



Editor's Choice

Sexual Orientation Differences in Pregnancy and Abortion Across the Lifecourse



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Article history: Received 12 February 2019; Received in revised form 21 October 2019; Accepted 30 October 2019

ABSTRACT

Objectives: We examined sexual orientation-related differences in various pregnancy outcomes (e.g., teen pregnancy, abortion) across the lifespan.

Methods: We collected data from 124,710 participants in three U.S. longitudinal cohort studies, the Nurses' Health Study 2 and 3 and Growing Up Today Study 1, followed from 1989 to 2017. Multivariate regression was used to calculate differences of each outcome—ever had pregnancy, teen pregnancy, ever had abortion, and age at first birth—by sexual orientation groups (e.g., heterosexual, mostly heterosexual, bisexual, lesbian), adjusting for potential confounders of age and race/ethnicity.

Results: All sexual minority groups—except lesbians—were generally more likely than heterosexual peers to have a pregnancy, a teen pregnancy, and an abortion. For example, Growing Up Today Study 1 bisexual participants were three times as likely as heterosexuals to have had an abortion (risk ratio, 3.21; 95% confident interval, 1.94–5.34). Lesbian women in all of the cohorts were approximately half as likely to have a pregnancy compared with heterosexual women.

Funding: This work was supported by the National Institutes of Health, United States [grant numbers F32HD084000, K99ES026648, R01HD057368, R01HD066963, UM1CA176726, U01HL145386, and R24ES028521], Maternal and Child Health Bureau, United States [grant numbers T71MC00009, T76MC00001], American Cancer Society, United States [grant number MRSG CPHPS 130006], Society of Family Planning, United States [grant number SHPRF9-18], the Aerosmith Endowment Fund for Prevention and Treatment of AIDS and HIV Infections at Boston Children's Hospital, and the Breast Cancer Research Foundation.

Dr. Charlton was supported by grant F32HD084000 and Dr. Austin by R01HD057368 and R01HD066963 from the Eunice Kennedy Shriver National Institute of Child Health and Human Development, National Institutes of Health. Dr. Charlton was additionally supported by grant MRSG CPHPS 130006 from the American Cancer Society, grant SHPRF9-18 from the Society for Family Planning, and the Aerosmith Endowment Fund for Prevention and Treatment of AIDS and HIV Infections at Boston Children's Hospital. Dr. Gaskins was supported by

K99ES026648 from the National Institute of Environmental Health Sciences, National Institutes of Health. Dr. Austin was additionally supported by grants T71MC00009 and T76MC00001 from the Maternal and Child Health Bureau, Health Resources and Services Administration. The cohorts [noted in brackets] were supported by UM1CA176726 [Nurses' Health Study 2] from the National Cancer Institute, U01HL145386 [Nurses' Health Study 2 and 3, Growing Up Today Study] from the National Heart, Lung, and Blood Institute, and R24ES028521 [Nurses' Health Study 3] from the National Institute of Environmental Health Sciences, National Institutes of Health. The Nurses' Health Study 3 was also supported by a grant from the Breast Cancer Research Foundation.

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Few sexual orientation group differences were detected in age at first birth.

Conclusions: The increased risk of unintended pregnancy among sexual minority women likely reflects structural barriers to sexual and reproductive health services. It is critical that sex education programs become inclusive of sexual minority individuals and medical education train health care providers to care for this population. Health care providers should not make harmful heteronormative assumptions about pregnant patients and providers must learn to take sexual histories as well as offer contraceptive counseling to all patients who want to prevent a pregnancy regardless of sexual orientation.

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One in five women in the United States is a sexual minority, as defined by having same-sex attractions, having same-sex partners, or identifying as lesbian/gay/bisexual (Centers for Disease Control and Prevention, 2018). Although it may seem counterintuitive, compared with heterosexual women, sexual minority women are more likely to have teen (Charlton et al., 2013; Goodenow, Szalacha, Robin, & Westheimer, 2008; Lindley & Walsemann, 2015; Riskind, Tornello, Younger, & Patterson, 2014; Saewyc, Bearinger, Blum, & Resnick, 1999; Saewyc, Poon, Homma, & Skay, 2008) and unintended (Everett, McCabe, & Hughes, 2016, 2017; McCauley et al., 2015) pregnancies. Research suggests that, compared with heterosexual women, sexual minority women are more often exposed to established risk factors (e.g., earlier sexual initiation [Charlton et al., 2011]) for teen and unintended pregnancy; sexual minority women also have additional risk factors that are unique to their experiences (Charlton et al., 2018; Everett et al., 2016; Saewyc et al., 2008; Travers, Newton, & Munro, 2011). There is now a growing literature that suggests similar differences exist in abortion prevalence across sexual orientation groups. Compared with heterosexual women, lesbian women are less likely to have abortions (Dibble, Roberts, & Nussey, 2004; Dibble, Roberts, Robertson, & Paul, 2002; Moegelin, Nilsson, & Helström, 2010), whereas bisexual women are as likely (Chetcuti et al., 2013; Saewyc et al., 1999) or more likely (Fethers, Marks, Mindel, & Estcourt, 2000; Lhomond & Saurel-Cubizolles, 2006; Mercer et al., 2007; Tornello, Riskind, & Patterson, 2014). Some of the most robust studies estimate bisexual women are three times as likely as heterosexual women to have had an abortion (Lhomond & Saurel-Cubizolles, 2006; Mercer et al., 2007; Tornello et al., 2014).

These emerging data on sexual orientation-related pregnancy and abortion disparities have been critical in highlighting the reproductive health needs of all women, regardless of sexual orientation. However, these studies have methodological limitations. The majority of these studies are cross-sectional, making longitudinal analyses across the lifespan impossible. Small sample sizes have resulted in the combination of sexual minority subgroups, such as bisexual and lesbian groups, despite their possibly different patterns of abortion prevalence. Sexual orientation is often defined using only one of its three dimensions (i.e., attraction, identity, behavior) at a single time point, leading to misclassification. Additionally, few data beyond abortion prevalence are available in these studies, such as lifetime pregnancy histories, that might help researchers to better characterize the reproductive health experiences and needs of sexual minority women.

This study aims to address some of these gaps by utilizing data from three U.S. longitudinal cohort studies with more than 125,000 participants who provided detailed data on their sexual orientation and pregnancies. To our knowledge, this is the largest study on sexual orientation-related disparities in pregnancy and abortion that includes information about timing of these outcomes across women's lifespans.

Methods

Study Population

The Nurses' Health Study (NHS) 2 began in 1989 when 116,430 nurses, cisgender women aged 25–42 years, completed questionnaires about their medical history and health behaviors. Nurses were recruited from the 14 most populous states where state nursing board mailing lists were readily available. In 1996, the NHS2 women enrolled 16,881 of their girl and boy children aged 9–14 years into the Growing Up Today Study (GUTS) 1. NHS3 began in 2010 as an open cohort with nurses, aged 19–46 years; current enrollment includes 45,080 cisgender women. Data collection is ongoing in each cohort via annual or biennial questionnaires that are mailed and available online. When participants fail to respond to initial mailings, study staff implement extensive follow-up procedures to ensure a high response rate; for example, even the longest running cohort of NHS2 has a follow-rate of greater than 90%.

The current analysis was limited to women participants who reported their sexual orientation between enrollment at baseline and the end of follow-up in 2017 ($N = 124,710$). This study was approved by the Brigham and Women's Hospital Institutional Review Board.

Measures

Sexual orientation

The following question was included on the NHS2 questionnaire in 1995 and 2009, after being pilot tested (Case et al., 2006): "Whether or not 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." No information about the sex of sexual partners was collected in NHS2.

Detailed information about sexual orientation has been collected on every GUTS1 questionnaire starting in 1999. The item was adapted from the Minnesota Adolescent Health Survey (Remafedi, Resnick, Blum, & Harris, 1992), which asks about feelings of attraction and identity with six mutually exclusive response options (completely heterosexual, mostly heterosexual, bisexual, mostly homosexual, completely homosexual, and unsure). We combined data from this item with a question about the sex of sexual partners. Partners were reported as "I have not had sexual contact with anyone," "females," "males," and "males and females" in their lifetime. We combined the item about feelings of attraction/identity with this sexual partners item to create an additional sexual minority group (completely heterosexual women with same-sex partners). The term "sexual contact" was not defined for the participants, so this was not restricted to penile–vaginal sexual intercourse. Similar sexual orientation

information to GUTS1 was collected on the fifth follow-up questionnaire in NHS3 starting in 2013.

For the current analyses, we used the participant's most recent report of sexual orientation (e.g., GUTS1 2013, NHS2 2009, NHS3 questionnaire 5). If data were missing, we imputed with the most recent previous response. As has been consistently done in prior literature (Charlton et al., 2013), sexual orientation groups were modeled as completely heterosexual (included GUTS1 and NHS3 "completely heterosexual with no same-sex partners" and NHS2 "heterosexual"); completely heterosexual with same-sex partners (included GUTS1 and NHS3 corresponding category); mostly heterosexual (included GUTS1 and NHS3 corresponding category); bisexual (included GUTS1, NHS2, and 3 corresponding category); and lesbian (included GUTS1 and NHS3 "mostly homosexual" and "completely homosexual" and NHS2 "lesbian, gay, or homosexual"). We also ran sensitivity analyses using different sexual orientation reports (e.g., ever reporting a sexual minority status, reporting a sexual minority status before first pregnancy, reporting a change in sexual orientation [Ott, Corliss, Wypij, Rosario, & Austin, 2011]). When data were available on the sex of sexual partners, we also ran sensitivity analyses excluding women who never in their lifetime had men as sexual partners.

Pregnancy

Participants in NHS2 and NHS3 provided full pregnancy histories at baseline (NHS2 in 1989; NHS3 in 2010) and then reported on any subsequent pregnancies on each biennial questionnaire. Beginning in 1999, GUTS1 participants reported their lifetime pregnancies and continued to report any subsequent pregnancies on each subsequent questionnaire. For the current analyses, we categorized participants as ever having a pregnancy as well as ever having a pregnancy before age 20 years (i.e., teen pregnancy). Additionally, we also examined participants' age at first birth among parous participants ($N = 116,570$) in the NHS2 and NHS3 cohorts where such data were available; these data were not available in the GUTS1 cohort.

Abortion

On the 1993 NHS2 questionnaire, participants reported their lifetime history of induced abortions by replying to the question, "Have you ever had an induced abortion before the sixth month of pregnancy?" Response options included "no," "yes," and, if "yes," at what age(s). On each subsequent biennial questionnaire

through 2009, participants were asked whether they had been pregnant in the previous 2-year period and whether pregnancies that lasted less than 6 months ended in induced abortions. Abortion is substantially underreported on surveys of this type (Jones & Kost, 2007; Lindberg & Scott, 2018; Tierney, 2019) and we consider this prevalence to be a minimum estimate. More than 99% of participants provided information on this abortion item at least once throughout follow-up. Similar items were asked of GUTS1 participants starting in 2010 and of NHS3 participants at baseline starting in 2010.

Confounders

All analyses were stratified by cohort. Baseline age in years and race/ethnicity (White, another race/ethnicity) were included in multivariable analyses as potential confounders. In sensitivity analyses, we further adjusted for proxy measures that are known to increase the risk of pregnancy (i.e., age at coitarche and number of sexual partners [men and/or women partners]). If any confounder data were missing, these were imputed from previous questionnaire years; if no such data were available, then multiple imputation procedures were used.

Statistical Analysis

Across sexual orientation groups, we first examined the prevalence of each outcome (ever pregnancy, ever teen pregnancy, age at first birth, and ever abortion). All p values were calculated using analysis of variance for continuous variables and χ^2 tests for categorical variables. All analyses used completely heterosexual women with no same-sex partners in GUTS1 and NHS3 and heterosexual women in NHS2 as the reference group. Multivariable regression from log-binomial models was used for dichotomous outcomes to calculate risk ratios (RR) and 95% confidence intervals (CI). When models did not converge, log-Poisson models were used, providing consistent but not fully efficient estimates (Zou, 2004). Linear regression with the robust sandwich estimator was used for continuous outcomes to calculate adjusted mean differences between groups and standard errors. To account for sibling clusters in GUTS1, we estimated the variance using generalized estimating equations with a compound symmetry working correlation matrix.

We calculated the RRs or mean differences of each outcome by sexual orientation groups (referent = completely heterosexual with no same-sex partners in GUTS1 and NHS3; heterosexual

Table 1
Demographic Characteristics by Sexual Orientation in Three Cohorts* of U.S. Women ($N = 124,710$)

Demographic Characteristics	Heterosexual (NHS2) or Completely Heterosexual with No Same-Sex Partners (GUTS1/NHS3)	Completely Heterosexual with Same-Sex Partners	Mostly Heterosexual	Bisexual	Lesbian
GUTS1 ($n = 8,141$)	(76.4%; $n = 6,218$)	(4.7%; $n = 386$)	(15.3%; $n = 1,243$)	(2.1%; $n = 168$)	(1.6%; $n = 126$)
Age at baseline,† mean years (SD), range, 8–15	11.6 (1.6)	11.7 (1.7)	11.6 (1.6)	11.4 (1.6)	11.8 (1.6)
White race/ethnicity, % (n)	97.1 (6013)	95.6 (366)	96.3 (1192)	94.6 (158)	94.4 (119)
NHS2 ($n = 99,850$)	(98.7%; $n = 98,509$)			(0.4%; $n = 415$)	(0.9%; $n = 926$)
Age at baseline,† mean years (SD), range, 24–44	34.4 (4.7)			34.9 (4.7)	35.1 (4.5)
White race/ethnicity, % (n)	94.1 (91346)			93.6 (382)	95.7 (876)
NHS3 ($n = 16,719$)	(82.5%; $n = 13,792$)	(2.5%; $n = 410$)	(11.4%; $n = 1,910$)	(1.8%; $n = 300$)	(1.8%; $n = 307$)
Age at baseline,† mean years (SD), range, 19–49	33.6 (7.1)	33.5 (6.6)	32.3 (6.6)	33.0 (6.2)	35.4 (7.0)
White race/ethnicity, % (n)	94.5 (12894)	96.8 (392)	95.3 (1805)	96.3 (286)	93.4 (281)

Abbreviations: GUTS, Growing Up Today Study; NHS, Nurses Health Study; SD, standard deviation.

* GUTS1 participants were born 1982–1987, NHS2 1947–1964, and NHS3 1965–1995.

† Baseline: GUTS1 (1996), NHS2 (1989), NHS3 (2010).

Table 2
Frequency of Pregnancy and Abortion by Sexual Orientation in Three Cohorts of U.S. Women (N = 124,710)

Pregnancy and Abortion	Heterosexual (NHS2) or Completely Heterosexual With No Same-Sex Partners (GUTS1/NHS3)	Completely Heterosexual with Same-Sex Partners	Mostly Heterosexual	Bisexual	Lesbian	p [†]
GUTS1 [‡] (n = 8,141)	(76.4%; n = 6,218)	(4.7%; n = 386)	(15.3%; n = 1,243)	(2.1%; n = 168)	(1.6%; n = 126)	<.0001
Pregnancy, in lifetime, % (n)	24.8 (1,430)	35.9 (138)	23.4 (281)	29.5 (48)	10.9 (13)	<.0001
Pregnancy, age <20 years, % (n)	1.6 (92)	3.7 (14)	2.0 (24)	2.5 (4)	1.7 (2)	.05
Abortion, in lifetime, % (n)	3.3 (145)	11.7 (43)	7.6 (75)	10.5 (15)	1.9 (2)	<.0001
NHS2 (n = 99,850)	(98.7%; n = 98,509)			(0.4%; n = 415)	(0.9%; n = 926)	<.0001
Pregnancy, in lifetime, % (n)	88.0 (86,559)			70.4 (292)	40.4 (374)	<.0001
Pregnancy, age <20 years, % (n)	10.0 (9,828)			19.8 (82)	7.2 (67)	<.0001
Age at first birth, mean years (SD)	26.6 (4.8)			26.3 (5.8)	25.6 (5.6)	.002
Abortion, in lifetime, % (n)	18.4 (18,098)			32.8 (136)	14.9 (138)	<.0001
NHS3 (n = 16,719)	(82.5%; n = 13,792)	(2.5%; n = 410)	(11.4%; n = 1,910)	(1.8%; n = 300)	(1.8%; n = 307)	<.0001
Pregnancy, in lifetime, % (n)	57.1 (7,714)	59.8 (239)	50.4 (943)	49.5 (146)	33.0 (100)	<.0001
Pregnancy, age <20 years, % (n)	8.1 (1,097)	11.2 (45)	11.7 (219)	10.8 (32)	9.9 (30)	<.0001
Age at first birth, mean years (SD)	27.0 (5.0)	26.7 (5.2)	27.0 (5.6)	26.3 (5.5)	28.1 (6.6)	.18
Abortion, in lifetime, % (n)	8.7 (1,194)	15.1 (62)	15.2 (290)	13.7 (41)	9.5 (29)	<.0001

Abbreviations: GUTS1, Growing Up Today Study; NHS, Nurses Health Study; SD, standard deviation.

* Unadjusted frequencies.

† Data were not available on age at first birth among all GUTS1 participants, so these analyses excluded GUTS1 and are restricted to parous participants in NHS2 and 3 (n = 116,570).

‡ The p-value calculated using analysis of variance for continuous variables and χ^2 tests for categorical variables; values <.05 are bolded.

in NHS2), adjusting for potential confounders. Next, we ran a number of sensitivity analyses. Estimates were restricted to participants who had men as sexual partners in their lifetime and estimates were also then calculated after adjusting further for sexual behavior (i.e., age at coitarche, number of sexual partners). Analyses were conducted using SAS 9.4 (SAS Institute, Cary, NC).

Results

Of the 124,710 participants in our sample (Table 1), the GUTS1 participants (n = 8,141) were born between 1982 and 1987, NHS2 participants (n = 99,850) were born between 1947 and 1964, and NHS3 participants (n = 16,719) were born between 1965 and 1995. Participants ranged in age from 30 to 70 years during the most recent questionnaire, meaning that many GUTS1 and NHS3 participants had not yet completed their reproductive lives. Therefore, the prevalence of each outcome varied across the cohorts. Pregnancies were reported by 25% of GUTS1 participants, 88% of NHS2 participants, and 56% of NHS3 participants. Teen pregnancies were reported by 2% of GUTS1 participants, 10% of NHS2 participants, and 9% of NHS3 participants. Abortion was reported by 5% of GUTS1 participants, 18% of NHS2 participants, and 10% of NHS3 participants. In the cohorts with data on age at first birth, the mean was 26.6 (standard deviation, 4.8) in NHS2 and 27.0 (standard deviation, 5.1) in NHS3.

All sexual minority groups—except lesbians—were generally more likely than their heterosexual peers to have a pregnancy, a teen pregnancy, and an abortion in their lifetimes (Table 2). This pattern persisted in multivariable adjusted models (Table 3). For example, GUTS1 bisexual women were three times as likely as heterosexual women to have had an abortion (RR, 3.21; 95% CI, 1.94–5.34). Lesbian women in all of the cohorts were approximately one-half as likely to have a pregnancy compared with heterosexual women (e.g., NHS2 RR, 0.46; 95% CI, 0.42–0.50). Although no differences were detected for teen pregnancy or abortion in GUTS1 or NHS3 comparing lesbian with heterosexual women, NHS2 lesbian women were less likely than heterosexual women to have a teen pregnancy or abortion. Among parous participants (Table 4), few differences were detected in age at first birth except among NHS2 lesbian women, who reported a younger age than their heterosexual peers.

All of these sexual orientation patterns were similar when restricted to participants who had men as sexual partners in their lifetime (Supplemental Tables 1 and 2). Results were also consistent after modeling sexual orientation in different ways (e.g., ever reporting a sexual minority status) and after adjusting for sexual behavior (i.e., age at coitarche, number of sex partners; Supplemental Tables 3 and 4).

Discussion

A woman's reproductive life course, including pregnancies and abortions, has profound implications not only for her social and economic circumstances, but also for her health. For example, having an unintended pregnancy is associated with adverse child and maternal health outcomes like preterm delivery (Mohllajee, Curtis, Morrow, & Marchbanks, 2007) and postpartum depression (Cheng, Schwarz, Douglas, & Horon, 2009). Our data reveal that, relative to heterosexual women, sexual minority women—except lesbian women—are as likely, or more likely, to have had a pregnancy, a teen pregnancy, and an

Table 3
Multivariable* Relative Risks of Having a Pregnancy and Abortion by Sexual Orientation in Three Cohorts of U.S. Women (N = 124,710)

Pregnancy and Abortion	Relative Risk (95% CI)				
	Heterosexual (NHS2) or Completely Heterosexual with No Same-Sex Partners (GUTS1/NHS3)	Completely Heterosexual with Same-Sex Partners	Mostly Heterosexual	Bisexual	Lesbian
GUTS1 (n = 8,141)	(76.4%; n = 6,218)	(4.7%; n = 386)	(15.3%; n = 1,243)	(2.1%; n = 168)	(1.6%; n = 126)
Pregnancy, in lifetime	1.00 (ref)	1.35 (1.17-1.55)	0.95 (0.85-1.06)	1.23 (0.98-1.55)	0.42 (0.25-0.70)
Pregnancy, age <20 years	1.00 (ref)	2.21 (1.27-3.85)	1.28 (0.82-1.99)	1.58 (0.60-4.18)	0.97 (0.23-4.07)
Abortion, in lifetime, % (n)	1.00 (ref)	3.51 (2.53-4.85)	2.31 (1.76-3.02)	3.21 (1.94-5.34)	0.56 (0.14-2.23)
NHS2 (n = 99,851)	(98.7%; n = 98,509)			(0.4%; n = 415)	(0.9%; n = 926)
Pregnancy, in lifetime	1.00 (ref)			0.80 (0.75-0.85)	0.46 (0.42-0.50)
Pregnancy, age <20 years	1.00 (ref)			1.97 (1.62-2.39)	0.73 (0.58-0.92)
Abortion, in lifetime, % (n)	1.00 (ref)			1.79 (1.56-2.06)	0.82 (0.70-0.96)
NHS3 (n = 16,719)	(82.5%; n = 13,792)	(2.5%; n = 410)	(11.4%; n = 1,910)	(1.8%; n = 300)	(1.8%; n = 307)
Pregnancy, in lifetime	1.00 (ref)	1.06 (0.93-1.21)	0.98 (0.91-1.04)	0.92 (0.78-1.09)	0.52 (0.42-0.63)
Pregnancy, age <20 years	1.00 (ref)	1.43 (1.06-1.92)	1.63 (1.41-1.88)	1.42 (1.00-2.02)	1.05 (0.73-1.52)
Abortion, in lifetime, % (n)	1.00 (ref)	1.77 (1.37-2.29)	1.95 (1.72-2.22)	1.68 (1.23-2.29)	0.96 (0.66-1.39)

Abbreviations: CI, confidence interval; GUTS, Growing Up Today Study; NHS, Nurses Health Study; SD, standard deviation.
* Adjusted for age and race/ethnicity; multiple imputation used for any missing covariates; values <0.05 are bolded.

abortion. Lesbian women were as likely, or less likely, than their heterosexual peers to have had a pregnancy. Among parous participants, few differences were detected in age at first birth except among NHS2 lesbian women, who reported a younger age than their heterosexual peers.

Existing literature on pregnancy outcomes across sexual orientation groups has primarily focused on teen (Charlton et al., 2013; Goodenow et al., 2008; Lindley & Walsemann, 2015; Riskind et al., 2014; Saewyc et al., 1999, 2008) and unintended pregnancies (Everett et al., 2016, 2017; McCauley et al., 2015). However, some data on other parity outcomes are available among sexual minority women who completed their reproductive years in the 1980s and 1990s. For example, Case et al. (2004) used NHS2 data through 1993 to document that bisexual and lesbian women were less likely than heterosexual women to be parous and have a teen pregnancy. That analysis also examined age at first birth among parous women and found that sexual minority women were as likely as heterosexual women to have a "later" age at first birth (defined in that study as >30 years of age); no further data were reported on age at first birth. In an analysis of breast cancer risk factors based in California, Dibble et al. (2004) found that lesbian women were less likely than their heterosexual sisters to have ever had a pregnancy, but no data were available on the age at first birth. The current findings support much of this previous literature, but we detected a higher, rather than lower, prevalence of these pregnancy outcomes among bisexual women. These differences could be due to any number of reasons, including the current study's robust sexual orientation data.

Estimating the prevalence of abortions is challenging primarily owing to underreporting, and the prevalence reported in this analysis should be considered a minimum estimate (Jones & Kost, 2007; Lindberg & Scott, 2018; Tierney, 2019). Some of the most robust abortion prevalence data from the Guttmacher Institute's 2014 Abortion Patient Survey estimate that 5% of women will have an abortion by age 20 years, 19% by age 30, and 24% by age 45 years (Jones & Jerman, 2017b). As expected, the abortion prevalences reported in NHS2, GUTS, and NHS3 are below the Guttmacher Institute's estimates for the corresponding age ranges, likely due in part to underreporting. In addition, our prevalence data are below the Guttmacher Institute's estimates, likely due to true lower than average abortion rates in the cohorts because GUTS, NHS2, and NHS3 participants are primarily White and middle- to upper-class women; lower income women and women of color have higher abortion rates in the United States. Despite low estimates, these data allow for an examination of sexual orientation-related differences and do follow broader trends, such as a lower abortion prevalence in younger (i.e., GUTS) than older (i.e., NHS2) cohorts.

The patterns of sexual orientation disparities in abortion confirm much of the existing research that has been conducted in other samples (Chetcuti et al., 2013; Dibble et al., 2004, 2002; Fethers et al., 2000; Lhomond & Saurel-Cubizolles, 2006; Mercer et al., 2007; Moegelin et al., 2010; Saewyc et al., 1999; Tornello et al., 2014), including samples that were smaller and cross-sectional. For example, Tornello et al. (2014) leveraged National Survey of Family Growth data to estimate that bisexual women were three times as likely as their heterosexual peers to have had

Table 4
Multivariable* Linear Associations between Sexual Orientation and Age at First Birth in Two Cohorts[†] of U.S. Women (N = 116,570)

Age at First Birth	Adjusted Mean Differences (Standard Error)							
	Completely Heterosexual with Same-Sex Partners		Mostly Heterosexual		Bisexual		Lesbian	
	p Value	p Value	p Value	p Value	p Value	p Value	p Value	
NHS2 (n = 99,851)					(0.4%; n = 415)		(0.9%; n = 926)	
Age at first birth					-0.007 (0.012)	0.53	-0.029 (0.011)	0.01
NHS3 (n = 16,719)	(2.5%; n = 410)		(11.4%; n = 1,910)		(1.8%; n = 300)		(1.8%; n = 307)	
Age at first birth	-0.013 (0.014)	0.34	0.001 (0.007)	0.89	-0.017 (0.018)	0.35	0.039 (0.021)	0.07

Abbreviation: NHS, Nurses Health Study.

* Adjusted for age and race/ethnicity; multiple imputation used for any missing covariates and the reference is Heterosexual (NHS2) or Completely Heterosexual with No Same-Sex Partners (NHS3), values <0.05 are bolded.

[†] Data were limited on age at first birth among GUTS1 participants so these analyses excluded GUTS1 and are restricted to parous participants in NHS2 and 3 (n = 116,570).

an abortion, although no lesbian women in that sample reported having an abortion. Dibble et al. (2004) compared a sample of sibling pairs to estimate that lesbian women were approximately one-half as likely as their heterosexual sisters to have had an abortion. Our findings not only confirm these patterns in bisexual and lesbian women, but also shed new light on nuances in other sexual minority subgroups, including women who identify as completely heterosexual with same-sex partners and who identify as mostly heterosexual.

Future research should explore drivers of these sexual orientation patterns. For example, there is substantial evidence that, compared with heterosexual women, sexual minority women are more likely to report their pregnancies are unintended (Everett et al., 2016, 2017; McCauley et al., 2015) while having less access to health care (Buchmueller & Carpenter, 2010). However, abortion access is generally poor for women of all sexual orientations throughout much of the United States, because the trend of states enacting restrictions on abortion providers has accelerated in the last decade and the number of clinics offering abortion has also decreased (Jones & Jerman, 2017a). In addition to geographic disparities in abortion availability, different demographic subgroups of women are differentially burdened by the need to pay out-of-pocket for abortion care owing to public and private insurance restrictions (Roberts, Gould, Kimport, Weitz, & Foster, 2014). Therefore, the sexual minority subgroups that are having more abortions than their heterosexual peers are likely doing so because of the higher prevalence of unintended pregnancies rather than superior access to abortion care. Given the consistent pregnancy and abortion results after adjusting for proxy measures of sexual behavior, it seems these unintended pregnancies in our data are driven by lower use of contraceptives rather than “risky” sexual behaviors. Sexual minority women are also more likely than heterosexual women to be victims of sexual violence during their childhood and adolescence, as well as into adulthood (McCauley et al., 2015; Tornello et al., 2014), which may explain even more of their unintended pregnancy burden (Jones, Jerman, & Charlton, 2018). However, more research is needed to confirm such hypotheses and understand how abortion access, as well as sexual and reproductive health care more generally, differs across sexual orientation groups, including the role of factors like geography, income, and health literacy.

The increased risks of abortion and teen pregnancy among completely heterosexual women with same-sex partners, mostly heterosexual, and bisexual participants compared with their exclusively heterosexual peers also suggest an opportunity for improved contraceptive access and contraceptive counseling for sexual minority women (Charlton et al., 2019). Previous research has found that sexual minority women are less likely to access sexual and reproductive health services (Agénor, Krieger, Austin, Haneuse, & Gottlieb, 2014b,a; Brown, McNair, Szalacha, Livingston, & Hughes, 2015; Buchmueller & Carpenter, 2010; Charlton et al., 2011; McNair, Szalacha, & Hughes, 2011; Tjepkema, 2008), and often face discriminatory interactions in these settings (Levy, 1996; Sinding, Barnoff, & Grassau, 2004; Trettin, Moses-Kolko, & Wisner, 2006). On the provider side, limited LGBT-specific training opportunities may result in problematic provider assumptions about the sexual and reproductive health needs of sexual minority women (Abdessamad, Yudin, Tarasoff, Radford, & Ross, 2013; Fuzzell, Fedesco, Alexander, Fortenberry, & Shields, 2016). Improving provider–patient interactions in medical settings and ensuring inclusivity in contraceptive counseling conversations are therefore imperative for

helping sexual minority women achieve their reproductive health goals. Given the potential critical role of sex education in primary prevention, research such as this about sexual minority health should be incorporated into the larger body of evidence that is used to inform sex education programs (Gowen & Wings-Yanez, 2014; Schalet et al., 2014).

Although the current study is the largest to date on sexual orientation-related disparities in pregnancy related outcomes, it has a number of limitations. This sample included only nurses and their daughters, whose race/ethnicity was primarily White. Therefore, results may not generalize to other populations. Although data were available among the GUTS1 and NHS3 cohorts on all three sexual orientation dimensions, the attractions and identity dimensions were collected as a single item. Sexual orientation data collection in those cohorts began while many participants were adolescents—a time when it is easier for participants to categorize sexual orientation according to a combination of these two dimensions (Remafedi et al., 1992); the item has remained unchanged for consistency purposes. Additionally, data were also limited to a single dimension (i.e., identity) among the NHS2 cohort. In some of the smaller sexual orientation subgroups, data may not have been robust enough to identify weak associations. Data were limited on the circumstances surrounding the pregnancies, including whether the pregnancy was the result of sexual violence, which is more common for sexual minority women (McCauley et al., 2015). Data were not available about the extent to which pregnancies were mistimed or unwanted; as an example where this context is needed, pregnancies are not always unwelcome by teens, so such data would help to illuminate the public health implications (Luker, 1996; Mollborn, 2011). Proxy measures were also limited to coitarche and number of partners when measuring pregnancy risk. Our data were also limited on gender identity and expression. Nonetheless, the longitudinal nature of the data and the inclusion of women across several generations are unique. The detailed data allowed us to examine pregnancy outcomes across different time periods in the participants' lives, including during the teen years, and enabled us to explore different sexual orientation subgroups and dimensions (i.e., attraction/identity, behavior).

Conclusions

Our data reveal that pregnancies, including during the teen years, and abortions appear to be more common among sexual minority women—except lesbian women—compared with heterosexual women.

Implications for Practice and/or Policy

Researchers must continue to document sexual orientation-related reproductive health differences, including their association with other health outcomes (e.g., nulliparity and breast cancer) to improve the lives of all women. It is crucial that sex education programs become inclusive of sexual minorities. Additionally, health care providers must not assume that pregnant patients and those seeking an abortion are heterosexual. Medical education must prepare health care providers to take a sexual history as well as offer contraceptive counseling and management to all patients who want to prevent a pregnancy regardless of sexual orientation.

Acknowledgments

An abstract of this work was presented at the 2018 American Public Health Association Meeting and Exposition. Dr. Charlton had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Supplementary Data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.whi.2019.10.007>.

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