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Abstract

Unplanned pregnancies in the U.S. disproportionately occur among poor, less educated, and minority women, but it is unclear whether poverty following a birth is itself an outcome of this pregnancy planning status. Using the National Longitudinal Survey of Youth 1997 (n=1701) and National Survey of Family Growth (n=778), we constructed two-year sequences of contraceptive behavior before a birth that signal an unplanned versus a planned birth. We regressed poverty immediately after the birth both on this contraceptive-sequence variable and on sociodemographic indicators including employment and poverty status before the birth, race/ethnicity, education, partnership status, birth order, and family background. Compared to sequences indicating a planned birth, sequences of inconsistent use and non-use of contraception were associated with a higher likelihood of poverty following a birth, both before and after controlling for sociodemographic variables, and before and after additionally controlling for poverty status before the birth. Overall, having not used contraception consistently is associated with a 46% higher odds of poverty after birth. The positive association of poverty after birth with contraceptive inconsistency or non-use, however, is limited to women with low to medium educational attainment. These findings encourage further exploration into relationships between contraceptive access and behavior and subsequent adverse outcomes for the mother and her children.

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Key Words: Fertility, Pregnancy Intentions, Newborn Poverty, Contraceptive Consistency, Education

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Introduction

In a recent special journal issue exploring policy proposals to reduce poverty, Wu and Mark (2018) advocate for a policy that would provide all women with free access to the most effective contraceptives, namely long-acting reversible contraceptives (LARC). In quasi-experimental studies, greater access to effective contraception and to abortion has been found to reduce the likelihood of poverty. Bailey (2013) and Browne and LaLumia (2014) found that access to the contraceptive Pill in the 1960's and 1970's was associated with lower poverty rates and higher household incomes. Bailey, moreover, found that these effects arose to some extent through reductions in mistimed and unwanted pregnancy. Bailey, Malkova, and McLaren (2018) additionally found that the expansion of Title X programs for low-income women's family planning in the 1960's and 1970's reduced their poverty rates. Finally, having access to abortion has been found to reduce substantially the likelihood of poverty among pregnant, disadvantaged women (Foster et al 2017).

Underlying these studies and policy prescriptions is the premise that when births arise from some combination of a woman's non-use of contraception and imperfect or inconsistent method use, she is likely to be less financially prepared for the birth. We are unaware, however, of any study that has explicitly investigated associations between consistency of contraceptive use and income and poverty following a birth. Women's available contraceptive choices and their contraceptive attitudes and behavior are also dependent on broader societal and institutional forces associated with socioeconomic status (England et al. 2016). This also needs to be carefully accounted for when examining the relationship between contraceptive consistency and subsequent poverty. In the present study, we evaluate links between the planned versus unplanned status of a birth, as inferred from the new mother's pattern of contraceptive use in the

two years before the year of the birth, and the poverty status of the family immediately after the birth. We incorporate into our multivariate analyses standard sociodemographic variables plus indicators of whether the woman had stable employment before the birth, her family structure as a teenager, and her poverty status in the year before the birth. Our analyses also include models that allow for the association between contraceptive consistency and poverty after birth to differ by the woman's educational attainment.

We first review the existing literature on contraceptive access, attitudes, and behavior, pregnancy intentions, and poverty outcomes. We then describe our use of nationally-representative data in two surveys, the National Longitudinal Survey of Youth 1997 (NLSY97) and National Survey of Family Growth (NSFG). We use the two data sources separately and together in pooled-survey estimation. Both the NLSY97 and NSFG questions allow for the constructing of sequences of contraceptive behavior in the two years before the year of the birth in a way that signals whether the birth was unplanned versus planned. Both the NLSY97 and NSFG include measures of poverty-status following a birth, but the NLSY97 alone additionally includes poverty status before the birth. This is a critical variable for our analyses, intended to capture unobserved characteristics that raise the woman's likelihood of poverty after a birth independently of her contraceptive use or non-use. We use cross-survey multiple imputation (Rendall et al 2013) to combine these two survey samples to produce pooled-survey estimates of poverty after a birth in a model that accounts for poverty status before the birth in addition to contraceptive-use sequence and sociodemographic characteristics. To anticipate our main results, we find that, compared to women whose patterns of consistent contraceptive use indicate the birth was planned, women with inconsistent use or non-use of contraception have higher poverty rates following a birth, both before and after controlling for sociodemographic characteristics

and after additionally controlling for poverty status before the birth. We find that this result holds for women with no more than a high school education or some college, but does not hold for women with a bachelor's degree. We interpret this as preliminary descriptive evidence consistent with a causal impact of unplanned births on poverty after the birth among women whose socio-economic characteristics already put them at higher risk of poverty.

Background

Approximately half of U.S. pregnancies are classified as unintended (Finer and Zolna 2011, 2016). A woman's pregnancy intention may be distinguished from whether the pregnancy is planned versus unplanned. In reviewing the two concepts of pregnancy intention and pregnancy planning, Klerman (2000) describes the concept of "unplanned" as being manifested in a woman's contraceptive-use behavior, including not only non-use of contraception but also whether she used a method incorrectly or inconsistently. She finds it "…puzzling that so much more attention seems to be given to…unintended pregnancies compared to…unplanned ones" (p.159). According to Bachrach and Morgan (2013, p460), an intention is a desire for a particular outcome and the belief that specific behaviors will bring it about. However, measuring fertility intentions can be complex. Thoughts, emotions, and other cognitive processes may not always line up exactly with behavior. For example, having the intention to avoid pregnancy is a consistently strong predictor of contraception use (Bartz et al 2007, Moreau et al. 2013). However, Jones (2017) found that a sizable fraction of women both said it was important to avoid pregnancy, but also said they would be happy if they became pregnant; these women were nonetheless more likely to take pregnancy avoidance measures. Additionally, retrospective pregnancy and birth-intention survey questions can be problematic (Brown and Eisenberg 1995,

Bachrach and Newcomer 1999, Williams and Abma 2000). Surveys are typically not able to ask a woman near the time of conception about her pregnancy intentions (although see Moreau et al. 2013). Instead, respondents who have already given birth are asked to describe how they felt at the time of conception of their child. They are asked to indicate whether they would have preferred the pregnancy to have occurred sometime later (classified as "mistimed"), or whether the pregnancy was simply not wanted at any time. Parents may be especially hesitant to mark their child as unwanted, and may also hesitate to state explicitly that the child arrived at "the wrong time." In their ethnography of poor women in a Philadelphia neighborhood, for example, Edin and Kefalas (2005) found many of the women hesitated to label their births as either intended or unintended. As a consequence, many unintended births may be mislabeled. Critics of the traditional birth intention measure additionally argue that the categories too strictly demarcate intended vs. unintended births, whereas individuals' feelings on the matter may be more complex (Bachrach and Newcomer 1999).

Bachrach and Morgan (2011; 2013) draw on Fishbein and Ajzen's (1975; 2010) theory of reasoned action to conceptualize pregnancy intentions as a continuum including ambivalence about pregnancy. Ambivalence about pregnancy may present itself is through inconsistent use of contraception (Zabin 1999). The theoretical framing of contraceptive behavior as part of pregnancy planning within social class context is further developed by England and colleagues (England 2016, England et al. 2016). They describe "efficacy" (planfulness, self-regulation, assertiveness, and beliefs in one's ability to carry out behaviors that will help realize one's goals) as being formed through social class-dependent socialization processes. Efficacy is not socialized independently of class; agency and efficacy are driven by confidence in oneself and confidence in institutions (England 2016). This is often instilled from birth. Applying their theoretical

framework to contraceptive use, England et al. (2016) find that women who had high efficacy were five to eight times more likely to use contraceptives consistently. Young women's economic prospects may also serve as a motivator for their contraceptive behavior. Using longitudinal data on 18 to 19 year old women for two and a half years in the Relationship Dynamics and Social Life Study (RDSL), Wu et al. (2016) found several significant characteristics of young women who were more likely to use contraceptives consistently: women with a GPA of 3.0 or higher and women who have a job. Having a high GPA can mean that young women see higher education as a possibility and having a job can imply a chance for a financially stable future. Moreau et al. (2013), also using RDSL data, found that high education, higher parental income, and being unmarried were all predictors of more consistent contraceptive use.

We know of just two studies assessing explicitly the connection between contraceptive access and poverty following a birth, and one study that assesses the connection between abortion access and poverty following a birth. Using pooled U.S. Census data, Browne and LaLumia (2014) found that if a woman lived in a state that had early access to the Pill in the 1970's, her probability of being in poverty would decrease 0.5%. Bailey, Malkova, and McLaren (2018) analyzed the impact of "Title X" federal family planning programs in the 1960's and 1970's. The purpose of these programs was to increase the access to contraceptives, education, and counseling for disadvantaged women. Bailey et al compared poverty levels of children both in the same counties before and five years after the implementation of the programs. Children born after the introduction of the programs were 7% less likely to live in poor households. The researchers suggest that the leading mechanism explaining the policy impact was the increase in income of disadvantaged parents who avoided unintended pregnancy. These parents would have

chances to improve their human capital and socioeconomic conditions before a birth. The selection effect (decreases in births among poor parents) was less significant in explaining the effects of lower poverty. Bailey (2013) used geographic variation in the introduction of the Pill in the 1960's and 1970's as a quasi-experiment, finding positive outcomes including increased labor market access, earnings, and household income among parents. Bailey also found that in states where the Pill was permitted, fewer women labeled their births as unwanted and mistimed. Foster et al (2017) analyzed the time sequences of poverty status of pregnant women presenting at 30 clinics nationwide for an abortion, comparing those women whose gestational duration was within the limit versus just over the limit that allowed her access to abortion at that clinic, with the result in the latter case that she was turned away from the clinic. The authors found that the poverty rate 6 months later of women who were turned away from the clinic was on average 16 percentage points higher than the poverty rate of women who received their requested abortion at the clinic (61% versus 45%). The difference in poverty rates between these two groups continued to be large at least two years on.

Although we are aware of no previous studies specifically of associations between contraceptive consistency and poverty, nor of the relationship between contraceptive access and poverty in periods since the 1970s, a few studies using recent U.S. data have analyzed more generally the correlates of family poverty immediately following a birth (McKernan and Ratcliffe 2005, Lichter et al. 2018, Thiede, Sanders, and Lichter 2018). McKernan and Ratcliffe (2005) measured poverty before and after a birth, and found that having a birth increased the likelihood of poverty by 30%. Foster et al (2017) found that the increase in household size occurring with a birth was the primary reason for a woman's being poor after a birth. All of these studies have found significantly higher rates of poverty among women whose births occurred in

a context of socioeconomic and family disadvantage. An already socioeconomically vulnerable woman may be especially likely to be economically penalized for an unplanned birth. In-depth interviews of 65 men and women by Kavanaugh et al. (2017) found that respondents felt financially stressed by the addition of a child, the biggest issue stemming from trouble finding childcare. However, we are unable to tell from these more general infant and child poverty studies what, if any, may have been the roles of contraceptive access and consistency of contraceptive use in determining the likelihood of poverty after a birth.

Current Study

Using data from two nationally representative surveys covering births in the 2000s through early 2010s, we examine associations of contraceptive consistency in the two years preceding the year in which a woman gives birth with poverty in the year of the birth. We first estimate this association for all women giving birth, controlling for their socioeconomic background and current family status, and alternately before and after controlling for poverty status before the birth. We then allow the association of contraceptive consistency with poverty in the year of the birth to apply differentially for women at low, medium, and high levels of educational attainment. The goal of this study is to begin to shape a story of how persistent disadvantage can be exacerbated and reproduced with an unplanned pregnancy and birth. In a country such as the United States where general social support for families is low (Brady and Burroway 2012), an unplanned birth may put women and their newborn children in a uniquely vulnerable position. We test the following hypotheses:

H1: A woman whose contraceptive use indicates the birth was planned will be less likely to be in poverty after a birth than will a woman whose contraceptive use was inconsistent, holding constant her socioeconomic characteristics and poverty status before the birth.

H2: The association between consistency of contraceptive use and poverty after a birth will be strongest among women with the greatest pre-birth socioeconomic disadvantage, as represented by low educational attainment.

Data and Methods

Data

Data for this study come from U.S. women who reported giving birth between panel waves in the National Longitudinal Survey of Youth 1997 (NLSY97) and from women who reported giving birth in the year before survey in the National Survey of Family Growth (NSFG). These two surveys have the major strengths of collecting both contraceptive-use histories and poverty status. The NSFG collects more detailed contraceptive histories than does the NLSY97. Only the NSLY97, however, collects poverty status across multiple time points (annually). Combining the two data sources has three advantages. First, it allows for replication of our main results of differences in poverty in the year of the birth by contraceptive consistency before the birth across two data sources. Second, it allows for a regression specification that includes a crucial control variable of poverty status in the year preceding the birth. Third, with the application of cross-survey multiple imputation (described below), it allows for estimation of the fuller regression specification using a sample size of the two surveys combined, thereby providing more precise estimates of the relationship between contraceptive consistency and poverty after giving birth.

Starting in 1997, the NLSY97 (Bureau of Labor Statistics 2017) interviewed a nationally representative sample of 8,984 individuals who were between ages 12 and 16. 92.1% of eligible respondents completed the first round, 1997, interview. Black and/or Hispanic and Latino populations were oversampled. Respondents were interviewed annually until 2011 and biennially since. Approximately 83 percent of the 1997 sample was interviewed in 2011. Our sample includes all women who gave birth having been sexually active in one or more of the years preceding the 1999 through 2011 survey waves and who had non-missing values on the outcome and predictor variables. Because we build the contraceptive-consistency and birth sequence from three consecutive years of data, we are not able to use data after the biennial interview schedule began after 2011. Because we need two years of data before a birth to observe contraceptive use, the first year we can use to observe a birth is the 1999 wave (unless birth happened in 1998 wave and respondent reported having sex for the first time in 1997 wave). The women in our analytic sample are interviewed at ages immediately after the birth that range from age 17 to 31. A woman is represented as a separate observation at each birth that meets these criteria. We exclude births that were the result of contraceptive failure during consistent contraceptive use, which is defined as using contraceptives 100% of the time in the year before birth among women who gave birth in any of the first nine months of the year of birth exposure (discussed in more detail below).

The NSFG is a cross-sectional representative survey of the household population of women between 15 and 44 years old, and is conducted by the National Center for Health Statistics (Center for Health Statistics 2003, 2011). Since 1973, ten rounds have been completed. The first six (1973 to 2002) used a periodic strategy (each sample was interviewed in the course of one year) and since 2006, the NSFG has followed a continuous interviewing design (the

sample for each cycle respond during two to four years). Women are interviewed on topics including individual history of family life, marriage and divorce, pregnancy, infertility, use of contraception, and general and reproductive health. The questions are answered by in-person interview, but more sensitive questions are answered privately by self-administration. To conduct our analysis on a sample of women approximately comparable to those in the NLSY97, we use data from the female respondents between ages 17 and 31 years from the 2002 and 2006-2010 cycles. In these cycles, Hispanic, Black, and teen women were oversampled. The overall response rate was 79% in the 2002 cycle and 78% in the 2006-2010 cycle. We select women who had a birth in the year before the interview, since poverty is assessed in only the year before interview in the NSFG.

Measures

Contraceptive Consistency

As noted above, our measures of contraceptive consistency preceding a birth require three consecutive years of observation. The third year of observation, denoted (t-1,t), is the year in which the birth occurred. The two preceding years, (t-3,t-2) and (t-2,t-1), are those in which a woman's contraceptive use is observed. In addition, if a woman gives birth in one of the last two months of (t-1,t), we also use observed contraception in the first months of year (t-1,t). In general, we assume that year (t-2,t-1) was the year of exposure to either a planned or unplanned conception. The two surveys capture contraceptive use differently. The NSFG questions are monthly based, whereas the NSLY questions are yearly and sexual-episode based. Also, whereas the NSFG`s respondents need to recall their contraceptive use in the last three years, the NSLY`s respondents report in each wave on their contraceptive use in the previous year. We tested the comparability of both measures for a larger sample (women 17-35 years sexually active, years

2001-2015), not restricted to women with recent births, and found no statistically significant differences between both surveys in terms of annual contraceptive use/non-use (results not shown).

Contraceptive consistency is defined as using contraception at every sexual encounter in the case of the NLSY97, or at every sexually-active month in the case of the NSFG. The first step in defining our multi-year categories of contraceptive consistency prior to the birth is to divide women into three categories of contraceptive use in a given year: 0% birth control use is non-use; 1-99% is inconsistent use; and 100% is consistent use. This strict definition of "consistent use" matches that used by Manlove et al (2007) and Sipsma and Ickovics (2015). We use up to two years before the year in which the birth occurred to observe contraceptive consistency, conditional on the women having had sex for the first time. Using the NSFG, Glei (1999) showed that long-term contraceptive non-users were at most risk for an unintended birth, followed by inconsistent users, and then least at risk were effective users. Following this framework, we classified women into three multi-year categories of contraceptive use prior to a birth: never-consistent; ever-consistent; and non-use, married. Women who do not use contraceptives at all, but are married in the year before the birth are in their own category. These women do not fit in perfectly with the 'planners'; they also however do not fit well with the non-planners, as married women have some of the lowest rates of unintended pregnancies (Finer and Zolna 2016).

The ever-consistent women are those who in the year that is two years before the birth use contraceptives 100% of the time. In the year before birth, their use of contraceptives will be less than 100% and possibly not at all, indicating they stopped using contraception in that year with the intention of becoming pregnant. These women represent the highest level of planning in

our grouping, similarly to Glei's sample of effective users who most often avoided an unintended birth. Never-consistent women are those with any combination of non-use and inconsistent use in the two years before the year of giving a birth.

In the NLSY97, our annual contraceptive-use measure is built using several questions in the Self Administered Questionnaire. First, the respondent was asked how many times in the last year have they had sexual intercourse. Next, the respondent was asked how many times out of all the times that they have had sexual intercourse in the last year did the respondent used *any* method of birth control. In 2002 to 2011, before being asked about general birth control, the respondent was first asked how many times they had used condoms. If the respondent stated using condoms 100% of the time, they were not asked further about other birth control method use. To obtain a percentage, we divided the number of times a woman used birth control by the times she has had sex in the last year. To minimize missing data, we also took advantage of questions used as follow-ups if the respondent did not know how often they used birth control (1998 and onward). The follow-up questions allowed for a respondent to give a percentage, 0 to 100%, as an estimate of how many times they used birth control in the last year.

Based only on contraceptive-use information in the year before the year of the birth, about 19% of the births to women in the NLSY97 would appear to be attributable to contraceptive failure. That is, the woman reported 100% contraceptive use before the year of birth (results not shown). This is higher than the national average of 10-12% (Sundaram et al. 2017). In part, however, this will be because a year-by-year observation period will over-identify contraceptive failures: births occurring in the last three months of year (t-1,t) may have been conceived in one of the first three months of year (t-1,t), following 100% contraceptive use in

year (t-2,t-1)).[2] To address this issue, we code as "ever-consistent," women who are consistent contraceptive users (100%) in (t-2, t-1) but have their birth in the last two months of (t-1, t). This will include in our analytic sample women who may have had at least two to three months of intentional non-use before getting pregnant early in the year and who went on to give birth in the last two months of the (t-1, t). Similarly, we include women who had sex for the first time in the year before the birth, reported consistent contraceptive use in the year before the birth, and had a birth in the last two months of (t-1,t). Distributions of the NLSY97 contraceptive sequences making up each multi-year prior contraceptive-use category are shown in Table A1 of the Appendix.

The NSFG collects information of monthly sexual intercourse and contraceptive method used for the time period from the January three years prior to the interview date (National Center for Health Statistics 2003, 2011). For example, for interviews conducted in August 2010, information covers from January 2007 through August 2010. The number of months reported for each respondent depends on the date (month/year) of her interview, but ensures a window of at least three years of contraceptive questions for each respondent. Restricted to women who declare at least one experience of sexual intercourse with a man, the survey collects monthly information for this three-year period on whether they had sexual intercourse and on the contraceptive methods used. The woman's annual measure contraceptive use is then whether she used contraceptives 0% of the months, 1%-99% of the months, or 100% of the months. We combined information on annual contraceptive use in the two years before the year of the birth into the three categories of never-consistent, ever consistent, and non-use, married in the same

[2] Another possibility, given that 40% of identified "contraceptive failures" were pill users, is that the measurement of contraceptive consistency in the NLSY97 may not be targeting the kind of inconsistencies experienced by pill users (i.e. not taking the pill on time, missing pills, not using a backup method while on antibiotics etc.)

way as for the NLSY97. As with the NLSY97, we also use information on contraceptive use in the first months of year (t-1,t) to code as "ever-consistent," women who gave birth in the last two months of (t-1, t) and reported consistent use in year (t-2,t-1). Distributions of the NSFG annual sequences making up each multi-year prior contraceptive-use category are found in Table A2 of the Appendix.

Poverty

Rounds 1-7 (1997-2003) of the NLSY97 collected income information on all members of the household; therefore we have a household income measure in those years. After 2003, due to change of question wording, income information was only collected for family members, including resident nonmarital partners. The percentage of women in poverty after birth in the sample therefore reflects a household level from 1998-2003 and family level from 2004-2011. The poverty variable in the NLSY97 is coded using income from wages, child support, interests, stocks, and other assets. Due to non-response data on some of those income questions, approximately 13% of the possible sample has missing poverty data in the year of the birth.

An important predictor of current poverty status (that for the year of the birth) is poverty status in the year before the year of the birth. Therefore, we use poverty status both in the year of the birth and in the previous year, the latter serving as a lagged dependent variable. Due to the same processes that leave some missing values in poverty in the year of the birth, approximately 19% of the possible sample has missing values for poverty in the year before[3].

[3] If the respondent is not independent from their parents, but their parents did not fill out a "Parent Interview" we do not know the income and poverty status of the respondent, and therefore have missing poverty information. 35% of women had missing data on either the year of the birth or the year before the birth.

In the NSFG, the income used in the calculation of the poverty status is a combination of family income from all sources in the last twelve months. That is, poverty status is observed only in the year of the birth. The family income includes all relatives as well as a resident nonmarital partner. In both the NLSY97 and NSFG, a status of poor is defined using annual poverty thresholds as assigned by the U.S. Census Bureau, but including cohabitors as family members when defining the threshold.

Social, economic, and demographic characteristics

In order to best isolate the effects of contraceptive use on poverty after birth, we control for other possible predictors of poverty and contraceptive-use influencers. Own education, mother's education, birth order, age, and partnership status in the model are measured at the end of the year of the birth. A mother's low education can indicate a higher chance of a respondent growing up in an economically disadvantaged household, and therefore having a higher chance of being vulnerable to poverty herself (Hoynes, Page, and Stevens 2006; Kaushal 2014). The NSFG and the NLSY97 do not provide sufficient data to code fathers' education. Several studies have shown that going through family transitions is associated with adverse life outcomes (McLanahan and Percheski 2008; Rosenfeld 2015; McLanahan and Jacobsen 2015). Therefore we include a measure of family structure during youth. We used the best-matched variable between the NLSY and NSFG, which was whether the respondent lived with both biological parents at 18 years old.

We include a variable for presence of having ever had a spell of at least 6 months of continuous full-time employment before the birth, coded from a single question in the NSFG and from detailed employment histories in the NLSY97. Alon, Donahoe, and Tienda (2001) and Lu et al (2017) have shown that when women have an established work record, they tend to stay on

that trajectory. Rendall and Shattuck (2019) show more specifically that women's achieving stable employment before becoming a mother is associated with a higher employment probability in years following a birth. Active participation in the labor market, not surprisingly, decreases the chances of a child being in poverty (Chen and Corak 2008).

Analyses

We estimate three regression models. In each model we adjust for the complex survey design, including the possibility of a woman being included more than once in the NLSY97 sample if she contributes more than one birth. The first (Model 1) includes only the contraceptive-consistency variable among the regressors. Model 2 includes contraceptive consistency plus the sociodemographic variables, but not pre-birth poverty status. Model 3 adds pre-birth poverty status. This is our preferred specification, as pre-birth poverty status is expected to capture unobserved characteristics that raise the woman's likelihood of poverty independently of her contraceptive use. Each regression model was first estimated separately on the NLSY97 and NSFG samples and then re-estimated on a sample that pooled observations across the two surveys. The methodology used for our pooled-survey estimation is adapted from that described in Rendall et al (2013) and applied in an analogous child-outcome context in Baker, Rendall, and Weden (2015). Pre-birth poverty status is available only in the NLSY97. We used cross-survey multiple imputation (MI) to impute values of this variable from the NLSY97 to every observation in the NSFG. This allows us to estimate Model 3 not only for the NLSY97 sample, but also both for the NSFG sample alone and for the combined NSFG and NLSY97 samples. As a result, our preferred regression model specification can be estimated on a sample whose size is substantially larger than that of the NLSY97 alone. We additionally show below that estimated magnitudes of contraceptive-consistency associations with post-birth poverty status are generally

smaller, as expected, after controlling for pre-birth poverty status in addition to the socio-demographic variables present in both surveys. The cross-survey multiple imputation method thus overcomes what would otherwise be omitted-variable bias if the less preferred specification of only variables in common between the NLSY97 and NSFG (that is, the Model 2 specification) were used.

Because our estimation combines observations from two nationally representative surveys of approximately the same ages and years, we begin by assuming that they sample from a common social process except for a potential difference in levels of the outcome variable (post-birth poverty status). We test the validity of this assumption by conducting diagnostics under a model-fitting framework, following Rendall et al. (2013). This procedure consists of including as a regressor "survey" (the woman's being observed in the NSFG rather than in the NLSY97), and then "survey" and its interaction with all covariates, and assessing change in AIC and BIC model fit statistics with the addition first of the "survey" intercept shifter and second with the addition of "survey" interactions with the covariates. Only variables common to both surveys are included in this model-fit test. As recommended by Rendall et al (2013, p.498), we emphasize the BIC over the AIC as the preferred model-fit statistic. A finding of model-fit improvement when adding a "survey" intercept shift variable for overall post-birth poverty rate differences between the surveys would not be problematic. However, a finding of model-fit improvement when adding a full set of covariate interactions with "survey" would be evidence against the assumption that the surveys sample from a common social process, calling into question the appropriateness of a pooled-survey method. As we show below in the results section, we find model-fit improvement only when adding an intercept shift variable for overall post-birth poverty rate differences between the surveys.

One of the strengths of the multiple imputation method is its separation of the imputation step from the estimation of the analysis model. This allows for greater flexibility in the implementation of the analysis model. For example, the complex sample designs of both surveys are handled easily using the SAS SURVEYLOGISTIC procedure in the analysis model. In particular, the standard errors are adjusted for clustering of births within woman in the case of multiple births to the same woman in the NLSY97 using the CLUSTER command. We are able to implement both the imputation and analysis steps using statistical package software from SAS Version 9.4, respectively using the PROC MI (with the MONOTONE LOGISTIC option) and PROC MIANALYZE commands. Estimates are weighted in the analysis model (but not in the imputation model) using survey weights provided by the respective (NSFG and NLSY97) data producers to account for oversampling, differential non-response and attrition. PROC MIANALYZE allows us to estimate confidence intervals, standard errors, and significance tests that are adjusted for the additional uncertainty introduced by the cross-survey imputation process. We follow Ratitch, Lipkovich, and O'Kelly (2013) in calculating the imputation-adjusted confidence intervals around the odds ratios after first using PROC MIANALYZE to calculate the imputation-adjusted standard errors.

For our second hypothesis, we use the pooled data to estimate the interaction effects between own education and contraceptive consistency. Our purpose is to allow the difference in poverty between women with never-consistent versus ever-consistent contraceptive use to vary by their educational attainment. For this, we use the Model 2 specification that does not require that poverty before the birth is first multiply imputed from the NSLY97 to the NSFG. Using the margins command in Stata, we obtain the predicted probabilities and confidence intervals of being in poverty after a birth for women in each combination of education and contraceptive use.

To test for statistical significance between never-consistent and ever-consistent for each education group, we use the Stata lincom command.

Results

In Table 1 we show that the NSFG and the NLSY97 compare reasonably well on most of the sociodemographic predictors. The NSFG education distribution has both slightly more women having a bachelor's degree or more, at 24.6% compared to 21.0% in the NLSY97, and slightly more women with no more than a high school graduate education (56.5% in the NSFG versus 52.6% in the NLSY97). The NLSY97 race/ethnic distributions have notably more (non-Hispanic) White women and fewer Hispanic women than the NSFG. This reflects changes in the U.S. population composition between the 1997 year of the NLSY's sampling frame and the 2002 and 2006-2010 years of the NSFG's sampling frames. The NLSY97 and the NSFG are similar in their partnership status distribution and mean age. The birth-order distributions are substantively very similar between the NSFG and NLSY97, with first births respectively accounting for 45.5% and 45.0% of births, and differ statistically only at the .10 level. Among family background variables, differences in distributions of mother'education parallel the differences of distributions seen in the mother of the newborn's own education, with more high school educated and bachelor's degree educated women in the NSFG, and more with some college in the NLSY97. The proportion of women who had already experienced a continuous period of 6 or months full-time employment is substantially higher when estimated from the NLSY97 data (84.3%) than when estimated from the NSFG data (67.7%). This will be partly due to the higher proportion Hispanic in the NSFG, a race/ethnic group previously shown to experience lower proportions achieving stable employment before a first birth (Shattuck and Rendall 2017).

[TABLE 1 ABOUT HERE]

The percent of women in poverty after a birth in the NSFG is 33.1%, which is substantially and statistically significantly higher than the NLSY97 (20.3%). This difference is consistent in direction with differences between the surveys on some sociodemographic variables, notably the higher percentages of disadvantaged minorities (Hispanic and Black) in the NSFG than in the NLSY97, and the higher percentage of women with 6 or more months of full time employment before the birth in the NLSY97. However, in the multivariate models that control for these variables as described below, we find that poverty is still substantially more likely to be experienced in the year of the birth in the NSFG than in the NLSY97. Survey measurement differences therefore also are likely to play a significant role. These may include the NLSY97's using household poverty (which included non-family members as well) for the first seven rounds and its asking in more detail than in the NSFG the different potential sources of household or family income.

Our measures of contraceptive consistency are overall similar between the NLSY97 and NSFG, though more women are estimated to be never-consistent in their contraceptive use using the NLSY97 (49.7%) than using the NSFG (41.2%). Offsetting this, 48.0% of women are ever-consistent contraceptive users before the birth when estimated using the NSFG versus 40.2% who are ever-consistent when estimated using the NLSY97. The higher ever-consistent proportion in the NSFG may be due to contraceptive consistency being measured as "every month" in the NSFG versus every episode of sexual intercourse in the NLSY97. The third category, non-use, married, has similarly small percentages of 10.8% in the NSFG and 10.1% in the NLSY97. More detailed distributions of these contraceptive use sequences are shown in Tables A1 and A2 of the Appendix. In particular, in both the NSFG and NLSY97 the modal two-

year sequence in the "never-consistent" category is women who are inconsistent contraceptive users in both (t-3,t-2) and (t-2,t-1), and the modal two-year sequence in the "ever-consistent" category is women who are consistent contraceptive users in (t-3,t-2) and inconsistent contraceptive users in (t-2,t-1). The inconsistent-use category will include women who were consistent contraceptive users for a first portion of the year (t-2,t-1) and consistent non-users for the remaining portion of that year, leading to the birth in year (t-1,t).

[TABLE 2 HERE]

Table 2 shows the logistic regression models for the binary outcome of poor /non-poor after the birth. Results are presented as odds ratios (OR) with confidence intervals (CI). The baseline model (Model 1) shows that women who have a pre-birth contraceptive-use sequence in which they never display 100% contraceptive use (never-consistent) are substantially more likely to be poor after the birth than are women who use contraceptives 100% of the time in at least one of the two years before the birth (ever-consistent). These results are seen in both the NSFG (OR 2.79; 95% CI 1.79, 4.35) and NLSY97 (OR 1.63; 95% CI 1.25, 2.71). Women with a contraceptive sequence of non-use while married do not differ significantly at the .05 level in their likelihood of poverty after birth compared with women whose contraceptive use is ever-consistent. When adding in the sociodemographic predictors (Model 2), the odds ratio for never-consistent contraceptive sequence decreases to 2.42 in the NSFG, meaning women who have a contraceptive sequence that is never-consistent are about 2 and a half times more likely as ever-consistent women to be in poverty after birth, after controlling for their sociodemographic characteristics. In the NLSY97, the never-consistent Odds Ratio also decreases with inclusion of socio-demographic characteristics, with never-consistent users being 30 percent more likely to be in poverty than ever-consistent users, a result that is significant only at the .10 level (OR 1.30;

95% CI 0.96, 1.77). Neither the NSFG and the NLSY97 shows statistically significant contrasts at even the .10 level for the non-use, married group relative to the ever-consistent group.

Other strong predictors of poverty after birth that are consistent across the two surveys are being Black (compared to White women), having no more than a high school education, and not having had a spell of at least 6 months consistent full time employment before the birth. The relationship of own education to poverty is both strong and monotonic. Compared to women with no more than a high school education, women with some college education are estimated to be 48% less likely to be poor in the NSFG (OR 0.52; 95% CI 0.27, 0.99) and 31% less likely to be poor in the NLSY97 (OR 0.69; 95% CI 0.47, 1.00), and women with a bachelor's degree or more are 89% less likely to be poor in the NSFG (OR 0.11; 95% CI 0.04, 0.30) and 80% less likely to be poor in the NLSY97 (OR 0.20; 95% CI 0.09, 0.46).

Some predictors are consistent in direction between the NSFG and NLSY97 but are statistically significant in their association with poverty in only one of the two surveys. Having no resident partner (compared to being married) increases the likelihood of poverty greatly in the NLSY97 (OR 3.48; 95% CI 2.27, 5.33), but at OR=1.66 in the NSFG this contrast with married women's poverty is not statistically significant. Similarly, living with both biological parents at 18 years old reduces the likelihood of poverty by a third in the NLSY97 (OR 0.66; 95% CI 0.47, 0.92), but is not statistically significant in the NSFG. Finally, relative to a first birth, the likelihood of poverty after a second birth is greater in the NLSY97 (OR 2.24; 95% CI 1.57, 3.20), but at OR=1.47 in the NSFG this contrast is not statistically significant. Hispanic and Other race women are significantly more likely to be poor in the multivariate Model 2 for NSFG women, but are not statistically different from White women in the NLSY97. Only for one variable, birth order 3 or higher, is there an opposite and statistically significant associations with

poverty between the NSFG and NLSY97, and that is seen in the unexpectedly lower likelihood of poverty of women in the NSFG contrasted with the (expected) higher likelihood of poverty of women in the NSFG.

As we showed in Table 1, the overall poverty levels of women who just gave birth differ between our surveys, at 13% higher in the NSFG sample. We evaluate whether this survey difference is maintained in a multivariate model predicting poverty after birth by pooling the NSFG and NLSY97 observations and including an NSFG indicator variable among the regressors (see the 'NSFG+NLSY97' columns in Table 2). Comparing the magnitude of the odds ratio for the NSFG indicator between Model 1 and Model 2, we see that the difference does not go away, but that some of the difference is attributable to the differences in sociodemographic variables between the two surveys. In Model 1, the odds of poverty are 109% higher (OR 2.09; 95% CI 1.62, 2.70) when using the NSFG data before including sociodemographic variables among the regressors. After including these sociodemographic variables as regressors in the model (Model 2), the poverty likelihood is reduced to being 62% higher among women sampled into and measured in the NSFG relative to women sampled into and measured in the NLSY97 (OR 1.62; 95% CI 1.08, 2.45). The model fit is improved by including an "NSFG survey" intercept, as shown in Appendix Table A3. Focusing on the BIC statistic, we note that the best fitting model is indeed the model that includes a main effect for NSFG. The BIC statistics is lower than when the NSFG indicator is left out, and lower also than when interactions are included of NSFG with all of the regressors. Moreover, we do not find model-fit improvement using the BIC criterion when adding the "NSFG survey" interactions with only the main predictor variable, contraceptive consistency. These findings that the model fit worsens when

including these interactions with survey imply that pooling observations across the two surveys is statistically appropriate when estimating Models 2 and 3.

The final model, Model 3, includes as a regressor, poverty in the year before the year of the birth. This is our preferred model specification, with estimation with the pooled NSFG+NLSY97 sample preferred over estimation with either the NSFG or NLSY97 alone. As with the other pooled-survey estimates (Model 1 and Model 2), it includes an "NSFG" intercept. As expected, being in poverty in the year immediately prior to the birth increases greatly the likelihood of being in poverty after the birth (OR 6.24; 95% CI 4.66, 8.36). The magnitude of contrast in the odds of poverty after birth between never-consistent and ever-consistent contraceptive use is smaller than before inclusion of poverty before the birth (OR 1.68, 95% CI 1.28, 2.20), but remains substantial and statistically significant (OR 1.46, 95% CI 1.15, 1.86). That is, never using contraception consistently is associated with a 46% higher odds of poverty after birth relative to ever having used contraception consistently in the two years before the birth. This 1.46 odds ratio estimate falls between the 1.21 odds ratio in the NSLY97-only estimation and the 1.79 odds ratio in the NSFG-only estimation. Both of those latter, single-survey estimates are estimated, moreover, with substantially wider confidence intervals than seen in the pooled-survey estimate, and only the NSFG estimate attains statistical significance. The contrast between married non-users of contraception and ever-consistent contraceptive users does not attain statistical significance in either of the single-survey estimates nor in the pooled-survey estimates.

Among the variables substantially and statistically-significantly associated with poverty after the birth in the full model (Model 3) with pooled-survey estimation include being Black (67% higher poverty risk than White), having more education (37% and 82% lower likelihood of

poverty respectively for some college and bachelor's degree than the chance of poverty among women with no more than a high-school education), and being single or cohabiting (respectively 166% and 61% higher likelihoods of being poor than a married woman. Finally, the background factors of whether the woman had stable employment before the birth and whether she lived with both biological parents at age 18 remain strongly protective against poverty after the birth (45% and 27% less likely to be poor respectively). Having a mother with a bachelors' degree is also protective (38% less likely to be poor).

[FIGURE 1 HERE]

To evaluate our second hypothesis of greater association of less consistent contraceptive use with higher poverty among women with the lowest education levels, we first estimate differences in contraceptive use and its relationship to poverty after a birth by the three levels of own education. Figure1 shows the bivariate distribution of contraceptive use sequences before a birth by own educational attainment, estimated separately using the NSFG and NLSY97. As expected, never-consistent contraceptive users are most common in the lowest education group of women with no more than a high school graduate education. Never-consistent contraceptive users represent about half of all women in this lowest education category in both surveys. Ever-consistent contraceptive users are increasingly more prevalent as educational attainment increases, constituting one half to three fifths of college graduate women. Nevertheless, "never-consistent" contraceptive users are common too in this highest education group, at between a third and two fifths of all women.

[FIGURE 2 HERE]

We next use the combined NSFG and NLSY97 data in a Model 2 regression specification (that is, excluding poverty status in the year before the birth), but with the addition of

interactions of contraceptive consistency indicators with own education. Results are presented in the form of average predicted probabilities of poverty for women in each educational group, controlling for birth order, age, marital status, mothers education, employment, family structure, and race. Among women in both the low (no more than high school graduate) and medium (some college) educational attainment groups, the poverty rate is in both cases substantially higher among never-consistent contraceptive users. For women with no more than high school graduate educational attainment, the poverty rates of never-consistent and ever-consistent contraceptive users are respectively 31.7% and 24.8%. For women with some college education, the poverty rates of never-consistent and ever-consistent contraceptive users are respectively 25.2% and 16.2%. For both education groups these differences in poverty between never-consistent and ever-consistent contraceptive users are statistically significant. For women with a bachelors degree or more, however, we find not only that poverty rates after a birth are much lower, but also that this poverty rate is statistically no different by pattern of contraceptive use before the birth (6.9% and 7.4% respectively for never-consistent and ever-consistent contraceptive users).

Discussion and Conclusions

In this study we used nationally-representative retrospective (NSFG) and panel (NLSY97) data sources of longitudinal contraceptive-use information to investigate unplanned births and their potential consequences for newborn child poverty. Our major finding, consistent with our first hypothesis, was that women whose behavior does not include consistent contraceptive use in the two years preceding a birth have a higher risk of poverty after giving birth than women whose contraceptive use in those two preceding years indicates that the birth

was planned. In our multivariate analyses, the additions of sociodemographic factors, which partially explain contraceptive use in previous studies (Glei 1999), reduced but did not remove the association of inconsistent contraceptive use with poverty after a birth. Nor did inclusion of poverty in the year before the year of the birth remove this positive association of inconsistent contraceptive use with poverty after the birth. Other factors that we found to be protective against poverty after a birth are being White, having fewer children, living with both biological parents at age 18, having a college-educated mother, having had a spell of full-time employment for at least 6 months, being highly educated, and being married. Having a cohabiting partner was somewhat protective compared to having no resident partner. Although none of these findings on other factors associated with poverty after giving birth are surprising, they are reassuring with respect to our data sources and analytical methods, including pooled-survey estimation with poverty status before the birth multiply imputed from the NLSY97 to the NSFG observations.

A woman's educational attainment is expected to have particular significance for our analyses because of its hypothesized relationship to both a woman's labor market prospects and to knowledge and socialization about contraception and about planned behavior in general (England et al 2016). When we viewed the distribution of contraceptive use behavior prior to a birth by education, we found that as education increased, a smaller percentage of women fell into the never-consistent category. Women, regardless of socioeconomic status, may be sexually active, but unintended births are more common among disadvantaged women (e.g, Reeves and Venator 2015; Finer and Zolna 2016; but see also Wise et al. 2016). When predicting the risk of poverty after a birth allowing for an interaction of education level and contraceptive-use pattern, we found that, consistent with our second hypothesis, the association of consistency of contraceptive use with poverty after birth is stronger among less educated women. Women with

a bachelor's degree or more having significantly different outcomes than all other women is a phenomenon not unique to poverty after a birth. Women with a bachelor' degree are more likely to get married and stay married (Lundberg and Pollak 2015, Cherlin 2004, Kennedy and Ruggles 2014) and have fewer children and postpone childbearing (Musick et al. 2009). In the present study, we found that not only do women with a bachelor's degree have significantly lower poverty levels after a birth than a woman with some college or no more than a high school education, but also that contraceptive consistency in the two years preceding a birth was not predictive of their poverty status after giving birth. Inconsistent contraceptive use, meanwhile, was associated with a poverty rate between 7 to 9 percentage points higher than consistent contraceptive use for women with a high-school-only or some-college level of educational attainment. We interpret these results to indicate that highly-educated women have access to resources that can buffer the possible effects of using contraception inconsistently in a way that less-educated women cannot. This is an added privilege to an already privileged group. We note here also that Wise et al. (2016) found that, after controlling for other factors, women who are highly educated were actually more likely to have a mistimed birth than those with low education levels. Consistent with this, our study suggests that a major advantage experienced by higher-educated women is having the resources to avoid at least the most severe negative economic outcomes of a birth after inconsistent contraceptive use.

Using quasi-experimental methods, previous research has addressed how contraceptive access effects poverty using data from the 1960's and 1970's, taking advantage of the family planning policy shifts (Browne and LaLumia 2014, Bailey, Malkova, and McLaren 2018). To our knowledge, our study is the first to explore the relationship of contraceptive access or contraceptive use with poverty after a birth using recent data. The finding of a link between

inconsistent contraceptive use and newborn child poverty thereby offers indirect support to studies calling for provision of LARCs (Wu and Mark 2018, Trussell et al. 2013), as these methods do not rely on user consistency for pregnancy prevention once inserted. As those authors argue, reducing unplanned births may reduce not only newborn child poverty but also public expenditures associated with poverty and adverse child health (see also Joyce et al 2000). If efforts to support women's contraceptive access and consistency were more widely funded and supported, women may also have enhanced agency with respect to achieving their fertility goals, including those related to their fertility timing. In addition, we also point to contraceptive use operating together with education, where highly educated women avoid the economic outcomes of a birth after inconsistent contraceptive use. Encouraging consistent contraceptive use is therefore only a partial poverty-prevention policy strategy, with policies that increase pre-birth resources a needed additional instrument.

Limitations

There are several limitations of our study to consider. First, although there are strong arguments for a focus on unplanned rather than unintended pregnancies (Klerman 2000), measuring norms and attitudes about childbearing in the community that the woman spent most of her younger years would help us understand her feelings toward childbearing and its alternatives and strengthen the need for focusing on behavior rather than attitudes (Barber 2001). By using two nationally-representative data sources, we were able to corroborate our main findings on both contraceptive consistency and sociodemographic variables on poverty after birth, and to provide more precise estimates of these associations than by use of one survey alone. However, the need to use the two data sources in a way that largely relies on variables in

common between them means that we did not take full advantage of the NSFG's additionally including questions on contraceptive and pregnancy attitudes and how these relate to observed contraceptive behavior.

Second, an important factor that we are unable to investigate because of data limitations (Lindberg and Scott 2018) is that higher education women may be more likely to get an abortion because they often have more access to those services (Reeves and Venator 2015). This may partly explain our finding of no difference in poverty outcome between consistent and inconsistent contraceptive users among women with a bachelors' degree or higher, in contrast to the higher poverty rates of inconsistent contraceptive users with a high school or "some college" level of educational attainment. We note in this context the recent findings of Foster et al. (2018) that disadvantaged women tried unsuccessfully to get an abortion were more likely to face economic hardship after a birth.

A final important limitation of our study in the context of previous studies of contraceptive access and poverty is its lack of a quasi-experimental design. Our estimates are therefore not causal, but rather an association between contraceptive patterns and poverty after a birth after controlling for as large as possible a range of social, economic, and demographic predictors of poverty. Although in previous quasi-experimental studies, individual selectivity appears not to have be the main factor influencing poverty outcomes (Bailey et al 2018), our findings can only be considered to be consistent with, and not proof of, a causal impact of inconsistent contraceptive use on poverty after a birth.

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Data Appendix

NLSY97

Birth

Respondents are asked every year what is the birth date of their first, second, and any subsequent births. We use the new appearance of values from missing to non-missing for these variables to determine a birth that happened in the last year. Using the birth date, we also determine if the birth occurred in the last two months of the interview year.

Partnership Status

Respondents are asked every wave whether the they are married, never married, separated, widowed, or cohabiting. The partnership status is taken during the time of interview, which in our analysis corresponds to within 12 months after the birth (in Table A1 it is time *t*).

Family Structure

From 1997 to 2003, the respondents were asked "what is the relationship of the parent figure(s)/guardian(s) in household to the youth as of the survey date?" This question was asked as long as the respondents were living with a guardian. If the respondent lived with "Both biological parents" between ages 17 and 18, we counted them as "1" in living with two biological parents at age 18.

Poverty

The U.S. Bureau of Labor Statistics creates a poverty ratio comparing the total family income to federal poverty thresholds based on the number of household residents and the number of

members under 18. The ratio is based on the income in the last 12 months, therefore corresponding to poverty status within 12 months after the birth (in Table A1 this is the income in {*t-1,t*}). For the poverty status before the birth, we take the income from the year before birth exposure (in Table A1 it is in interval {*t-2,t-1*}). For years 1997-2003 a total income variable was used and therefore represents the total household income including any income from residents over 14 years old in the household, after 2003 only the family income was considered when calculating the poverty threshold. Cohabitors are included in both household and family definitions of poverty threshold (1997-2011).

Education, Age, and Birth Order

Education is determined as the current completed education after the birth (in Table A1 it is time *t*). Age relates to the age right after the birth (in Table A1 it is time *t*). Birth order is determined including the focal birth (in Table A1 it is time *t*). Therefore "two" means that the focal birth is the second birth.

Mother's Education

In the first year of survey only, the NLSY97 asks "What was the highest grade completed by respondents biological mother?" and "What was the highest grade completed by respondent's residential mother?" We used answers for the residential mother-- if missing we used the response for the biological mother.

Work Status History

We track respondents' monthly employment history beginning at age 16 and up to each sequential interview, to identify whether that individual had experienced a spell of full-time

employment of six months or more by the time of the interview at the end of the year in which the woman gave birth.

Weights and Survey Design Adjustments

We used the panel sample weights of the NLSY97 throughout our analyses. Specifically, we use the Custom Weighting feature of the NLSY97, especially made for the use of repeated sample spanning several survey years. We cluster our observations using the unique person identification number of each respondent to adjust for women appearing multiple times in our analyses when they had more than one birth in the observed period.

NSFG

We combine the data of 17-31 year old female respondents from the 2002 and 2006-2010 cycles. All the variables that we used are available in both cycles.

Birth

We identified women with births during the last year using the information for the year-month of the last birth (CMLASTLB) and the year-month of the interview (CMINTVW). For the analysis, we distinguished women who had a birth in the 12 months (*t-1,t*) before the interview (*t*). Using these same specifications, we determine whether a woman had a birth in the last two months of the year (*t-1, t*).

Contraceptive consistency

To determine the contraceptive consistency in the two previous years (*t-2,t-1* and *t-3,t-2*), we use two variables available for the 48 months before the survey. First, we determine whether the

respondent had sexual intercourse in a specific year/month, conditional on declaring at least one sexual intercourse with a man. Second, we determine the number of contraceptive methods reported per specific year/month. Third, we count the number of months the woman used contraceptive methods, conditional on sexual intercourse in the month. The ratio between number of months using contraception and number of months with sexual intercourse gives a percentage for each period (*t-2,t-1* and *t-3,t-2*). We used this percentage (0 to 100%, over 12 months) as an estimate of how many times they used birth control in each year (*t-2,t-1*) and (*t-3,t-2*). We cannot know, however, if the respondent used contraception for all episodes of sexual intercourse in a given month.

Partnership Status

Respondents are asked for their partnership status at the moment of interview (RMARITAL). Respondents can report being married, not married but living with an opposite-sex partner, widowed, divorced, separated or never been married.

Family Structure

We use the INTACT18 variable to distinguish whether the respondent lived in an intact (two biological or adoptive parents) family from birth to age 18.

Poverty

The "poverty level income" variable (POVERTY) combines the family income from all sources in the calendar year before the interview, divided by the threshold income of families whose head of household was under 65 years of age. These thresholds are defined by the annual

poverty thresholds for each family size (between 1 and 8 members, or 9 or more) by the U.S. Census Bureau[4]. A value between 0 and 500 is given to each respondent. We identified respondents as poor when the value was equal to or lower than 100. The number of members of the household (NUMFMHH) used to estimate the family size for the poverty threshold calculations includes all the household member's related to the respondent plus any other usual resident. If the woman is cohabiting with a male partner, that partner's income is included in the total combined income of the family (TOTINC).

Due to the difference in estimated poverty rates between the NLSY97 (21.9%) and NSFG (33.7%, both weighted results), we conducted additional checks. We first reviewed the questions used in the NSFG to estimate the household poverty level. We found no differences between the 2002 and 2006-2010 cycles in the questions related to the Household members (NUMFMHH), and last year family income (TOTINC). We found the estimated poverty rate to be similar between the two cycles. Next we replicated results from other studies using the NSFG for the same years. We found no differences between our estimates and others' estimates[5]. An additional reason for the poverty difference could be differences in the populations represented by the NLSY97 and NSFG. As Table 1 shows, compared to the NLSY97 the NSFG's weighted characteristics include lower educational attainment (lower proportion in Bachelors-Degree-plus

[4] https://www.icpsr.umich.edu/icpsradmin/nsfg/variable/recode_spec/cycle8.1/preg/POVERTY.pdf

[5] First, we replicated the proportion of poor women (Less than 101%) who received specified family planning services in the 12 months previous the interview using the 2006-2010 data, following Martinez et al (2013). Second, using the 2002 data we replicated the proportion of poor women (Less than 100%) for the analysis of pregnancy intentions made by Wu et al (2008).

category), a higher proportion Hispanic, and a lower proportion with 6 continuous months' full-time employment. These are all characteristics associated with higher likelihood of poverty.

Education, Age, and Birth Order

Education is determined as the current completed education (in Table A2, at time *t*). First, we adjusted the variable for the 2006-2010 cycle as suggested by the NSFG official documentation[6]. Second, we constructed a variable distinguishing three levels: high school or less, some college and bachelor degree or more[7]. The age corresponds to the current age at the interview (AGE_A). The birth order information comes from the variable NUMBABES, recoded to distinguish women with 1, 2, or 3 or more births at the end of the birth exposure period, time *t*.

Mother's Education

We use the MOMDEGRE variable to identify the highest level of education of the respondents` mothers. Nevertheless, cycles 2002 and 2006-2010 have different alternatives for college education. The 2002 alternative was "Some college, including 2-year degree"; the 2006-2010 was "Some college." The bachelor level wording is the same between the 2002 and 2006-2010 cycles ("Bachelor's degree or higher").

Work Status History

[6] https://www.cdc.gov/nchs/data/nsfg/HIEDUC_correction_2006_2010.pdf

[7] The "associated degree in college/university" corresponds to the "bachelor degree or more" category.

We use the CMBFSTWK variable to identify whether the respondent ever had a period of 6+ consecutive months of full time employment before the survey.

Weights and Survey Design Adjustments

We used the final post-stratified, fully adjusted case weight for 2002 (FINALWGT) and 2006-2010 (WGTQ1Q16).

References

Martinez, G., Chandra, A., Febo-Vazquez, I., & Mosher, W. (2013). Use of family planning and related medical services among women aged 15-44 in the United States: National Survey of Family Growth, 2006-2010 (No. 2013). *US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics*.

Wu, J., Meldrum, S., Dozier, A., Stanwood, N., & Fiscella, K. (2008). Contraceptive nonuse among US women at risk for unplanned pregnancy. *Contraception*, 78(4), 284-289.

Appendix

[TABLES A1, A2, A3 HERE]

Table 1: Characteristics of women giving birth between ages 17 and 31, 1999 to 2011, proportions

	NSFG	NLSY97		NSFG+NLSY97
	Model 1&2	Model 1, 2, & 3	χ^2	Model 1&2
Education			**	
High School or Less	0.565	0.526		0.538
Some College	0.190	0.263		0.240
Bachelors Degree +	0.246	0.210		0.221
Race/Ethnicity			**	
White	0.550	0.721		0.667
Black	0.129	0.149		0.143
Hispanic	0.230	0.117		0.152
Other	0.092	0.012		0.037
Age	25.4	24.8		25.0
Partnership Status				
No Resident Partner	0.184	0.179		0.180
Cohabiting	0.168	0.204		0.192
Married	0.648	0.618		0.627
Birth Order			+	
One	0.455	0.450		0.451
Two	0.310	0.347		0.335
Three Plus	0.236	0.203		0.213
Lived with biological parents at 18 years old	0.420	0.441		0.435
Mother's Education			**	
High School or Less	0.630	0.594		0.605
Some College	0.210	0.288		0.264
Bachelors Degree +	0.161	0.117		0.131
Had 6+ months of full-time employment before birth	0.677	0.843	**	0.791
Contraceptive Consistency			**	
Ever Consistent	0.480	0.402		0.427
Never Consistent	0.412	0.497		0.470
Non-Use Married	0.108	0.101		0.103
Poor at Birth	0.331	0.203	**	0.243
Poor in year immediately prior to birth	-	0.174		-
Unweighted N	778	1,701		2,479

Notes: All proportions are weighted

Group differences from chi-squared (NLSY97 vs. NSFG)), ** p<0.01, * p<0.05, + p<0.1

Sources: National Longitudinal Survey of Youth 1997 (NLSY97) and the National Survey of Family Growth 2002, 2006-2010

Table 2: Logistic Regression of Poverty at Birth on Contraceptive Consistency and Socio-demographic variables, ages 17 to 31, 1999 to 2011, Odds Ratios

	NSFG			NLSY97			NSFG+NLSY97		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Contraception sequence before birth (Reference: Ever Consistent)[a]									
Never Consistent	2.79 **	2.42 **	1.79 **	1.63 **	1.30 +	1.21	2.02 **	1.68 **	1.46 **
	[1.79, 4.35]	[1.46, 4.02]	[1.19, 2.71]	[1.25, 2.12]	[0.96, 1.77]	[0.87, 1.69]	[1.59, 2.57]	[1.28, 2.20]	[1.15, 1.86]
Non Use Married	2.09 +	1.54	1.79	0.66	1.34	1.13	1.12	1.45	1.45
	[0.93, 4.68]	[0.63, 3.76]	[0.83, 3.87]	[0.39, 1.11]	[0.75, 2.41]	[0.61, 2.11]	[0.70, 1.80]	[0.88, 2.37]	[0.92, 2.28]
Other Predictors									
Age		0.98	1.00		0.85 **	0.87 **		0.96	0.99
		[0.90, 1.07]	[0.93, 1.08]		[0.80, 0.91]	[0.82, 0.93]		[0.92, 1.01]	[0.95, 1.03]
Race/ethnicity (Reference: White)									
Black		2.03 *	1.45		1.80 **	1.42 +		2.18 **	1.67 **
		[1.01, 4.06]	[0.81, 2.60]		[1.22, 2.64]	[0.97, 2.08]		[1.57, 3.03]	[1.24, 2.24]
Hispanic		2.06 *	1.25		0.87	0.71		1.37 +	1.00
		[1.12, 3.77]	[0.72, 2.19]		[0.57, 1.32]	[0.46, 1.12]		[0.97, 1.93]	[0.73, 1.35]
Other		2.75 *	2.26		0.54	0.40 +		1.80	1.32
		[1.04, 7.22]	[0.76, 6.76]		[0.16, 1.82]	[0.14, 1.12]		[0.82, 3.95]	[0.60, 2.88]
Education (Reference: High school or less)									
Some College		0.52 *	0.66		0.69 *	0.82		0.51 **	0.63 **
		[0.27, 0.99]	[0.38, 1.14]		[0.47, 1.00]	[0.56, 1.19]		[0.37, 0.70]	[0.48, 0.84]
Bachelor degree +		0.11 **	0.20 **		0.20 **	0.24 **		0.11 **	0.18 **
		[0.04, 0.30]	[0.08, 0.45]		[0.09, 0.46]	[0.11, 0.54]		[0.06, 0.21]	[0.11, 0.31]
Partnership Status (Reference: Married)									
No Resident Partner		1.66	2.74 **		3.48 **	2.80 **		2.50 **	2.66 **
		[0.86, 3.20]	[1.47, 5.09]		[2.27, 5.33]	[1.80, 4.37]		[1.73, 3.60]	[1.92, 3.68]
Cohabiting		1.03	1.32		2.32 **	1.95 **		1.63 **	1.61 **
		[0.53, 2.03]	[0.72, 2.43]		[1.57, 3.43]	[1.29, 2.94]		[1.17, 2.28]	[1.18, 2.21]
Birth Order (Reference: One)									
Two		1.47	1.22		2.24 **	2.21 **		1.26	1.12
		[0.86, 2.50]	[0.75, 2.00]		[1.57, 3.20]	[1.50, 3.26]		[0.96, 1.66]	[0.87, 1.45]
Three Plus		0.23 **	0.25 **		4.68 **	3.58 **		1.37	1.07
		[0.10, 0.51]	[0.12, 0.50]		[3.00, 7.31]	[2.27, 5.63]		[0.94, 2.01]	[0.79, 1.45]
Had 6+ months of employment before birth		0.36 **	0.72		0.49 **	0.60 *		0.40 **	0.55 **
		[0.20, 0.65]	[0.45, 1.14]		[0.34, 0.72]	[0.40, 0.89]		[0.29, 0.55]	[0.42, 0.73]
Lived with biological parents at 18 years old		0.93	0.92		0.66 *	0.69 *		0.71 **	0.73 **
		[0.55, 1.57]	[0.60, 1.41]		[0.47, 0.92]	[0.49, 0.97]		[0.54, 0.94]	[0.57, 0.92]
Mother's Education (Reference: High school or less)									
Some College		1.21	1.25		0.72	0.74		0.83	0.91
		[0.66, 2.22]	[0.74, 2.09]		[0.49, 1.08]	[0.49, 1.11]		[0.60, 1.15]	[0.69, 1.21]
Bachelor degree+		0.88	0.44 *		0.66	0.66		0.73	0.62 +
		[0.40, 1.91]	[0.20, 0.95]		[0.32, 1.35]	[0.32, 1.38]		[0.43, 1.24]	[0.38, 1.00]
Poor before birth			6.51 **			6.75 **			6.24 **
			[3.40, 12.48]			[4.71, 9.66]			[4.66, 8.36]
NSFG indicator							2.09 **	1.62 **	1.70 **
							[1.62, 2.70]	[1.08, 2.45]	[1.24, 2.33]
Sample N	778	778	778	1701	1701	1701	2479	2479	2479

Notes: Estimates are weighted and confidence intervals are in brackets

** p<0.01, * p<0.05, + p<0.1

[a]Contraceptive consistency sequence is defined by the longer of two years or time since first sex.

Source: NLSY97 and NSFG (2002, 2006-2010)

FIGURE 1:

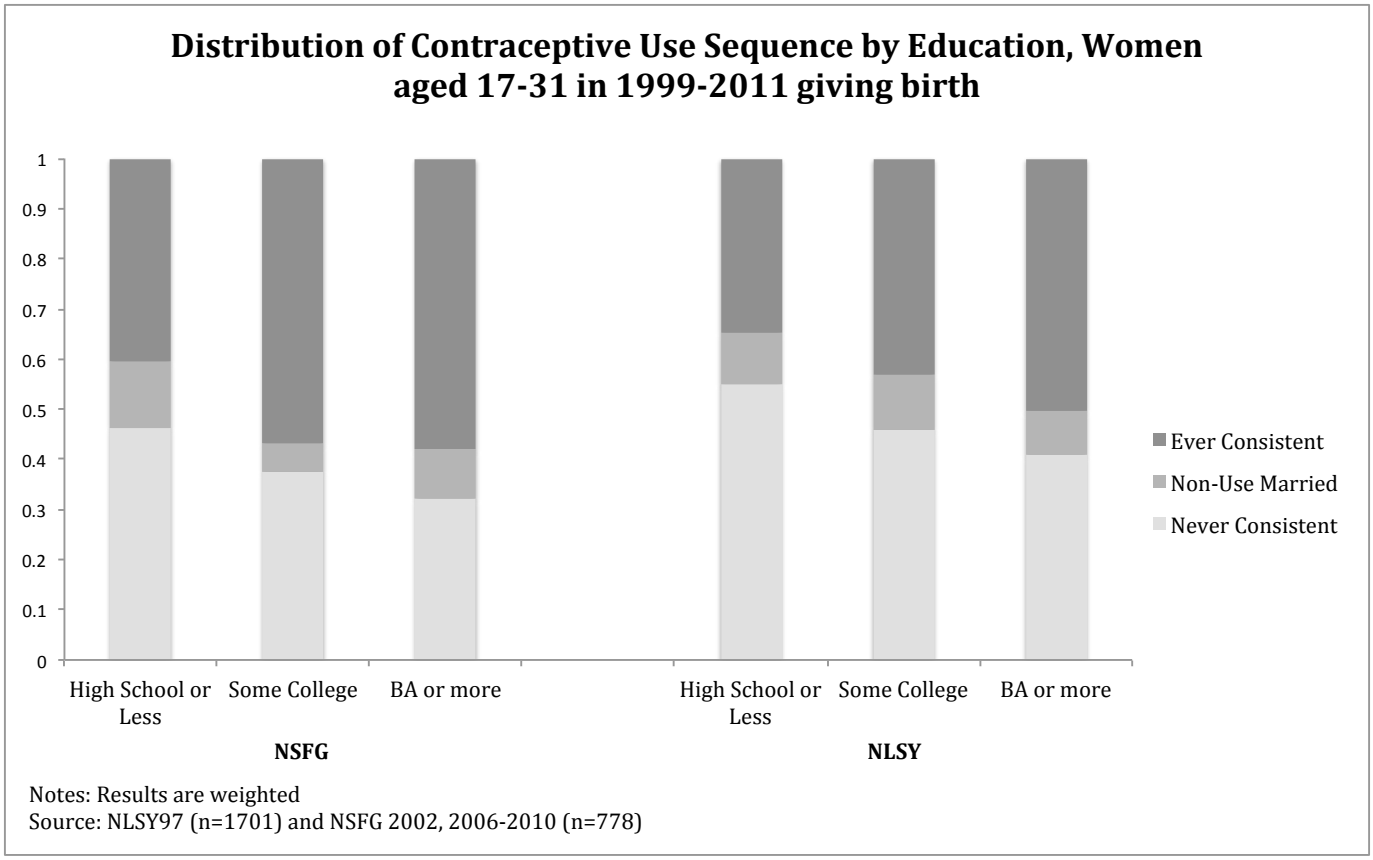
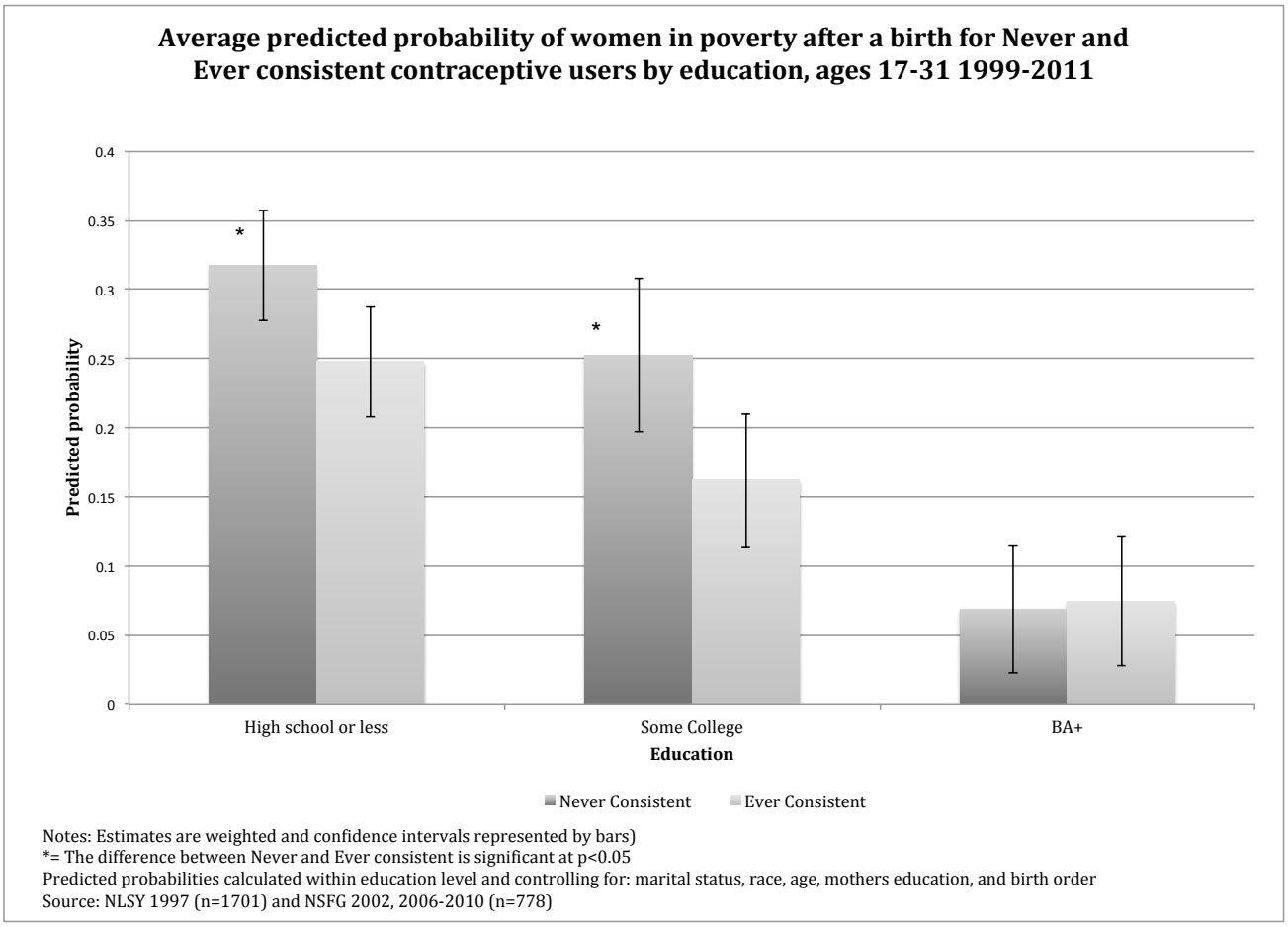

Distribution of Contraceptive Use Sequence by Education, Women aged 17-31 in 1999-2011 giving birth
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
High School or Less
Some College
BA or more
High School or Less
Some College
BA or more
NSFG
NLSY
Ever Consistent
Non-Use Married
Never Consistent
Notes: Results are weighted
Source: NLSY97 (n=1701) and NSFG 2002, 2006-2010 (n=778)

FIGURE 2:



Notes: Estimates are weighted and confidence intervals represented by bars)
*= The difference between Never and Ever consistent is significant at p<0.05
Predicted probabilities calculated within education level and controlling for: marital status, race, age, mothers education, and birth order
Source: NLSY 1997 (n=1701) and NSFG 2002, 2006-2010 (n=778)

Table A1: Contraceptive Sequence, NLSY97

	N	Proportion Group	Proportion All	(t-3,t-2)	(t-2,t-1)	Birth(t-1,t)
Ever Consistent						
	163	0.2339	0.0958	Consistent	Nonuse	
	465	0.6671	0.2734	Consistent	Inconsistent	
	65	0.0933	0.0382	Consistent	Consistent	*
	4	0.0057	0.0024	[redacted]	Consistent	*
Total	697		0.4098			
Non-use Married						
	160	0.9816	0.0941	Nonuse	Nonuse	**
	3	0.0184	0.0018	[redacted]	Nonuse	**
Total	163		0.0958			
Never Consistent						
	82	0.0975	0.0482	Nonuse	Nonuse	***
	1	0.0012	0.0006	[redacted]	Nonuse	***
	386	0.4590	0.2269	Inconsistent	Inconsistent	
	19	0.0226	0.0112	[redacted]	Inconsistent	
	103	0.1225	0.0606	Nonuse	Inconsistent	
	250	0.2973	0.1470	Inconsistent	Nonuse	
Total	841		0.4944			
Total All	1701					

*= Gave births [t-2months, t]

**=Married at t

***=Unmarried at t

Table A2: Contraceptive Sequence, NSFG

	N	Proportion Group	Proportion All	(t-3,t-2)	(t-2,t-1)	Birth(t-1,t)
Ever Consistent						
	18	0.0508	0.0231	Consistent	Nonuse	
	262	0.7401	0.3368	Consistent	Inconsistent	
	68	0.1921	0.0874	Consistent	Consistent	*
	6	0.0169	0.0077		Consistent	*
Total	354		0.3599			
Non-use Married						
	64	0.3926	0.0823	Nonuse	Nonuse	**
	7	0.0429	0.0090	[redacted]	Nonuse	**
Total	71		0.0913			
Never Consistent						
	51	0.0606	0.0656	Nonuse	Nonuse	***
	9	0.0107	0.0116	[redacted]	Nonuse	***
	156	0.1855	0.2005	Inconsistent	Inconsistent	
	17	0.0202	0.0219	[redacted]	Inconsistent	
	38	0.0452	0.0488	Nonuse	Inconsistent	
	82	0.0975	0.1054	Inconsistent	Nonuse	
Total	353		0.4537			
Total All	778					

*= Gave births [t-2months, t]

**=Married at t

***=Unmarried at t

Table A3. Model Fit Statistics for Pooled Logistic Regressions of Poverty on Contraceptive Consistency

	Model 1				Model 2			
Pooled NLSY97 and NSFG Model Fit statistics	no NSFG intercept or regressor interaction	NSFG intercept, no regressor interaction	NSFG intercept and regressor interaction		no NSFG intercept or regressor interaction	NSFG intercept, no regressor interaction	NSFG intercept and regressor interaction	NSFG intercept and main variable interaction	
AIC	2,712.1	2,659.3	2,650.7	*	2,712.1	2,170.4	2,181.3	2,167.3	*
BIC	2,729.5	2,682.5 *	2,685.6		2,729.5	2,275.1 *	2,344.1	2,283.6	

* best fitting model (lower = better fit)

Sources: National Longitudinal Survey of Youth 1997 (NLSY97) and the National Survey of Family Growth 2002, 2006-2010

Notes: "NSFG intercept" indicates that the pooled-survey (NLSY97 and NSFG) regression model specification includes a dummy variable for the observation's coming from the NSFG sample. "NSFG intercept and regressor interaction" indicates that the pooled-survey (NLSY97 and NSFG) regression model specification includes a dummy variable for the observation's coming from the NSFG sample plus an interaction variable for NSFG*<regressor> for each of the regressors in the Model 1 or Model 2, respectively. "NSFG intercept and main variable interaction" indicated an interaction between the NSFG intercept and contraceptive consistency only. See Table 3 for Model specifications.