

**An intersectional analysis of education and racial/ethnic inequalities  
in contraceptive sterilization**

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## **An intersectional analysis of education and racial/ethnic inequalities in contraceptive sterilization**

Despite evidence that fundamental causes of health, such as socioeconomic status and race/ethnicity, often interact to shape outcomes, the contraceptive use literature contains little reports on such interaction effects, and even fewer studies explicitly adopt an intersectional framework. Drawing on data from the female ( $N=8,737$ ) and male ( $N=5,826$ ) samples of the 2006-2010, 2011-2013, and 2013-2015 rounds of the *National Survey of Family Growth*, this study relies on an intersectional approach to examine if persistent and gendered education gradients in contraceptive sterilization vary by race/ethnicity. For non-Hispanic white respondents, results confirm the negative education gradient in female sterilization, and positive gradient in male sterilization. For non-Hispanic black and Hispanic respondents, education gradients tend to be less steep for female sterilization, but steeper for male sterilization. This leads to more pronounced racial/ethnic differences in female sterilization, but less pronounced racial/ethnic differences in male sterilization among better-educated, as compared to less-educated respondents.

More than two decades ago, Link and Phelan (1995) argued that socioeconomic status (SES) should be considered a “fundamental cause” of health inequalities. Because of its multiple and enduring links with various proximate determinants of health, such as diet, weight, and exercise, SES shows an association with a range of health outcomes. More recently, Phelan and Link (2015) detailed how the fundamental cause framework extends to racism which “also has a fundamental association with health independent of SES.” (2015:311). The literature now commonly recognizes SES and race/ethnicity as fundamental causes that have independent and persistent links with health. In addition, health studies have documented a range of interactive effects of SES and race/ethnicity (e.g., Braveman et al. 2015; Farmer and Ferraro 2005; Hayward et al. 2000), suggesting that higher SES does not carry the same health benefits across racial/ethnic groups. In light of such findings, it has been asserted that systematically testing for interactions between SES and race/ethnicity is critical to adequately revealing the full extent of SES and racial/ethnic inequalities in health (Kessler and Neighbors 1986), because failing to do so may introduce bias in the estimated effects of both covariates.

While the need for an interaction approach has received increasing attention in the empirical health literature, it has been less well acknowledged in certain subfields, including research on contraceptive use. The contraceptive use literature contains little reports on interaction effects of SES and race/ethnicity (exceptions are: Borrero et al. 2007; Kramer et al. 2018; Stephen, Rindfuss, and Bean 1988)—although it is unclear to what extent this is due to studies failing to find, rather than failing to test for such effects. This relative lack of attention is surprising in light of several studies that have reported interaction effects for outcomes that are closely related to contraceptive use. For example, research has shown education gradients in both intended and unintended childbearing to be steeper among black, as compared to white, women (Musick et al. 2009). Correspondingly, racial and ethnic differences in teen childbearing, unintended childbearing, and nonmarital childbearing have been shown to be most pronounced among advantaged women (Finer and Henshaw 2006; Sweeney and Raley 2014). In light of such findings, the lack of attention to interaction effects in the contraceptive use literature could suggest the presence of estimation bias in the estimated inequalities by SES and race/ethnicity.

More fundamentally, the lack of attention to interaction effects likely hinders our understanding of power dynamics and of the ways in which interacting systems of power structure contraceptive use. The need to take account of the interactions between multiple dimensions of inequality is the key tenet of intersectionality theory. The concept ‘intersectionality’ was coined by legal scholar Kimberlé Crenshaw in a 1989 publication to underscore “the conception of structured social inequalities as interdependent, mutually constituted, integrally connected systems of inequality” (Weber 2006:40). Rather than being additive, effects of SES and race/ethnicity (and also gender, sexual orientation, and disability) are likely to combine, overlap, and intersect to shape individuals’ unique social positions and experiences. By revealing how “fundamental causes” interact and give rise to a “matrix of domination” (Collins 1990:225) that shapes health, an intersectional approach can support the incorporation of feminist intersectional thinking to the epidemiological study of health disparities, as well as connect health disparities research focused on the interactive effects of not only SES and race/ethnicity, but also gender, sexual orientation, and disability (Bowleg 2012). Yet, few—if any?—studies on SES or racial/ethnic inequalities in contraceptive use have explicitly adopted an intersectional perspective (examples of studies on sexual and reproductive health more generally that have adopted an intersectional perspective are: Downing, LaVeist, and

Bullock 2007; Rosenthal and Lobel 2018; Watts, Liamputtong, and Carolan 2014), despite some scholars explicitly pointing to its potential to place sexual and reproductive health outcomes within their historical, cultural, and social context (Harris 2010; Price 2011), and despite intersectionality being at the center of the Reproductive Justice movement (Luna and Luker 2013; Price 2011). Not considering the complex interplay between, for example, SES and race/ethnicity hinders our understanding of the potentially unique ways in which individuals' social positions and experiences shape their contraceptive use. Moreover, as others have pointed out, we should not jump to explaining phenomena which have not been first clearly described (see also Landale, Schoen, and Daniels 2010).

The current study adopts an intersectional approach to the study of educational and racial/ethnic inequalities in contraceptive sterilization. The latter method provides an ideal choice for considering how education and race/ethnicity intersect, because strong and persistent inequalities by education and race/ethnicity have been well-documented. Research since the mid-twentieth century has found less educated and minority women to rely more heavily on female sterilization, but less heavily on male sterilization, than women with high levels of education and white women, respectively (Bumpass and Presser 1972; Chandra 1998; Daniels et al. 2015). Both the female and male partner can get sterilized and, importantly, tubal ligation and vasectomy are about equally effective in preventing pregnancy (Grimes 2009). Hence, this contraceptive method provides a unique opportunity to consider if and how the interaction between education and race/ethnicity differs for women compared to men. Drawing on data from the 2006-2010, 2011-2013, and 2013-2015 rounds of the National Survey of Family Growth (NSFG), this study addresses two research questions. First, do education gradients in female and male sterilization vary across racial and ethnic groups? Stated differently, are the benefits of higher education different for non-Hispanic black and Hispanic, as compared to non-Hispanic white women and men? Second, does variation in the education gradients in female and male sterilization across racial and ethnic groups differ for female versus male sterilization?

## **Background**

### ***Race/ethnicity, Education, and Contraceptive Sterilization***

Compared to health outcomes such as mortality and self-rated health, it is hard to evaluate what should be considered a preferable outcome when studying contraceptive use. Much of this

difference stems from the preference-sensitive nature of contraceptive use and decision-making (see, e.g., Dehlendorf, Bellanca and Policar 2015). Individuals tend to have varied preferences for method characteristics; for example, some may prioritize a method's effectiveness in preventing pregnancy, while others may focus on disease prevention or how a method affects bleeding patterns. No single method is preferred with respect to all such characteristics simultaneously, thus making it hard to determine what should be considered a preferable outcome.

Several method characteristics put contraceptive sterilization at a clear advantage compared to other methods; most importantly, tubal ligation and vasectomy are highly effective, cost-effective methods of contraception that provide individuals and couples with long-acting protection against pregnancy (Grimes 2009). Still, there are a number of reasons to closely examine differentials in reliance on contraceptive sterilization. First, tubal ligation and vasectomy must be considered permanent, as procedures are not necessarily reversible. One-quarter of U.S. women with unreversed tubal ligations in 2006–10 reported that they desire a reversal of the procedure (author citation), and one-in-five U.S. men with unreversed vasectomies reported that they desire future children (Sharma et al. 2013). Moreover, sterilization has a long history of abuse in the U.S. and many other countries across the world. In the United States, coerced and forced sterilization disproportionately affected poor women and women of color (Hansen and King 2013). In light of this history, the fact that female sterilization remains most common among socioeconomically disadvantaged and minority women in the United States (Eeckhaut and Sweeney 2016; Jones, Mosher, and Daniels 2012) requires careful investigation. Vasectomy, in contrast, is most commonly used by socioeconomically advantaged and white men in the United States (Bumpass 1987; Eeckhaut and Sweeney 2016). Reasons for these persistent and gendered associations remain insufficiently understood, nor do we know if and how education and race/ethnicity intersect to shape patterns of female and male sterilization in the United States.

Contraceptive sterilization is typically used during the last stage of the reproductive life course, when individuals want to limit future childbearing—in 2006-10, fully 44% of contracepting women who intended no more births relied on tubal ligation and 16% relied on vasectomy (Jones et al. 2012:Table5). Both tubal ligation and vasectomy are medical procedures, but vasectomy tends to be simpler, more economical, and it has lower rates of minor and major

complications (Rind 1989; Shih, Turok, and Parker 2011). The main reason is that vasectomy involves only small incisions (or punctures if the no scalpel method is used) on each side of the scrotum which can be done under local anesthesia (Schwingl and Guess 2000), whereas tubal ligation generally requires general anesthesia and entry into the abdominal cavity (Shih et al. 2011). On the other hand, a significant portion of tubal ligations are performed in conjunction with a c-section (Whiteman et al. 2012), and newer transcervical techniques—such as Essure—provide a less invasive option to surgical tubal ligation, but these techniques also have been associated with a growing number of complications, including persistent pain, tubal or uterine perforation, and device migration (FDA 2016).

Use of voluntary sterilization increased in the U.S. during the second half of the 20<sup>th</sup> century, mainly between the late 1960s and early 1980s (Chan and Westhoff 2010; Presser and Bumpass 1972). Whereas 16 percent of married women aged 15-44 relied on sterilization for fertility control in 1965, this number had risen to 42 percent by 1988, but remained relatively stable thereafter (Chandra 1998; Jones, Mosher, and Daniels 2012). While the dramatic increase in the prevalence of sterilization signalled a profound change in family planning attitudes and practices (Bumpass 1987; Bumpass and Presser 1972), it did not substantially alter the association of contraceptive sterilization with SES and race/ethnicity. U.S. studies since the mid-twentieth century have found a persistent association of SES and race/ethnicity with contraceptive sterilization, with less educated and minority women generally relying more heavily on female sterilization, but less heavily on male sterilization, compared to women with high levels of education and white women, respectively (Bertotti 2013; Bumpass, Thomson, and Godecker 2000; Bumpass and Presser 1972; Chan and Westhoff 2010; Chandra 1998; Daniels et al. 2015; Eeckhaut and Sweeney 2016; Godecker, Thomson, and Bumpass 2001; Presser and Bumpass 1972; Shreffler et al. 2015).

Reasons underlying differential use of sterilization are insufficiently understood, but are likely multifactorial. Part of the differential can be explained by the multiple and enduring links of SES and race/ethnicity with various risk factors, such as differences in early childbearing, parity, unintended pregnancy, and union status and history (Borrero et al. 2009, 2011; Bumpass et al. 2000; Chandra 1998; Eeckhaut and Sweeney 2016; Godecker et al. 2001). Differences in insurance status (and, for race/ethnicity, socioeconomic status) also appear important, yet fail to fully explain inequalities in the prevalence of female and male sterilization by education and

race/ethnicity (Bass and Warehime 2009; Borrero et al. 2007, 2009). Individual preferences and knowledge likely play a role, as a man's education has been shown to be positively associated with his willingness to share contraceptive responsibility (Grady et al. 1996), and thus to consider male sterilization in addition to female sterilization. In addition, studies have shown that black men hold more negative attitudes towards sterilization than black women (Thorburn 2007), that black individuals report stronger norms regarding women holding primary contraceptive responsibility (Grady et al. 1996), and that they have a higher familiarity with tubal ligation, related to the higher number of female family members who have undergone sterilization (Borrero et al. 2011). Finally, there are indications of providers being less likely to mention long-acting reversible contraceptive methods to patients whose parents had a high school education or less (Dehlendorf et al. 2017), and being more willing to perform female sterilization on black women (Harrison and Cooke 1988).

All of the aforementioned studies have contributed to our understanding of the various risk factors shaping differential use of sterilization by SES and race/ethnicity. At the same time, however, their common focus on explaining the independent—or additive—effects of SES and race/ethnicity, or on the degree to which SES mediates the association between race/ethnicity and sterilization, also has its limitations if we accept that an individual's health is *simultaneously* shaped by SES and race/ethnicity, and that inequalities in health cannot be reduced to SES *or* race/ethnicity. Building on the current recognition of the importance of the complex interplay between SES and race/ethnicity for Americans' health (e.g., Bowleg 2012; Schulz and Mullings 2006), this study extends past work by asking if and how SES and race/ethnicity intersect to shape individuals' reliance on contraceptive sterilization.

### ***Intersectionality and Contraceptive Sterilization***

Intersectionality theory draws attention to power dynamics and to the ways in which multiple dimensions of inequality combine, overlap, and intersect to shape individuals' unique social positions and experiences (Weber 2006). The framework focuses on the complex—or intersecting—effects of different forms of oppression, such as racism, sexism, and classism. It is asserted, for example, that Black women's experiences tend to be qualitatively different than those of white women and those of black men; differences that cannot be fully captured by the additive or independent effects of being black and being female (Crenshaw 1989). Thus, an

intersectional approach is needed to investigate how multiple dimensions of inequality—such as SES and race/ethnicity—intersect to shape outcomes such as contraceptive use.

While recent health research has shown the value of adopting an intersectional framework (e.g., Green, Evans, and Subramanian 2017; Hinze, Lin, and Andersson 2012; Richardson and Brown 2016), this framework has been remarkably absent from the contraceptive use literature. Quantitative research on contraception, in particular, has often been variable-oriented, focused on identifying the full set of risk factors to help ‘explain’ differential reliance on contraception. An intersectional framework could help redirect attention to the broader systems of inequality and to the unique social positions and experiences resulting from intersecting forms of discrimination (Weber 2006). This is in line with one of the core tenets of the Reproductive Justice movement, which asserts that it is insufficient to focus solely on the role of reproductive rights or unequal access to reproductive health services, because reproductive disciplining—and privileging—relies on a range of policy and practice. Thus the elimination of reproductive oppression requires an intersectional analysis of how this system “regulates people’s reproductive futures through assessments of worthiness originating in assumptions about race, class, and disability (among other dimensions).” (Luna and Luker 2013:329). An intersectional approach also supports placing sexual and reproductive health outcomes within their historical, cultural and social context (Harris 2010; Price 2011). This latter point is of particular relevance to sterilization inequalities, which cannot be dissociated from the historical context of coerced and forced sterilization of socioeconomically disadvantaged and minority women in the United States, and from the ongoing system of stratified reproduction in which sterilization continues to play a part (e.g., the recent sterilization of female inmates in California; Johnson 2014).

Analytically, most quantitative research adopting an intersectional perspective has done so by adding interaction terms to the analysis. Based on previous quantitative health studies (see e.g., Farmer and Ferraro 2005), the interaction between SES and race/ethnicity would likely take the form of either of two patterns. A first pattern would be for SES gradients in female and male sterilization to be less steep for minority, as compared to white women and men. This is what Bowleg (2012:1269) referred to as the “intersectionality paradox,” as such a pattern would indicate that the general link between better health outcomes and higher SES does not necessarily extend to minority men and women. Two types of (related) explanations are typically proposed for this paradox. The *diminished returns hypothesis* asserts that minority men and



women do not enjoy the same returns to a higher education or SES as white men and women (Farmer and Ferraro 2005). Not only do blacks and Hispanics have lower earnings than whites at every education level (Snipp and Cheung 2016), they also have lower wealth (Oliver and Shapiro 2006), less purchasing power (Walker, Keane, and Burke 2010), and less upward and more downward intergenerational mobility (Mishel et al. 2012) at every income level. Applied to health, this means that indicators of SES, such as education, might not have the same association with resources such as health insurance and health care access for minority, as compared to white men and women. Moreover, current health is not only affected by current resources, but also by earlier experiences of disadvantage (Boen 2016; Williams 2012), with blacks having a much higher likelihood than whites to ever having experienced poverty (Rank and Hirschl 1999a, 1999b).

A second explanation for the “intersectionality paradox” focuses on the impact of experiences of racism and discrimination (Colen et al. 2018). Research generally finds that higher SES is associated with increased reporting of racism (Paradies 2006), perhaps because socioeconomic advantage leads to increased awareness of social injustice (Farmer and Ferraro 2005), and/or because status incongruence—the tension between disadvantaged racial/ethnic status, but advantaged SES—places high SES minority members in a unique position. Experiences of racism and discrimination can lead to psychological distress (Williams and Collins 1995), and can affect health behaviors and health care access (Williams 2012). For example, perceived racial/ethnic discrimination has been linked to lower use of any contraception and to lower use of prescription contraception among minority women (MacDonald et al. 2017; Thorburn and Bogart 2005).

SES gradients in female and male sterilization could also be steeper for minority, as compared to white women and men, though less explanations have been proposed for this second potential pattern. According to the *minority poverty hypothesis*, the combination of racial/ethnic and socioeconomic disadvantage (Farmer and Ferraro 2005) gives rise to a “black underclass” (Wilson 1984) or the “truly disadvantaged” (Wilson 1987). In other words, the double burden of poverty and racism/discrimination leaves low SES minority groups uniquely disadvantaged. Along similar lines, the *weathering hypothesis* (Geronimus 1996; Geronimus et al. 2015) points to the unique situation of black women, particularly poor black women. Their health status has been shown to begin to deteriorate in young adulthood relative to the health status of white

women. This process of ‘weathering’ is believed to result from the cumulative effects of social inequalities, with prolonged exposure to stressful circumstances resulting in growing gaps in health over the life course.

The sterilization literature contains little reports on interaction effects. The single study on female sterilization appears to support the possibility of SES gradients in sterilization being less steep for minority, compared to white women; Borrero and colleagues (2007) reported that racial/ethnic variation in tubal sterilization rates was limited to advantaged women—in effect, those with private insurance, higher income, or higher education. In addition, bivariate results from consecutive waves of the National Survey of Family Growth (NSFG) show that education gradients in female sterilization were less steep for black, compared to white women in 1988, 1995, and 2006-10, though not in 1982 (Jones et al. 2012; Mosher 1990; Piccinino and Mosher 1998). Stated differently, in all survey years since 1988, the racial/ethnic gap in reliance on female sterilization was largest among better-educated, as compared to less-educated women. More recent NSFG data (1995 and 2006-10 NSFG; Jones et al. 2012) similarly show a less steep education gradient for Hispanic, compared to white women, and a larger Hispanic/white gap in reliance on female sterilization among better-educated, compared to less-education women.

Bivariate results for male sterilization are more difficult to compare, mainly due to negligible levels of male sterilization among blacks at every education level (<4% in all NSFG survey years between 1982 and 2006-10; see Jones et al. 2012; Piccinino and Mosher 1998). However, results for Hispanics—who tend to have somewhat higher levels of male sterilization—appear to suggest a *steeper* SES gradient in male sterilization, compared to whites (1995 and 2006-10 NSFG; Jones et al. 2012). This latter finding indicates the importance of examining female and male sterilization separately, as the interaction effect between education and race/ethnicity could be gender-specific, displaying a different pattern for men versus women.

## **Data and Methods**

### ***Data***

Data for this study were drawn from the 2006-2010, 2011-2013, and 2013-2015 rounds of the National Survey of Family Growth (NSFG). The NSFG was designed and administered by the National Center for Health Statistics (NCHS), and has been conducted periodically from 1973 to 2002 and then moved to a continuous survey design in 2006. The NSFG data are representative

of the U.S. non-institutionalized population ages 15-44 when properly weighted, and include oversamples of teens, blacks and Hispanics. In-home interviews were conducted by trained female interviewers using computer-assisted personal interviewing (CAPI). For the 2006-2010, 2011-2013, and 2013-2015 surveys, a total of 12,279, 5,601, and 5,699 women and 10,403, 4,815, and 4,506 men were interviewed, respectively, resulting in response rates of 78%, 73%, and 71% for the female samples and 75%, 72%, and 67% for the male samples, respectively (U.S. Department of Health and Human Services 2016). All analyses and descriptive statistics were adjusted for the NSFG's complex sample design using the *svy* command in Stata 14.

Because of the interest in education as a covariate, and the fact that sterilization is rare at younger ages, the analytic samples were limited to respondents ages 25–44 years. Only respondents who were using contraception (contraceptive sterilization or another method) were selected, as the primary focus is on the choice of contraceptive method, rather than the decision whether or not to use contraception. Respondents who were pregnant, had a partner who was pregnant, or who indicated that it was physically impossible for them, or their partner, to have a child of their own for reasons other than a sterilization procedure that was performed for contraceptive reasons<sup>1</sup> were also excluded. Finally, to increase comparability across surveys, and following previous NSFG research (e.g., Borrero et al. 2008), women of 'non-Hispanic other' race/ethnicity were excluded, as this category is very small and heterogeneous, and there is considerable variation in the specific groups included across NSFG surveys.

### ***Measures***

The dependent variable was current method of contraception used, and distinguished between the following methods: female contraceptive sterilization (tubal ligation or ESSURE); male contraceptive sterilization (vasectomy); long-acting reversible contraceptive (LARC) method (intra-uterine device or implant); other highly effective reversible (HER) method (e.g., hormonal pill, patch, ring, or injection); male condom; and other less effective method (including traditional methods). First, respondents were identified who were themselves surgically sterilized, or whose partner was surgically sterilized, at the time of the survey or at last sex in the past 3 months. For non-sterilized respondents with no sterilized partner, reports of contraceptive method used at last sex in the past 3 months were then considered. In cases where multiple methods were reported, the most effective method used was selected, prioritizing methods in the

following order, based on documented differentials in failure rates (e.g., Trussell 2011): LARC; other HER method; male condom; other less effective method. The small number of respondents who reported relying on both female and male sterilization were categorized as relying on female sterilization.

The main independent variables were respondent's educational attainment (less than high school education; completed high school; some college; completed college), and respondent's race/ethnicity (non-Hispanic white; Hispanic; non-Hispanic black). A number of other factors shown to be associated with contraceptive use were taken into account (e.g., Chandra 1998). These included (see Appendix A): respondent's age (25–29; 30–34; 35–39; 40–44 years), whether the respondent was foreign-born; respondent's early childbearing (had a first birth before age 20 years; first birth at ages 20–24 years; no first birth before age 25), respondent's parity (0; 1; 2; 3 or more), respondent's current union status (married; cohabiting; single), and respondent's union history (no previous co-residential union; previous cohabitation(s) only; any previous marriage).

### ***Analysis technique***

The analysis was carried out in two stages. First, the distribution of contraceptive use by education and by racial and ethnic background was examined. Next, multinomial logistic regression was used to examine if education gradients in contraceptive use vary by race/ethnicity. The number of outcome categories was limited to three: female sterilization, male sterilization, and use of a reversible method. First, contraceptive use was regressed on education and race/ethnicity (Model 1). Next, the interaction between education and race/ethnicity was added (Model 2) to investigate possible variation by racial and ethnic background in the association between education and contraceptive use. Finally, controls for age, nativity, early childbearing, parity, union status, and union history were added (Model 3) to examine if observed patterns are explained by differences in these sociodemographic and reproductive risk factors across education or racial/ethnic groups.

## **Results**

### ***Descriptive analysis***

Among respondents ages 25-44 years using contraception, 43% of women, and 31% of men report relying on either female or male sterilization (Table1). Both women and men report higher levels of female, compared to male sterilization, though the gap is larger among female respondents (31.2% versus 11.9%, respectively, compared to 17.6% versus 12.9% among male respondents). Consistent with previous research, education is negatively associated with female sterilization, but positively associated with male sterilization. Reliance on female sterilization is higher among Hispanic and non-Hispanic black respondents, as compared to non-Hispanic white respondents, whereas the opposite is true for reliance on male sterilization.

*Table1 about here*

Do education gradients in sterilization vary by race/ethnicity? The joint distribution of contraceptive use by education and race/ethnicity (Table1) reveals a somewhat steeper education gradient in female sterilization for non-Hispanic whites, as compared to non-Hispanic blacks and Hispanics. While non-Hispanic white respondents with less than high school education are more than five times as likely to rely on female sterilization as compared to those who have completed college (64.2% versus 12.3% among female respondents, 31.5% versus 6.0% among male respondents), the corresponding ratio is ‘only’ three- (50.5% versus 17.5% among female respondents) to four- (31.3% versus 7.7% among male respondents) to-one for Hispanic respondents, and it is less than three-to-one (57.7% versus 19.8% among female respondents, 22.6% versus 8.4% among male respondents) for non-Hispanic black respondents.

Education gradients in male sterilization, in contrast, are less steep for non-Hispanic whites, as compared to non-Hispanic blacks and Hispanics. Non-Hispanic white respondents who have completed college are two (20.6% versus 10.1% among male respondents) to four (17.8% versus 4.6% among female respondents) times as likely to rely on male sterilization as compared to those with less than high school education. Among Hispanic women, the corresponding ratio is much higher at seven- (12.4% versus 1.8% among male respondents) to eight- (9.9% versus 1.3% among female respondents) to-one, whereas among non-Hispanic black women, reliance on male sterilization is essentially limited to men with a high school degree and women with some college, or—even more so—to men and women with a college degree.

### *Multivariate analysis*

Starting with the multivariate model that includes only the main effects of SES and race/ethnicity (Table2, Model1), results confirm that education is positively associated with reliance on male sterilization or a reversible method, versus reliance on female sterilization. Hispanic and non-Hispanic black respondents are less likely to rely on male versus female sterilization than are non-Hispanic white respondents. Non-Hispanic black women, but not men, are also less likely to rely on a reversible method versus female sterilization.

*Table2 about here*

Model2 adds the interaction between education and race/ethnicity to account for differences in the education gradient by race/ethnicity. This interaction—which is statistically significant ( $p < 0.001$ ) in both the female and male sample—reveals a steeper education gradient in reliance on male versus female sterilization for non-Hispanic black, as compared to non-Hispanic white respondents. In contrast, the education gradient in reliance on a reversible method versus female sterilization is *less* steep among Hispanic and non-Hispanic black, as compared to non-Hispanic white women, but not men. Patterns of reliance on a reversible method versus female sterilization are similar, but fail to reach statistical significance ( $p > 0.05$ ), in the male sample.

*Figure1 about here*

Figure1 graphs predicted probabilities of reliance on female sterilization, male sterilization, or a reversible method by education and racial and ethnic background, as calculated based on Model2. Starting with female sterilization, a strong negative education gradient is observed for non-Hispanic whites, and a somewhat weaker negative gradient for Hispanics. Among non-Hispanic blacks, those with less than high school education are *not* more likely to rely on female sterilization than those with a high school degree—though those who have at least some college are still substantially less likely to rely on female sterilization than their less-educated counterparts. This confirms that, among minorities, education gradients in female sterilization are less steep and even non-linear (non-Hispanic blacks only).

Turning to male sterilization, a positive education gradient is observed for non-Hispanic whites. In contrast, reliance on male sterilization among Hispanics and non-Hispanic blacks appears to result in two subgroups, with the group boundaries shifting depending on whether one relies on data from female or male respondents. In the female sample, a clear contrast is observed between the very low levels of male sterilization among Hispanic women with less than high school education and among non-Hispanic black women with high school education or less, and the much higher levels of male sterilization among their better-educated counterparts. In the male samples, the ‘boundary’ between low versus high male sterilization is located higher up the education ladder—between Hispanic and non-Hispanic black men with some college or less versus those who have completed college.

Reliance on a reversible method, finally, again reveals differing education gradients for Hispanics and non-Hispanic blacks, as compared to non-Hispanic whites. Estimates for non-Hispanic whites show a positive education gradient. Education differences for Hispanics are somewhat smaller and do not follow a monotonic pattern. Patterns are even more different for non-Hispanic blacks, especially in the male sample, where the education gradient now appears mostly flat.

The final multivariate model, Model3, adds sociodemographic and reproductive risk factors and indicates that the interaction effect between education and race/ethnicity is not ‘explained’ by differences in age, nativity, early childbearing, parity, union status, or union history across education and racial/ethnic groups. However, there are some minor changes in the main effects of education and race/ethnicity in Model3; most importantly, the lower odds of relying on male sterilization for Hispanic, compared to non-Hispanic white women, and for women with some college, compared to those who have completed college, are no longer statistically significant ( $p>0.05$ ).

### ***Sensitivity analyses***

Results are highly robust. Sensitivity analyses were performed to examine the impact of limiting the analytic samples to respondents who indicated that they have completed their intended childbearing, and to respondents in co-resident partnerships only.

Excluding respondents who indicated that they do not intend to have a(nother) child leads to higher overall levels of female and male sterilization. Results regarding the interaction between education and race/ethnicity, however, do not differ substantively from those based on the main analysis. Limiting the analytic samples to married and cohabiting women and men similarly results in higher overall levels of female and male sterilization, but not to substantively different conclusions regarding the interaction between education and race/ethnicity.

### **Discussion**

This study advanced understanding of socioeconomic and racial/ethnic inequalities in contraceptive use. The focus was on examining if persistent and gendered education gradients in female and male sterilization vary across racial and ethnic groups in the United States. The goal was to illustrate how the adoption of an intersectional approach and the integration of feminist intersectional thinking can advance understanding of such longstanding inequalities in contraceptive sterilization.

Three key findings emerged from this study. First, results confirmed the complex interplay between SES and race/ethnicity in shaping contraceptive use. Well-documented educational differentials in contraceptive sterilization do not apply equally to different racial/ethnic groups; results confirmed the existence of a strong negative education gradient in female sterilization, and a strong positive education gradient in male sterilization among non-Hispanic white respondents. For Hispanic and non-Hispanic black respondents, education gradients in female sterilization tended to be less steep, whereas education gradients in male sterilization tended to be steeper. Stated differently, racial/ethnic differences in female sterilization were found to be more pronounced among better-educated, as compared to less-educated respondents, whereas the opposite was true for racial/ethnic differences in male sterilization. Fundamental cause theory urges us to pay greater attention to basic social conditions (Link and Phelan 1995), and this focus should include consideration of the ways in which “fundamental causes” intersect to shape these conditions. The dominant additive approach may obscure important interaction effects (see e.g., Table 2, Model 1), as it limits the focus to the independent effects of SES and race/ethnicity, or to the degree to which SES mediates the association between race/ethnicity and sterilization.

Second, educational and racial/ethnic differentials in contraceptive sterilization were not fully explained by proximate risk factors such as early childbearing, parity, union status, and



union history. This is because many other risk factors likely affect reliance on contraceptive sterilization (e.g., insurance status), and these proximate risk factors may change over time, even if the association of SES and race/ethnicity with contraceptive sterilization itself is stable and enduring. While identifying the full set of risk factors of contraceptive sterilization can contribute to our understanding of inequalities, such an endeavor should never lose sight of the fundamental role of basic social conditions in shaping individuals' health, including individuals' sexual and reproductive health.

Finally, the finding of gender-specific interaction patterns reiterates the importance of taking account of not just SES and race/ethnicity, but all relevant dimensions of inequality, including gender. Different forms of oppression, including racism, classism, and sexism, combine, overlap, and intersect to shape individuals' unique social positions and experiences—and thus their health. While education was found to matter less for minority women's likelihood of being sterilized, it mattered more for minority men's likelihood of being sterilized, when compared to non-Hispanic whites. These complex and gender-specific patterns illustrate the importance of gender as yet another key system of power that, in combination with SES and race/ethnicity, structures contraceptive use.

Describing the complex ways in which SES, race/ethnicity, and gender shape reliance on contraceptive sterilization is only a first step in integrating feminist intersectional thinking into the contraceptive use literature. More fundamentally, such an integration requires redirecting attention from a focus on proximate causes of health to a focus on fundamental causes of health and to studying contraceptive use patterns as being influenced by the unique social positions and experiences resulting from intersecting forms of discrimination. This would include analyzing contraceptive use disparities within their historical, cultural, and social context (Harris 2010; Price 2011) and adopting a Reproductive Justice framework that acknowledges that reproductive disciplining—and privileging—relies on a range of policy and practice.

Applied to sterilization inequalities, such an intersectional approach raises several important questions. What social and political processes are at the basis of the *diminished returns* pattern that was found for female sterilization, but the *minority poverty* pattern that was found for male sterilization? Are better-educated minority women more likely to rely on female sterilization because of differences in preferences stemming from historical context; for example, the history of forced sterilization resulting in increased familiarity with this method within their

communities? Is it because negative perceptions of and/or experiences with medical professionals lead minority women to opt for methods that do not require continued engagement with medical professionals (i.e., most prescription contraceptive methods)? Is it because of higher levels of certain medical conditions and outcomes (e.g., c-sections, fibroids), possibly related to ‘weathering’ (e.g., Wise et al. 2007)? And why are less-educated minority men much less likely to rely on male sterilization? Is it because of the more precarious reality of life, including family life, for the “black underclass” (Wilson 1984)? Is it because male sterilization tends to be limited to married men (Eeckhaut 2015), and the probability of first marriage by age 30 has been found to be especially low among less-educated blacks (Bramlett and Mosher 2002:Table7). Is it because of different perceptions and ideals regarding masculinity and fatherhood stemming from historical context? Redirecting attention to the social and political processes that shape sterilization inequalities does not lead to straightforward answers and solution, but it better acknowledges that race/ethnicity is a social construct, rather than an objective category (Daniels and Schulz 2006). While monitoring racial/ethnic inequalities in health is necessary to assessing progress towards the elimination of such inequalities, such an analytic strategy should never lose sight of the socially constructed nature of race and the ongoing efforts to maintain racial/ethnic boundaries—most clearly, the maintenance of whiteness.

A few limitations should be noted regarding the interpretation of results. First, the analysis relied on only one indicator of SES, education. As the *diminished returns hypothesis* suggests, one indicator is likely insufficient to fully account for the socioeconomic differences by race/ethnicity. For example, research has shown that blacks and Hispanics have lower earnings than whites at every education level (Snipp and Cheung 2016). Including other SES indicators, such as income, wealth and purchasing power, could provide a more complete assessment (Krieger et al. 1993), but it would also require more information than is currently available in the NSFG survey. Moreover, it would increase the need to measure respondent’s characteristics at the time of sterilization—as well as at the time of the interview—as other SES indicators tend to be less stable than education.

Second, intersectionality ideally requires mixed-methods approaches and putting disadvantaged groups at the center of analysis (Daniels and Schulz 2006; Weber 2006). The fulfillment of these ideals is hard to achieve in quantitative research; for example, putting

disadvantaged groups at the center of analysis (i.e., making them the reference group) is often not recommended because of small(er) group sizes. Nevertheless, there is much to be gained from the integration of feminist intersectional thinking into quantitative research on contraceptive use; most importantly the opportunity to explore how interacting systems of power structure reliance on contraception in a nationally-representative sample of women and men. In sum, intersectionality provides a useful framework to help guide the design, completion, and evaluation of quantitative research studies on contraceptive use, even if such studies fall short of attaining the intersectional ‘ideal.’

By focusing on how SES and race/ethnicity intersect, this study shed light on persistent and gendered differentials in reliance on contraceptive sterilization in the United States. Use of an intersectional approach both extended past work on socioeconomic and racial/ethnic inequalities in sterilization, and illustrated the value of incorporating feminist thinking into the quantitative study of contraceptive use patterns. By providing a critical descriptive foundation, this study highlighted a number of important questions for future research to deepen our understanding of sterilization patterns—and contraceptive use differentials more generally. What factors can explain the relatively high reliance on female sterilization among highly educated minority women? What reasons can account for the negligible level of male sterilization among less-educated minority men? Future research on contraception should include an analysis of the social and political processes that shape contraceptive use, including its historical, cultural, and social context and the range of policy and practice that supports the maintenance of a system of stratified reproduction (Colen 1995).

### **Notes**

1. Contraceptive intent was not recorded for sterilization procedures of non-coresident partners in either the female or male sample, nor for sterilization procedures of female coresident partners in the male sample. These sterilization procedures were all considered to be contraceptive sterilizations. Sensitivity analyses limiting the analytic samples to married or cohabiting women and men did not lead to substantively different conclusions regarding the interaction between education and race/ethnicity (see part ‘Sensitivity analyses’).

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TABLE 1. *Percent distribution by method, racial and ethnic background, and education: Combined 2006-10, 2011-13, 2013-15 samples of females (N=8,737) and males (N=5,826) of the NSFG*

Sample	Percent distribution													
	N		Female sterilization		Male sterilization		Long-acting reversible		Other highly effective reversible		Condom		Other less effective	
	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male
<b>All</b>	<b>8,737</b>	<b>5,826</b>	<b>31.2</b>	<b>17.6</b>	<b>11.9</b>	<b>12.9</b>	<b>9.8</b>	<b>8.8</b>	<b>22.3</b>	<b>30.4</b>	<b>14.4</b>	<b>21.2</b>	<b>10.5</b>	<b>9.2</b>
<i>Less than high school</i>	992	700	56.0	30.5	2.2	4.5	7.6	9.1	14.5	23.2	12.0	23.8	7.8	8.8
<i>Completed high school</i>	2,335	1,676	44.6	23.1	10.2	10.7	7.2	9.9	15.6	25.4	11.5	20.3	11.0	10.5
<i>Some college</i>	2,594	1,704	29.0	18.4	12.3	12.1	11.7	9.8	22.0	31.2	13.4	20.0	11.7	8.6
<i>Completed college</i>	2,818	1,747	13.3	6.4	16.3	19.2	11.1	6.5	30.7	37.3	18.6	22.1	10.0	8.5
<b>Non-Hispanic white</b>	<b>5,823</b>	<b>3,957</b>	<b>26.5</b>	<b>16.2</b>	<b>15.4</b>	<b>16.8</b>	<b>10.0</b>	<b>9.0</b>	<b>23.6</b>	<b>30.9</b>	<b>13.6</b>	<b>18.3</b>	<b>10.9</b>	<b>8.8</b>
<i>Less than high school</i>	327	244	64.2	31.5	4.6	10.1	4.6	10.0	8.7	24.6	10.2	16.0	7.8	7.8
<i>Completed high school</i>	1,400	1,086	41.8	22.6	13.5	14.3	7.7	11.6	14.9	25.8	10.0	15.2	12.3	10.5
<i>Some college</i>	1,741	1,172	26.5	19.7	15.9	15.9	10.6	9.4	23.3	30.1	11.7	17.0	12.0	8.1
<i>Completed college</i>	2,355	1,454	12.3	6.0	17.8	20.6	11.6	6.7	31.1	36.5	17.5	22.0	9.7	8.2
<b>Hispanic</b>	<b>1,777</b>	<b>1,222</b>	<b>38.6</b>	<b>20.7</b>	<b>5.9</b>	<b>4.5</b>	<b>10.6</b>	<b>9.4</b>	<b>18.5</b>	<b>29.4</b>	<b>15.8</b>	<b>26.1</b>	<b>10.7</b>	<b>9.9</b>
<i>Less than high school</i>	531	386	50.5	31.3	1.3	1.8	10.0	9.1	17.5	22.5	12.2	25.0	8.9	10.3
<i>Completed high school</i>	569	352	44.6	21.9	8.5	4.1	8.0	9.1	16.4	24.1	12.4	30.5	10.1	10.3
<i>Some college</i>	444	320	27.7	13.1	6.0	4.2	15.4	12.7	18.6	35.3	19.1	25.1	13.2	9.6
<i>Completed college</i>	233	163	17.5	7.7	9.9	12.4	9.7	4.4	25.7	45.8	26.1	21.0	11.2	8.7
<b>Non-Hispanic black</b>	<b>1,137</b>	<b>647</b>	<b>43.3</b>	<b>20.3</b>	<b>2.9</b>	<b>4.7</b>	<b>7.9</b>	<b>5.9</b>	<b>21.2</b>	<b>29.2</b>	<b>16.6</b>	<b>29.6</b>	<b>8.1</b>	<b>10.3</b>
<i>Less than high school</i>	134	69	57.7	22.6	0.0	0.0	6.7	6.2	16.7	22.3	15.5	44.6	3.4	4.4
<i>Completed high school</i>	366	237	55.6	27.2	0.4	3.9	3.9	3.7	16.9	25.7	15.8	28.6	7.5	11.0
<i>Some college</i>	408	211	40.6	19.2	3.8	2.6	12.5	8.0	20.5	31.3	14.5	28.7	8.3	10.2
<i>Completed college</i>	229	131	19.8	8.4	7.2	12.2	6.9	6.6	32.3	35.7	22.4	24.9	11.5	12.3

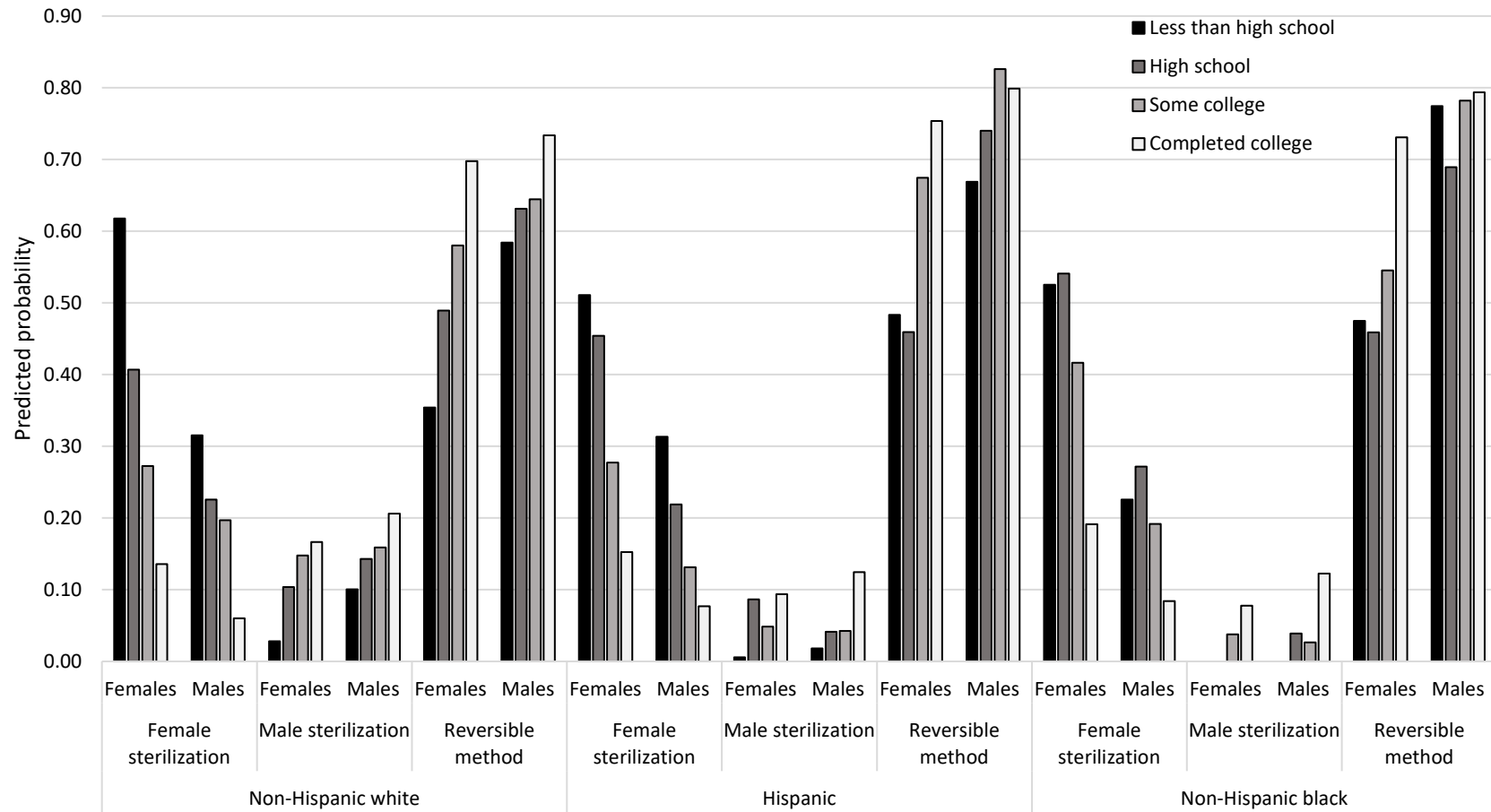
Notes: Numbers and percentages may not sum to total because of rounding.

TABLE 2. Exponentiated coefficients in multinomial logistic regression analyses of contraceptive use (ref. female sterilization): Combined 2006-10, 2011-13, 2013-15 samples of females (N=8,737) and males (N=5,826) of the NSFG

Sample	Model 1				Model 2				Model 3			
	Female		Male		Female		Male		Female		Male	
	Male sterilization	Reversible method	Male sterilization	Reversible method	Male sterilization	Reversible method	Male sterilization	Reversible method	Male sterilization	Reversible method	Male sterilization	Reversible method
Education (ref. Completed college)	***		***		***		***		***		***	
Less than high school	<b>0.05</b>	<b>0.14</b>	<b>0.07</b>	<b>0.16</b>	<b>0.05</b>	<b>0.09</b>	<b>0.09</b>	<b>0.15</b>	<b>0.13</b>	<b>0.15</b>	<b>0.12</b>	<b>0.18</b>
Completed high school	<b>0.22</b>	<b>0.19</b>	<b>0.18</b>	<b>0.24</b>	<b>0.22</b>	<b>0.19</b>	<b>0.18</b>	<b>0.23</b>	<b>0.42</b>	<b>0.30</b>	<b>0.21</b>	<b>0.27</b>
Some college	<b>0.40</b>	<b>0.39</b>	<b>0.24</b>	<b>0.31</b>	<b>0.41</b>	<b>0.38</b>	<b>0.24</b>	<b>0.27</b>	0.69	<b>0.55</b>	<b>0.28</b>	<b>0.25</b>
Race/ethnicity (ref. Non-Hispanic white)	***		***		***				*			
Hispanic	<b>0.50</b>	1.11	<b>0.36</b>	1.27	<b>0.39</b>	0.73	0.47	0.85	0.53	0.56	0.56	0.82
Non-Hispanic black	<b>0.15</b>	<b>0.72</b>	<b>0.29</b>	1.08	<b>0.25</b>	0.65	0.42	0.77	<b>0.33</b>	<b>0.53</b>	0.43	0.70
Education*Race/ethnicity					***		***		***		***	
Less than high school*Hispanic					0.92	<b>2.69</b>	0.38	1.35	0.73	<b>3.50</b>	0.37	1.50
Completed high school*Hispanic					1.50	1.35	0.63	1.42	1.50	1.76	0.64	1.28
Some college*Hispanic					0.92	1.51	0.85	2.25	0.82	1.54	0.67	2.50
Less than high school*Non-Hispanic black					<b>0.00</b>	<b>2.33</b>	<b>0.00</b>	2.40	<b>0.00</b>	<b>5.48</b>	<b>0.00</b>	3.16
Completed high school*Non-Hispanic black					<b>0.08</b>	1.15	0.53	1.17	<b>0.11</b>	1.76	0.63	1.67
Some college*Non-Hispanic black					0.62	0.98	0.40	1.61	0.82	1.25	0.36	2.15

\*p<.05. \*\*p<.01. \*\*\*p<.001. Notes: Model1 regressed contraceptive use on education and race/ethnicity, Model2 adds the interaction between education and race/ethnicity, and Model3 is the full model that includes controls for age, nativity, early childbearing, parity, union status, and union history. Symbols opposite the names of covariates indicate significance of associations between covariates and contraceptive use (based on Wald tests). Boldface indicates coefficient differs significantly from reference group (OR = 1.00), at p<.05 level.

FIGURE 1. Predicted probabilities of relying on female sterilization, male sterilization, or a reversible method for non-Hispanic white married contraceptive users aged 40–44 with two children who were born in the study country and had no early birth or previous co-residential partnership (based on Table2, Model2)



APPENDIX A. *Per cent distribution of respondents aged 25–44 currently using contraception by the main independent variables, by survey year: 2006-10, 2011-13, 2013-15 samples of females (N=8,737) and males (N=5,826) of the NSFG*

	2006-10		2011-13		2013-15	
	Female	Male	Female	Male	Female	Male
<b>Age</b>						
<i>25-29 years</i>	24.4	26.3	24.1	24.2	24.3	28.5
<i>30-34 years</i>	22.3	21.9	25.5	24.8	25.5	27.8
<i>35-39 years</i>	26.7	26.1	23.4	23.9	24.4	20.0
<i>40-44 years</i>	26.6	25.7	27.0	27.1	25.9	23.6
<b>Nativity</b>						
<i>US-born</i>	85.3	83.9	86.5	85.8	82.8	84.7
<i>Foreign-born</i>	14.7	16.1	13.5	14.2	17.2	15.3
<b>Early childbearing</b>						
<i>No birth &lt;25 years</i>	49.4	68.4	48.0	70.9	51.7	70.0
<i>First birth 20-24 years</i>	28.6	23.8	27.0	20.1	24.7	23.5
<i>First birth &lt;20 years</i>	22.1	7.8	25.0	9.0	23.6	6.7
<b>Parity</b>						
<i>0-1</i>	34.4	49.7	33.1	49.6	37.0	51.6
<i>2</i>	33.9	29.0	32.8	26.1	31.5	29.1
<i>3+</i>	31.7	21.3	34.1	24.4	31.5	19.3
<b>Union status</b>						
<i>Married</i>	63.9	55.9	58.8	56.0	57.5	55.5
<i>Cohabiting</i>	11.9	15.9	16.2	16.8	17.5	19.0
<i>Single</i>	24.2	28.2	25.0	27.3	25.0	25.5
<b>Union history</b>						
<i>No previous co-res. union</i>	54.9	55.8	51.3	55.7	53.8	57.6
<i>Previous cohabitation(s) only</i>	20.8	25.0	22.5	25.8	21.8	26.0
<i>Any previous marriage</i>	24.4	19.2	26.2	18.5	24.5	16.5