac{births}{\left(\frac{population * SA}{1000}\right)}$$

Births = number of births to mothers aged 15-19 years (CDC WONDER)
Population = population of females aged 15-19 years (CDC WONDER)
SA = percent of female high school students aged 14 years and older who are currently sexually active (YRBS)

Births per 1000 currently sexually active females aged 15-19 using no method of pregnancy prevention:

$$Y = \frac{births}{\left(\frac{population * NPP}{1000}\right)}$$

Births = number of births to mothers aged 15-19 years (CDC WONDER)
Population = population of females aged 15-19 years (CDC WONDER)
NPP = percent of currently sexually active female high school students aged 14 years and older who did not use any method of pregnancy prevention in last sexual intercourse (YRBS)

Supplemental Table A. Unweighted sample size of female high school respondents in YRBS annually, nationally and stratified by age and race/ethnicity (2007-2023).

	Year								
	2007	2009	2011	2013	2015	2017	2019	2021	2023
National	6,993	8,238	7,671	6,579	7,726	7,489	6,849	8,100	9,816
Age									
14-16 years	4,175	4,923	4,645	3,838	4,838	4,794	4,561	5,807	6,686
17 and older	2,818	3,315	3,026	2,741	2,888	2,695	2,288	2,293	3,130
Race/Ethnicity									
Asian	178	402	223	256	304	340	301	415	465
Black	1,516	1,443	1,426	1,493	820	1,438	1,020	1,116	846
Hispanic	1,903	2,424	2,341	1,658	2,543	1,836	1,541	1,547	2,007
White	2,925	3,419	3,019	2,601	3,453	3,241	3,397	4,273	4,797
Multiracial	217	309	340	354	392	425	364	526	836

Data for American Indian or Alaska Native and Native Hawaiian or other Pacific Islander students are not shown due to small sample sizes.

Supplemental Table B. Description of sexual behavior indicators from Youth Risk Behavior Survey (YRBS) used in analysis.

Analytic Sample	Measure	Question and Response Options	Response Codings
Among all female high school students aged 14 years and older	Currently sexually active	During the past 3 months, with how many people did you have sexual intercourse? [“I have never had sexual intercourse”; “I have had sexual intercourse, but not during the past 3 months”; “1 person”; “2 people”; “3 people”; “4 people”; “5 people”; “6 or more people”]	Considered to be currently sexually active if they responded with having sexual intercourse with at least 1 person during the past 3 months
Among currently sexually active female high school students aged 14 years and older	No method to prevent pregnancy	The last time you had sexual intercourse with an opposite-sex partner, what one method did you or your partner use to prevent pregnancy? [Response options in Supplemental Table 2]	Considered to use no method to prevent pregnancy if they selected, “No method was used to prevent pregnancy”
	No condom use	The last time you had sexual intercourse, did you or your partner use a condom? [“I have never had sexual intercourse”; “Yes”; “No”]	No condom use if they responded “No”
	No use of a highly/ moderately effective contraception for pregnancy prevention	The last time you had sexual intercourse with an opposite-sex partner, what one method did you or your partner use to prevent pregnancy? [Response options in Supplemental Table 3]	Considered to have no use of a highly or moderately effective method if they did *not* select IUD, implant, pill, ring, patch, or shot (Supplemental Table 3)
	No use of long-acting reversible contraceptives (LARC)	The last time you had sexual intercourse with an opposite-sex partner, what one method did you or your partner use to prevent pregnancy? [Response options in Supplemental Table 3]	Considered to have no LARC use if they did *not* select IUDs or implants (Supplemental Table 3)

Supplemental Table C. Pregnancy prevention method options included in the YRBS, 2007-2023.

Years	Response Options	Pregnancy prevention method		
		No method	Highly/ moderately effective method	LARC *
2007-2009	No method was used to prevent pregnancy	✓		
	Birth control pills		✓	
	Condoms			
	Depo-Provera (injectable birth control)		✓	
	Withdrawal			
2011	No method was used to prevent pregnancy	✓		
	Birth control pills		✓	
	Condoms			
	Depo-Provera (or any injectable birth control), Nuva Ring (or any birth control ring), Implanon (or any implant), or any IUD		✓	
	Withdrawal			
	Some other method			
	Not sure			
2013-2023	No method was used to prevent pregnancy	✓		
	Birth control pills **		✓	
	Condoms			
	An IUD (such as Mirena or ParaGard) or implant (such as Implanon or Nexplanon)		✓	✓
	A shot (such as Depo-Provera), patch (such as Ortho Evra), or birth control ring (such as NuvaRing)		✓	
	Withdrawal or some other method			
	Not sure			

* LARC, long-acting reversible contraceptive

** In 2021 and 2023, the category 'Birth control pills' was specified to exclude emergency contraception such as Plan B or the "morning after" pill.

Checkmarks indicate which response options were included as using no method, highly/moderately effective method, or LARC.

Supplemental Table D. Percentage and 95% confidence intervals for no long-acting reversible contraceptive (LARC) use among currently sexually active female high school students aged 14 years and older.

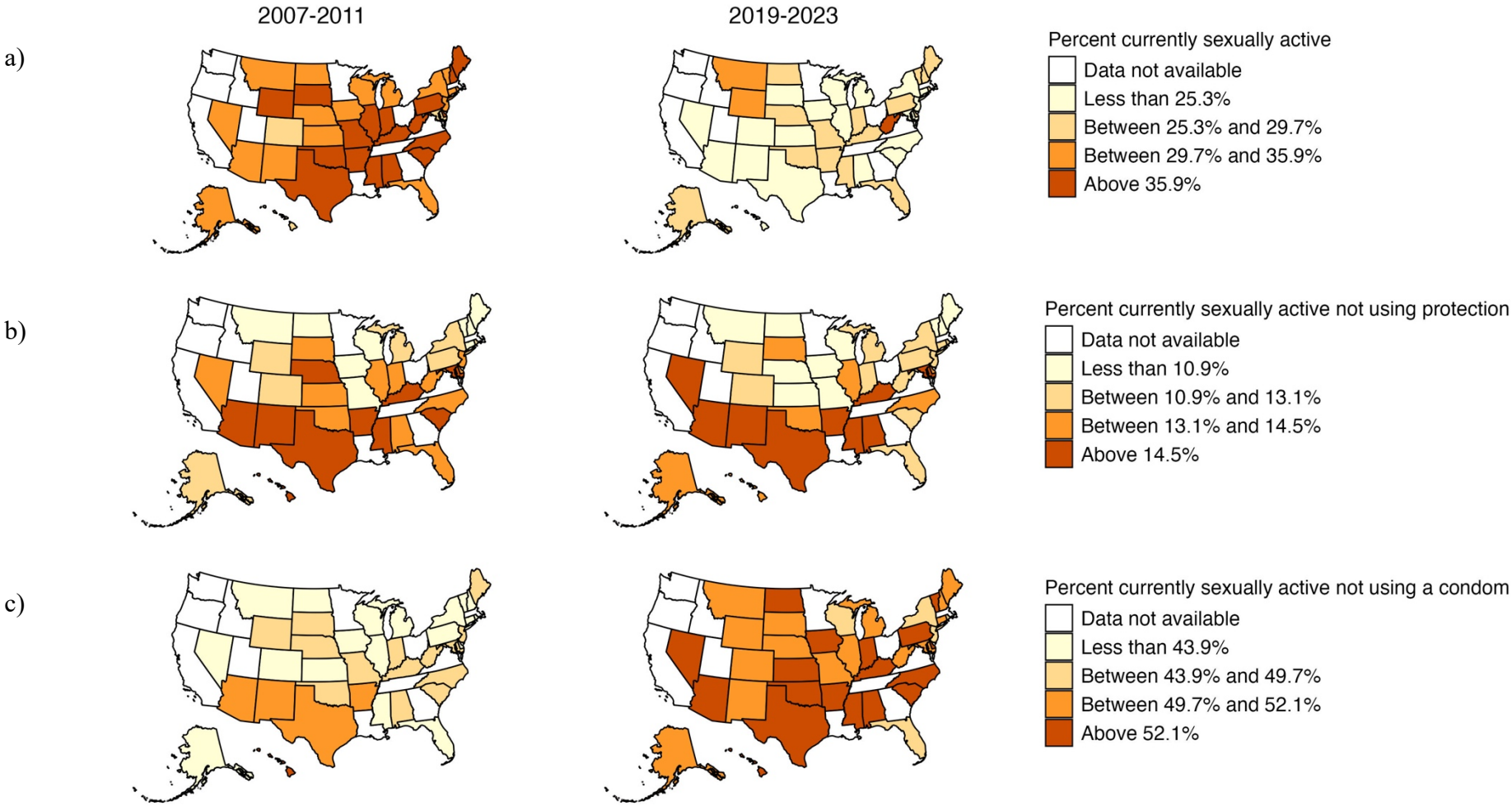
	% Currently sexually active who did not report using a long-acting reversible contraceptive (LARC) as their "one method" for pregnancy prevention in last sexual intercourse					
	2013	2015	2017	2019	2021	2023
National	98.2 (97.3, 98.8)	95.5 (93.6, 96.8) **	94.7 (92.3, 96.3) **	94.6 (92.7, 96.1) **	89.7 (85.1, 93) **	89.9 (87.9, 91.6) **
Age						
14-16 years	98.8 (97.6, 99.4)	96 (93.5, 97.5) **	95 (92.1, 96.8) **	97.1 (95.3, 98.2) *	93.1 (89.6, 95.4) **	93.8 (91.5, 95.5) **
17 and older	97.7 (96.7, 98.5)	95.1 (93.0, 96.6) **	94.4 (91.7, 96.3) **	92.7 (89.8, 94.9) **	86.5 (80.1, 91.0) **	87.0 (84.2, 89.3) **
Race/Ethnicity						
Black	98.3 (95.9, 99.3)	96.3 (92.7, 98.2)	96.1 (90.8, 98.4)	96.5 (91.5, 98.6)	89.6 (79.3, 95.1) *	91.5 (82.7, 96.1)
Hispanic	98.6 (97.1, 99.3)	95.9 (92.7, 97.8) **	95.5 (90.5, 97.9)	98.1 (95.2, 99.2)	91.9 (84.9, 95.8) *	90.2 (85.3, 93.5) **
White	98 (96.7, 98.8)	95.2 (92.5, 97.0) **	93.8 (90.7, 95.9) **	92.4 (89.6, 94.5) **	88.4 (81.7, 92.8) **	89.1 (86.2, 91.4) **

Race and ethnicity was categorized as Black, Hispanic or Latino (Hispanic), and White. (Persons of Hispanic origin might be of any race but are categorized as Hispanic; all racial groups are non-Hispanic.) Sample sizes for Asian, Multiracial, American Indian or Alaska native, and Native Hawaiian or other Pacific Islander were too small for precise estimates.

LARC use was defined as selecting "an IUD (such as Mirena or ParaGard) or implant (such as Implanon or Nexplanon)" as the one method for pregnancy prevention.

* $p < 0.05$, ** $p < 0.01$. All estimates compared to 2013 data.

Supplemental Figure A. Prevalence by state in (a) percent currently sexually active, (b) percent currently sexually active who used no method to prevent pregnancy in last sexual intercourse, and (c) percent currently sexually active who did not use a condom in last sexual intercourse among female high school students aged 14 years and older, 2007-2011 compared to 2019-2023 (YRBS).



Legend colors are defined by quartile cutpoints.