

GENERAL GYNECOLOGY

Sexual orientation differences in teen pregnancy and hormonal contraceptive use: an examination across 2 generations

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OBJECTIVE: To examine whether sexual orientation is associated with disparities in teen pregnancy and hormonal contraception use among adolescent females in 2 intergenerational cohorts.

STUDY DESIGN: Data were collected from 91,003 women in the Nurses' Health Study II (NHSII), born between 1947-1964, and 6463 of their children, born between 1982-1987, enrolled in the Growing Up Today Study (GUTS). Log-binomial models were used to estimate risk ratios for teen pregnancy and hormonal contraception use in sexual minorities compared with heterosexuals and metaanalysis techniques were used to compare the 2 cohorts.

RESULTS: Overall, teen hormonal contraception use was lower and teen pregnancy was higher in NHSII than GUTS. In both cohorts, lesbians were less likely, whereas the other sexual minorities were

more likely, to use hormonal contraception as teenagers compared with their heterosexual peers. All sexual minority groups in both cohorts, except NHSII lesbians, were at significantly increased risk for teen pregnancy, with risk ratios ranging from 1.61 (95% confidence interval, 0.40–6.55) to 5.82 (95% confidence interval, 2.89–11.73). Having an NHSII mother who was pregnant as a teen was not associated with teen pregnancy in GUTS participants. Finally, significant heterogeneity was found between the 2 cohorts.

CONCLUSION: Adolescent sexual minorities have been, and continue to be, at increased risk for pregnancy. Public health and clinical efforts are needed to address teen pregnancy in this population.

Key words: bisexuality, contraceptive agents, health care disparities, homosexuality, pregnancy in adolescence, sexual behavior

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Regardless of intention, teen pregnancy is associated with numerous adverse health and social outcomes.

Compared with women who give birth in their 20s, teens are more likely to experience a quicker repeat pregnancy,

more unemployment, poverty, and welfare reliance, and single parenthood. Infants of teen mothers are more likely to be premature and die before the age of 1 year. Compared with children of older mothers, these children also do more poorly on indicators of health and social wellbeing.^{2,3}

Although research examining pregnancy rates by sexual orientation is sparse, prior studies suggest that sexual minority females (eg, bisexuals, lesbians) may be at heightened risk compared with heterosexual peers.⁴⁻⁶ Risk factors for teen pregnancy, such as earlier sexual initiation and more sexual partners,⁷ are more common in female sexual minorities who report a high proportion of male sexual contacts, a younger age of sexual initiation, and more partners (male or female) compared with heterosexuals.^{4,8,9} Sexual minority females at risk for unintended pregnancy may also be less likely than heterosexual females to use contraceptives, and, in particular, highly effective hormonal

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contraceptives. One study found that this group underutilizes regular reproductive health screenings such as Papanicolaou smears and sexually transmitted infection (STI) tests, in which contraceptive counseling is offered.⁹ In addition, sexual minority adolescent females may have additional risk factors such as engaging in risky sexual behavior with men, to hide their sexual orientation.¹⁰

Sex education,¹¹ contraceptive technology,¹² and attitudes about sexual orientation have changed over time and have affected historic trends in teen pregnancy and contraceptive use.¹³ For example, comprehensive sex education has been shown to reduce teen pregnancy compared with no education or abstinence-only education.¹⁴ In addition, an estimated 60% of sexually active teens report using a highly effective form of contraception (eg, intrauterine devices and hormonal methods) in 2010, which is an increase from 47% in 1995.¹⁵ Contraception is less stigmatized than it was even 1 generation ago and physicians are more likely to raise the issue with patients.¹⁶ Although initial research has been conducted on teen pregnancy among sexual minorities, these studies were of limited power, combined sexual minority groups, and were restricted to a single generation.

Using data from 2 intergenerational longitudinal cohort studies in which participants were teenagers during different periods (Nurses' Health Study II [NHSII] 1969-1983 and Growing Up Today Study [GUTS] 1995-2006), we examined sexual orientation group disparities in teen hormonal contraception use and pregnancy. We explored 3 aims: (1) sexual minority disparities; (2) intergenerational effects; and (3) historic cohort differences. First, we examined whether there were sexual orientation disparities in teen hormonal contraception and pregnancy. Next, we focused on the effect of having a mother with a teen pregnancy on her daughter's risk of teen pregnancy. Thirdly, we formally tested for differences between the 2 generations. For aim 1, we hypothesized that compared with completely heterosexual females, sexual minorities would be less likely to use hormonal contraception as teens in both cohorts. We also

hypothesized sexual minority teenagers would have higher risks of becoming pregnant before age 20 in both the NHSII and GUTS cohorts. For aim 2, we expected having a mother with a teen pregnancy would be associated with her daughter's teen pregnancy risk. Finally for aim 3, we hypothesized that all of the disparities would vary historically and be more pronounced among the NHS cohort compared with the GUTS cohort.

METHODS

Study sample

NHSII is a longitudinal cohort that began in 1989, enrolling 116,678 female nurses from 14 US states. Participants were between 25 and 42 years of age at baseline and born between 1947 and 1964. This cohort has been, and continues to be, followed with the use of biennial mailed questionnaires to update information on health-related behavior and to determine incident disease outcomes. In 1996, the NHSII women provided consent and contact information for their children between the ages of 9 and 14 years, born between 1982 and 1987, thereby creating another longitudinal cohort known as the GUTS. Questionnaires were mailed to more than 25,000 of these children; 9039 girls (68%) and 7843 (58%) boys returned completed questionnaires, indicating their consent. When NHSII or GUTS participants failed to respond to the first few mailings, extensive follow-up procedures were implemented to ensure a high response rate. More detailed information on recruitment and study protocols are available elsewhere.^{17,18} We limited the current analysis to female NHSII and GUTS participants who reported their sexual orientation, age, race, and geographic region ($n = 88,398$). This study was approved by the Brigham and Women's Hospital institutional review board.

Measures

Sexual orientation

In 1995, the following question was added to the long form of the NHSII questionnaire, after being pilot tested:¹⁹ "Whether you are currently sexually active, what is your sexual orientation or identity? (Please choose one answer).

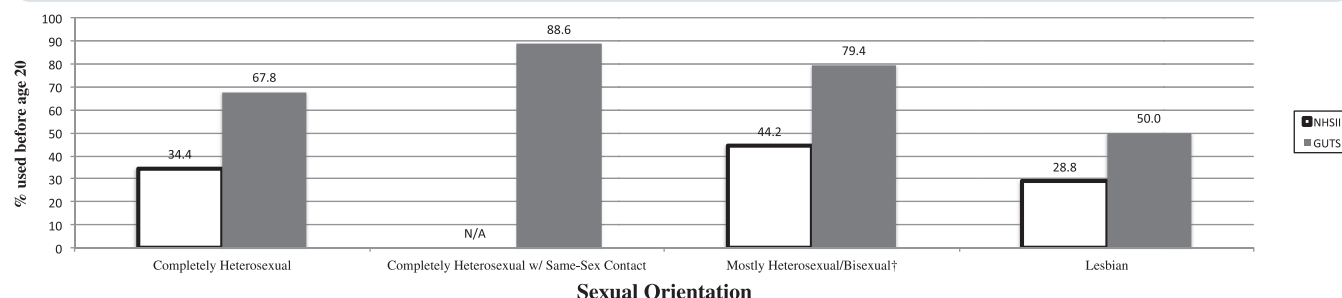
(1) Heterosexual, (2) Lesbian, gay, or homosexual, (3) Bisexual, (4) None of these, (5) Prefer not to answer." For ease of interpretation, analyses did not include participants who responded with "None of these" or "Prefer not to answer" (1%, $n = 616$).

Sexual orientation is measured in GUTS with a question adapted from the Minnesota Adolescent Health Survey²⁰ asking about identity and feelings of attraction: "Which of the following best describes your feelings? (1) Completely heterosexual (attracted to persons of the opposite sex), (2) Mostly heterosexual, (3) Bisexual (equally attracted to men and women), (4) Mostly homosexual, (5) Completely homosexual (gay/lesbian, attracted to persons of the same sex), (6) Not sure." We collapsed the "mostly heterosexual" and "bisexual" groups to form 1 category, because preliminary analyses showed that associations with predictors and outcomes were similar in the 2 groups and combining them increased statistical power. Similarly, the "mostly homosexual" and "completely homosexual" responses were combined to form a lesbian category. Again, analyses did not include participants who were unsure ($n = 6$) or missing ($n = 14$) the orientation item response. In addition, the sex of participants' sexual contacts was measured with an item reading: "During your life, the person(s) with whom you have had sexual contact is (are)..." Responses included "I have not had sexual contact with anyone," "Females," "Males," or "Female(s) and Male(s)." An indicator variable was used for missing data on the sex of sexual contacts ($n = 33$). An individual could therefore endorse being a sexual minority through their identity/attractions in the first question above and/or through their behavior in the next question.

This analysis used the most recently available data in NHSII from 1995 to categorize the following sexual orientation groups for that cohort as: "heterosexual," "bisexual," or "lesbian, gay, or homosexual." The most recently available GUTS data from 2007 were used to categorize that cohort into the following groups: "completely heterosexual" with no same-sex partners, "completely

FIGURE 1

Teen hormonal contraceptive use in 2 intergenerational cohorts* of US females



*The NHSII participants were born between 1947-1964 and their children, born between 1982-1987, were enrolled in the GUTS; †Includes NHSII bisexuals and GUTS mostly heterosexuals/bisexuals.

GUTS, Growing Up Today Study; NHSII, Nurses' Health Study II.

Charlton. Sexual orientation and teen pregnancy. *Am J Obstet Gynecol* 2013.

heterosexual" with same-sex partners, "mostly heterosexual/bisexual," or "mostly homosexual/completely homosexual."

Teen hormonal contraceptive use

NHSII participants reported their history of using oral contraceptives on the 1989 baseline questionnaire. Beginning in 1999, each GUTS questionnaire has included various questions about oral contraceptives as well as more newly available hormonal contraceptives (Supplementary Table; Appendix). We categorized participants as a teen hormonal contraception user if they reported any such use before age 20 (Figure 1).

Teen pregnancy

Similarly, NHSII participants reported their pregnancy histories on the 1989 baseline questionnaire. Beginning in 1999, each GUTS questionnaire included questions about pregnancy (Supplementary Table; Appendix). We defined teen pregnancy as occurring before the age of 20. Using this definition enabled comparisons between our findings and the previous literature on teen pregnancy, including among sexual minorities (Figure 2).

Covariates

Additional covariates included age, race, and geographic region based on a priori knowledge and available data in both cohorts. Age and racial information were collected on both baseline cohort questionnaires in 1989 for NHSII and 1996 for GUTS. Geographic region was accessed in NHSII from an item on the

1993 questionnaire that read: "In which state did you live at age 15?" GUTS geographic region was collected on each questionnaire, so we assigned the region at which each participant indicated they lived at age 15. Analyses did not include participants who did not report their race ($n = 1798$; 1.5% in NHSII and $n = 26$; 0.4% in GUTS) or geographic region ($n = 2007$; 2.1% in NHSII). GUTS participants who reported living outside of the United States at age 15 were also excluded due to small sample size ($n = 11$).

Statistical analysis

Descriptive statistics and multivariable regression analyses were conducted using SAS statistic software 9.2 (SAS Institute, Cary, NC). All analyses were cross-sectional with heterosexual females in NHSII and completely heterosexual females with no same-sex partners in GUTS as the reference groups. Log-binomial models were used to estimate risk ratios (RRs) and 95% confidence intervals (CIs) for the outcomes of teen hormonal contraceptive use and pregnancy.^{22,23} When the models did not converge, log-Poisson models were used, which provide consistent but not fully efficient estimates of the RR and its 95% CI.²⁴ Generalized estimating equations (GEE) were used to account for sibling clusters in GUTS.

Additional analyses were conducted to examine the effect of having a NHSII mother who was pregnant as a teen on the risk of having a pregnancy before age 20

years among GUTS participants. Finally, the 2 cohorts were compared on both outcomes using metaanalysis techniques to examine heterogeneity.^{25,26} Statistical tests for between-study heterogeneity were the χ^2 test for heterogeneity (Cochran Q-statistic) and the I^2 statistic, which estimates the proportion of total variance because of between-study variability.

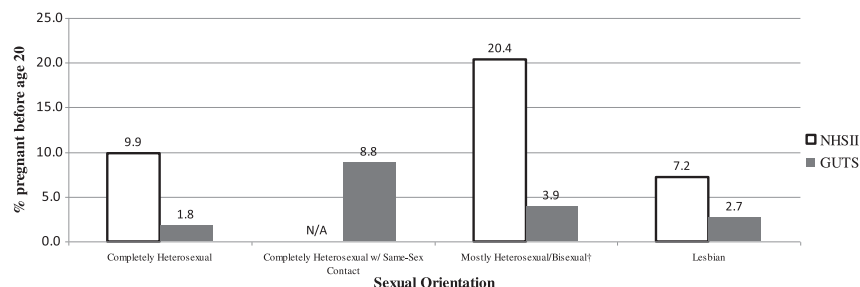
RESULTS

Among the 81,974 NHSII participants included in the analyses, 99% described themselves as heterosexual, <1% as bisexual, and 1% as lesbian. Among the 6424 GUTS female participants included in the analyses, 84% described themselves as completely heterosexual, 1% as completely heterosexual with same-sex partners, 14% as mostly heterosexual/bisexual, and 1% as lesbian. Table 1 displays further characteristics of the 2 cohorts by sexual orientation. Teen hormonal contraception use was reported by 34% of NHSII women and 69% of GUTS participants, although 10% of NHSII women (mean age, 18.0 years) and 2% of GUTS participants (mean age, 17.9 years) reported a teen pregnancy.

The multivariable RRs for teen hormonal contraception use and pregnancy are displayed in Table 2 after adjusting for age, race, and geographic region. In both cohorts, lesbians were less likely, whereas the other sexual minorities (NHSII: bisexuals, GUTS: completely heterosexuals with same-sex partners and mostly heterosexual/bisexuals) were

FIGURE 2

Teen pregnancy in 2 intergenerational cohorts* of US females



*The NHSII participants were born between 1947-1964 and their children, born between 1982-1987, were enrolled in the GUTS;

†Includes NHSII bisexuals and GUTS mostly heterosexuals/bisexuals.

GUTS, Growing Up Today Study; NHSII, Nurses' Health Study II.

Charlton. Sexual orientation and teen pregnancy. *Am J Obstet Gynecol* 2013.

more likely, to use hormonal contraception as teenagers compared with their heterosexual peers. All sexual minority groups, except NHSII lesbians, were at increased risk for teen pregnancy, with RRs as high as 5.82 (95% CI, 2.89–11.73) among GUTS participants who identified as completely heterosexual with same-sex partners (pregnancy $n = 8$). Having a NHSII mother who was pregnant as a teen was not associated with teen pregnancy in GUTS participants on a univariate level nor did it have any effect in further adjusting the multivariable sexual orientation model. Finally, significant heterogeneity was found between the 2 cohorts for teen hormonal contraceptive use and pregnancy, with the I^2 value estimating 92% ($P = .01$) and 95% ($P = .003$), respectively, of the total variance due to between-study variability.

COMMENT

Although teen pregnancy rates were dramatically reduced in a single generation, our study showed that there were sexual orientation disparities in teen hormonal contraception use and pregnancy that have persisted across 2 generations. The general trends are consistent with findings from other national data sources, which report steadily rising teen pregnancy rates while NHSII participants were teens (1969-1983).¹ By the time GUTS participants were teens, the teen pregnancy rate decreased

41%.²⁷ A decrease in both birth and abortion rates demonstrates that intended and unintended pregnancy rates declined.¹ This decline was attributed to reduced sexual activity and increased contraceptive use.²⁸

All sexual minority groups in both cohorts were at increased risk for teen pregnancy, except NHSII lesbians, with relative risks as high as 5-fold. Although few studies have examined this issue, our findings are supported by the literature,^{6,8,29} but these studies were limited in power and combined sexual minorities into a single category. Saewyc et al²⁹ reported that from a sample of 3816 adolescents in Minnesota, 12.3% of bisexuals/lesbians (combined) experienced a teen pregnancy compared with 5.3% of heterosexual adolescents. Another study explored teen pregnancy rates by sex and sexual orientation in 6 school-based cohorts from various regions around the US. Again, bisexual and lesbian teens were more likely in each region to report pregnancy histories than heterosexual peers.²⁹

The origins of these disparities are complex. First, factors associated with teen pregnancy in the general population⁷ such as earlier sexual initiation,^{9,33-45} more sexual partners,^{4,9} and ineffective contraception^{8,33,34} are more common in sexual minorities. Adolescents who have been sexually abused are more likely to report these risks³⁰ as are homeless youth.^{31,32} Sexual minority

youth are more likely to report being sexually abused^{8,34} and make up a disproportionately large portion of homeless youth.³⁶ Heterosexual women with same-sex partners might be at especially high risk for teen pregnancy because of particular risk factors. For example, having same-sex partners despite identifying as a heterosexual could be a marker for risky behavior. Previous studies in this cohort also indicate that these women have more than twice as much sexual abuse history compared with their heterosexual peers.³⁷

There may also be risk factors that are specific to sexual minority adolescents. For example, they may engage in strategies to avoid or cope with stigma about their sexual orientation^{10,38} including sexual intercourse with the opposite sex and subsequent pregnancy involvement. Increased substance abuse among sexual minorities may be another coping strategy^{39,40} that can lead to unintended and unprotected sexual intercourse. Finally, sexual minority health is often overlooked in sex education so these youth may not receive appropriate education and counseling about contraception and other healthy decisions.¹⁰

When examining intergenerational affects, having a NHSII mother who was pregnant as a teen was not associated with increased risk for a teen pregnancy among the GUTS children nor did it have any affect in further adjusting the multivariable sexual orientation model. Teenage pregnancy is a complex phenomenon and involves numerous risk factors as well as protective mechanisms. Matrices and causal models have been published that include hundreds of variables,⁴² such as poverty, growing up in a single-family household, and, most importantly, unprotected sexual intercourse. Some studies have found that being the child of teenage parents was a risk factor for a having a teen pregnancy^{3,43} but our results did not support this.

The significant cohort differences likely exist for many reasons. NHSII women may have been less likely to use hormonal contraceptives than GUTS participants because these were not as

TABLE 1

Demographics and teen pregnancy and hormonal contraceptive use by sexual orientation in 2 intergenerational cohorts^a of US females (n = 88,398)

Cohort	Heterosexual (n = 81,053)	Bisexual (n = 283)	P value ^b	Lesbian (n = 638)	P value ^b		
NHSII (n = 81,974)							
Mean baseline age, years (SD) (range, 24–44 y)	34.5 (4.7)	35.2 (4.4)	.01	35.3 (4.6)	< .0001		
White race, % (n) ^c	94.2 (76,372)	94.4 (267)	.93	96.9 (618)	.003		
Geographic region at age 15, % (n) ^c							
Midwest	36.5 (29,547)	26.5 (75)		27.6 (176)			
West	10.8 (8769)	12.7 (36)		15.7 (100)			
South	13.4 (10,887)	13.4 (38)		15.7 (100)			
Northeast	37.3 (30,253)	44.5 (126)		38.2 (244)			
International	2.0 (1597)	2.8 (8)	< .0001	2.8 (18)	.001		
Hormonal contraceptive use <20 y old, % (n)	34.4 (27,870)	44.2 (125)	< .0001	28.8 (184)	.003		
Pregnancy <20 y old, % (n)	9.9 (7882)	20.4 (56)	< .0001	7.2 (44)	.02		
	Completely heterosexual (n = 5368)	Completely heterosexual with same-sex partners (n = 91)	P value ^b	Mostly heterosexual/bisexual (n = 891)	P value ^b	Lesbian (n = 74)	P value ^b
GUTS (n = 6424)							
Mean baseline age, years (SD) (range, 9–15)	11.5 (1.6)	12.2 (1.5)	< .0001	11.7 (1.6)	.0006	12.0 (1.6)	.004
White race, % (n)	94.1 (5052)	96.7 (88)	.20	90.0 (802)	< .0001	91.9 (68)	.70
Geographic region at age 15, % (n)							
Midwest	36.6 (1967)	35.2 (32)		30.4 (271)		23.0 (17)	
West	13.7 (734)	13.2 (12)		19.6 (175)		10.8 (8)	
South	14.8 (792)	16.5 (15)		11.5 (102)		21.6 (16)	
Northeast	34.9 (1875)	35.2 (32)	.39	38.5 (343)	.37	44.6 (33)	.62
Hormonal contraceptive use <20 y old, % (n)	67.8 (3535)	88.6 (78)	< .0001	79.4 (681)	< .0001	50.0 (34)	.004
Pregnancy <20 y old, % (n)	1.8 (95)	8.8 (8)	.02	3.9 (35)	.001	2.7 (2)	.64
NHSII mother had teen pregnancy, % (n)	7.1 (356)	12.6 (11)	.04	9.0 (76)	.06	5.9 (4)	.68

CI, confidence interval; GUTS, Growing Up Today Study; NHSII, Nurses' Health Study II; RR, risk ratio.

^a The NHSII participants were born between 1947–1964 and their children, born between 1982–1987, were enrolled in GUTS; ^b P values estimated by generalized estimating equation regression and heterosexual (NHS)/completely heterosexual (GUTS) is referent group.

Charlton. Sexual orientation and teen pregnancy. *Am J Obstet Gynecol* 2013.

readily available during earlier generations. The FDA approved oral contraceptives for birth control use in 1960 when all of the NHSII participants were <13 years old, though some states prohibited their use in unmarried women.

This statute was overturned in 1972, when NHSII women were aged 8–25 years, with *Eisenstadt v. Baird*.²¹ The average age of marriage was also lower when NHSII participants were teenagers compared with their daughters⁴¹ so

more of the teen pregnancies among NHSII women may have been planned. However, because collecting accurate information about pregnancy intention is difficult, we cannot examine this dimension.¹ Nonetheless, even if a teen

TABLE 2

Multivariable RRs^a for teen hormonal contraceptive use and pregnancy in 2 intergenerational cohorts^b of US females (n = 88,398)

Variable	Teen hormonal contraceptive use RR (95% CI)	Teen pregnancy RR (95% CI)
NHSII (n = 81,974)		
Heterosexual (n = 81,053)	ref	ref
Bisexual (n = 283)	1.26 (1.12–1.43)	2.08 (1.64–2.62)
Lesbian (n = 638)	0.84 (0.75–0.95)	0.72 (0.54–0.96)
GUTS (n = 6424)		
Completely heterosexual (n = 5368)	ref	ref
Completely heterosexual with same-sex partners (n = 91)	1.21 (1.16–1.26)	5.82 (2.89–11.73)
Mostly heterosexual/bisexual (n = 891)	1.11 (1.07–1.15)	2.28 (1.53–3.39)
Lesbian (n = 74)	0.72 (0.57–0.90)	1.61 (0.40–6.55)

CI, confidence interval; GUTS, Growing Up Today Study; NHSII, Nurses' Health Study II; RR, risk ratio.

^a All models adjusted for age, race (white/nonwhite), and region (Northeast [ref], Midwest, West, South, and International); ^b The NHSII participants were born between 1947–1964 and their children, born between 1982–1987, were enrolled in GUTS.

Charlton. Sexual orientation and teen pregnancy. *Am J Obstet Gynecol* 2013.

pregnancy is planned and wanted, the outcomes are still worse overall for the mother and her child compared with having a child later in adulthood.

Some limitations should be mentioned. All of the NHSII women are nurses and the GUTS participants are the children of nurses. Therefore, neither group is a nationally representative sample, which could limit generalizability. Sexual orientation effects would need to differ by socioeconomic status or race to limit generalizability so this should also be further explored in future analyses. Daughters of nurses may have more health care access than the general population, which could lead to an overestimation of hormonal contraceptive use. Because our study population included professional women along with their children, the majority of whom were white, the absolute risk of teen pregnancy in this population is lower than the national average and therefore does not capture the full extent of this public health problem. Sexual orientation was measured slightly differently in the 2 cohorts, but this is a complex measurement and methods are progressing. Sexual identity and behavior are fluid so we also cannot know the

circumstances of each teen pregnancy nor how the participants identified in regards to the sexual orientation at the time of the pregnancy. Using a single measure of sexual orientation may also have led to some misclassification. Measurement of other types of contraceptives was limited so we could not explore this. We were also able to study only female adolescents, though there is evidence to believe that teen male sexual minorities are at increased risk for having a pregnancy involvement.^{8,44}

Nonetheless, our analysis contributed in new ways and had a number of strengths such as the large sample not recruited on the basis of sexual orientation. This is the first study, to our knowledge, to examine teen contraceptive use and pregnancy among various sexual orientation subgroups and across generations, allowing us to examine historical trends as well as the intergenerational effects of a teen pregnancy. We were able to more precisely observe different sexual orientation identity groups, highlighting the differences not only between heterosexuals and sexual minorities but also across sexual minority subgroups.

Although teen pregnancy rates have declined over the last few decades in part

because of increased use of effective contraception, there are still disparities by sexual orientation. Clinical and public health practitioners need to be aware of such disparities and develop innovative ways to help these women avoid pregnancy during adolescence and subsequent adverse outcomes for the parents and children.

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APPENDIX

SUPPLEMENTARY TABLE

Questionnaire information by cohort

Question	Year
NHSII	
"Mark each age of oral contraceptive (OC) use for...2 months or more" and "...a full year (10+ months)."	1989
"Mark each age you...completed a pregnancy lasting 6 months or more" and "...completed a pregnancy lasting less than 6 months."	1989
GUTS	
"The last time you had sexual intercourse, what method(s) did you or your partner use to prevent pregnancy?" including a "birth control pill" response.	1999
"Have you ever used birth control pills or injectable estrogen (Lunelle) for any reason?"	2001
"Have you ever used birth control pills, patch (Ortho-Evra), ring (Nuvaring), Depo Provera, or injectable estrogen (Lunelle) for any reason?"	2003+
"How many times have you been pregnant?"	1999
"Have you been pregnant or are currently pregnant?"	2001
"Have you been pregnant or breast feeding in the past year?"	2003+

Depo Provera, Pharmacia and Upjohn, New York, NY; Lunelle, Pharmacia and Upjohn, New York, NY; Nuvaring, Merck and Co., Whitehouse Station, NJ; Ortho-Evra, Janssen Pharmaceuticals, Inc., Titusville, NJ.

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