Contraceptive Consistency and Poverty after Birth

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Abstract [149/150]

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 and National Survey of Family Growth, we constructed three sequences of contraceptive behavior before a birth that signal unplanned versus planned behavior. We regressed poverty immediately after the birth both on this contraceptive-sequence variable and on socioeconomic indicators including race, education and partnership status. Compared to sequences indicating a planned birth, sequences of inconsistent use and non-use of contraception were associated with higher likelihood of poverty following a birth, both before and after controlling for socioeconomic status, and before and after controlling for poverty before the birth. 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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Introduction

In a recent special journal issue exploring policy proposals to reduce poverty, Wu and Mark (2018) consider a policy that would provide all women with free access to the most effective contraceptives, namely long-acting reversible contraceptives (LARC). A premise of this policy is that unintended births arise from some combination of women's non-use of contraception and imperfect or inconsistent method use, and this unintendedness increases the likelihood that the woman is less financially prepared for the birth. The particular contraceptive choices women face in avoiding pregnancy are also dependent on broader societal and institutional forces. In this context, the extent to which poverty can be attributed to women's inconsistent or non-use of contraception is unclear. 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. We are unaware of any studies that use recent data to investigate associations between contraceptive use, pregnancy intendedness, and income and poverty following a birth.

A woman's intentions around a pregnancy may be distinguished from whether the pregnancy is planned versus unplanned. 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. The theoretical framing of pregnancy planning in its social class context is 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. England et al. (2016) find that women who had high

efficacy were five- to eight- times more likely to use contraceptives consistently. In reviewing the two concepts of pregnancy intention and pregnancy planning, Klerman (2000, p.159) 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. Klerman finds it "…puzzling that so much more attention seems to be given to…unintended pregnancies compared to…unplanned ones."

In the present study, we adopt a theory-of-planned-behavior perspective (Bachrach and Morgan 2013) to evaluate links between the planned versus unplanned status of a birth, as inferred by the new mother's pattern of contraceptive use prior to the birth, and the poverty status of the family immediately after the birth. We first review the existing literature on planned behavior, birth 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), to test for links between the planned versus unplanned character of a pregnancy and poverty status after a birth, controlling for both socioeconomic status and for poverty status before the birth. Both the NLSY97 and NSFG questions allow for the constructing of sequences of contraceptive behavior in the years before a birth in a way that signals unplanned versus planned behavior. 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 socio-economic characteristics. To anticipate our main results, we find that, compared to women whose patterns of contraceptive use indicate the birth was planned, women with inconsistent use or non-use of contraception have higher chances of being in poverty following a birth, both before and after controlling for socioeconomic status, and both before and after controlling for poverty status before the birth. We interpret this as preliminary descriptive evidence consistent with a causal impact of unplanned births on poverty after the birth.

Literature Review

Approximately half of U.S. pregnancies were unintended in 2006 and 2011 (Finer and Zolna 2011, Finer and Zolna 2016). According to Bachrach and Morgan 2013, an intention is a desire for a particular outcome and the belief that specific behaviors will bring it about. Despite any emotional feelings about a possible pregnancy, having the intention to avoid pregnancy is a strong predictor of contraception use (Jones 2017, Bartz et al 2007, Moreau et al. 2013). Jones (2017) uses prospective questions about pregnancy intentions from the Continuity and Change in Contraceptive Use study (see also Jones et al 2015), "How important is it to you to *avoid* becoming pregnant now?" and "How would you feel if you found out you were pregnant today?" Women who said it was important to avoid pregnancy, but would be happy if they became pregnant, were still more likely to take pregnancy avoidance measures. This points to the complicated nature of measuring fertility intentions. Thoughts, emotions, and other cognitive processes may not always line up exactly with behavior. Several scholars have pointed out flaws with traditional pregnancy and birth intention questions (Bachrach and Morgan 2013, Bachrach and Newcomer 1999, Brown and Eisenberg 1995, Williams and Abma 2000). A retrospective

question, as is traditional in many fertility surveys, asks the parent to label their child as "intended", "unintended", and "mistimed". Parents, however, are hesitant to mark their child as unintended; therefore many unintended births may go mislabeled. Surveys are typically not able to capture the intentions of a birth or pregnancy at conception (although see Moreau et al. 2013); rather they offer a preconception or post-hoc analysis of intention.

Scholars have approached the challenge of measuring unintended childbearing in several ways, notably by invoking and updating the Theory of Planned Behavior (TPB) developed first by Fishbein and Azjen in 1975. The TPB model describes how background factors (individual, social, and information) influence norms and perceptions of norms and then how those norms influence intention and therefore behavior (Fishbein and Ajzen 2010). Initially, demographers argued that the TPB implies a rational choice and therefore cannot be directly related to fertility, as fertility is not always rational (Barber 2011). Fishbein and Ajzen's 2010 addition to the TPB, however, included an interaction between control and how control is affected by environmental factors and an emphasis on norms rather than rational choice as controlling intentions. With outside influences on intentions, this means intentions do not always have to be rational or economically driven. The addition of control, or lack thereof, allows for somebody to have inventions, but not have the means to follow through with behavior to meet the intentions. Bachrach and Morgan (2013) argue for a modification to the model that includes an interaction between behavior and outcomes and the intention formation. These processes are cyclical and can evolve in response to stimuli, such as a life change or new exposure to different lifestyles (Bachrach and Morgan 2011). Most importantly, Bachrach and Morgan note that intentions are not necessarily formed until they must be formed. For example, if a woman is not highly educated and does not have a competitive career, she may not have ever considered whether she

needs to postpone motherhood. TPB focuses on a singular event in time, whereas fertility involves a life-course perspective to analyze intentions. Therefore, when implementing the theory in fertility research it is important to consider a longitudinal perspective.

Critics of the traditional birth intention measure argue that the categories are too strict (Bachrach and Newcomer 1999). TPB and its successors have been useful in expanding intentions into a continuum including ambivalence about pregnancy. Ambivalence about pregnancy is an important cognitive process, and one of the main ways that it presents itself is though inconsistent use of contraception (Zabin 1999).

England (2016) emphasizes that efficacy is not socialized independently outside of class; agency and efficacy are driven by confidence in oneself and confidence in institutions. This is often instilled from birth. A well off family with resources to send their child to a good school, to spend time together, and to seek good medical care will show their child that these systems work for them. However, a child born into an already disadvantaged household or in a poor community may be taught not to trust the institutions because they do not see them helping them or their community. A woman who was raised in a community without norms discouraging early child rearing, moreover, may hold positive feelings towards an unintended birth even while being of a higher socioeconomic status (Jumping-Eagle et al. 2008). Women in poverty have high rates of non-use of contraceptives and higher fertility. On the other hand, women who are over 400% of the poverty level are the most likely to have an abortion. This points to an inconsistency in affordability and access to fertility control because both women have a chance for an unintended pregnancy, but higher income women can more easily avoid an unintended birth (Reeves and Venator 2015). Young women's economic prospects may also serve as a motivator for her contraceptive behavior. Using data on 1,000 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 sense of responsibility and a chance for a financially stable future. Moreau et al. (2013), also using RDSL data, find that high education, parental income, fewer partners, and being unmarried are all predictors of consistent contraceptive use.

We know of only two studies assessing the connection between contraceptive access and poverty following a birth explicitly (Bailey 2013; Browne and LaLumia 2014). Using pooled US Census data, Browne and LaLumia 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 (2013), using geographic variation in the introduction of the Pill in the 1960's and 1970's as a quasi-experiment to test its effect, found that in states where the Pill was permitted, fewer women labeled their births as unwanted and mistimed. She also found economic differences such as increased labor market access, earnings, and household income among children whose parents had access to the Pill.

Other studies using more recent U.S. data have analyzed the correlates of family poverty immediately following a birth, not including contraceptive behavior or pregnancy intendedness (Lichter et al. 2015, Rendall et al. 2018, Thiede, Sanders, and Lichter 2018). Having a birth has been found to increase the likelihood of poverty by 30% (McKernan and Ratcliffe 2005). An already socioeconomically vulnerable woman may be especially likely to be uniquely 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. All of these studies have found significantly higher rates of poverty immediately following a birth, especially for unpartnered, Black, and Hispanic women. We are unable to tell from these studies, however, what if any may be the role of contraceptive access and use in determining the poverty status of newborns.

Current Study

While contraceptive consistency is not a direct proxy for pregnancy intention, the goal of this empirical analysis is to explore results of the behavior regardless of the women's attitudes toward pregnancy. We cannot directly use the framework developed by Bachrach and Morgan (2013), which emphasizes other outside forces influencing the interaction between intentions and behavior. Rather than naming a birth intended or intended, contraceptive behavior preceding a birth will define the planned status of the birth (Klerman 2000). As Bachrach and Morgan have pointed out, intentions do not always directly lead to intended outcomes. Therefore, by avoiding intentions we focus purely on the behavioral predictors. The goal of this project is to begin to shape a story of how persistent disadvantage can be exacerbated and reproduced with an unplanned pregnancy, which in a country such as the United States where general social support for families is low puts women in a uniquely vulnerable position (Brady and Burroway 2012). We test the following hypothesis:

H1: A women whose contraceptive use path appears to be planned prior to a birth will be less likely to be in poverty after a birth than will a woman whose contraceptive use path mirrors one of inconsistency, holding constant her socio-economic characteristics and poverty status before the birth.

Data and Methods

Data

Data for this study come from the National Longitudinal Survey of Youth 1997 (NLSY97) and the National Survey of Family Growth (NSFG).

NLSY97

These data are part of the National Longitudinal Survey program. Starting in 1997, the NLSY97 (Bureau of Labor Statistics 2017) interviewed a nationally representative sample of 8,984 individuals who were between 12 and 16 with Black and/or Hispanic and Latino respondents oversampled. Respondents were interviewed annually until 2011 and biennially since. Approximately 80 percent of the 1997 sample was interviewed in 2015. In order to build the contraceptive consistency sequence, we need at least one survey year prior to birth to observe contraceptive behavior. Due to some missing data in 1997 and from biennial interviews since 2011, we restrict our observation of NLSY97 women to the annual interviews between 1998 and 2011. Our sample includes all women who have given birth and were sexually active for at least one year prior to the birth. We observe women up to two years before a birth, conditional on being sexually active. The women in our analytic sample were interviewed at ages immediately after the birth that range from 17 to 31.

NSFG

The NSFG is a cross-sectional representative survey of the household population (civilian and noninstitutionalized) of the United States conducted by the National Center of Statistics (National Center for Health Statistics 2016). 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 follows a continuous interviewing design (the sample for

each cycle is interviewed between two to four years). Women between 15 and 44 years 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 in-person interview, but more sensitive questions are answered privately by self-administration.

To conduct our analysis on a sample of women comparable to those in the NLSY97, we use data from the female respondents between 17 and 31 years from the 2006-2010, 2011-2013 and 2013-2015 cycles.[2] In these cycles, Hispanic, Black, and teen women were oversampled. All the variables used in the analysis are the same across the three cycles.

Measures

Contraceptive Consistency

NLSY97

The annual consistency of contraceptive use is built using several questions in the NLSY97 Self Administered Questionnaire, following Manlove et al (2008) and Sipsma and Ickovics (2015). Contraceptive use is observed at times when a woman is at risk of a pregnancy, i.e. sexually active. 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 use *any* method of birth control? In 2002 to 2011, before being asked about general birth control, the respondents were first asked how many times they had use condoms. If the respondent stated using condoms 100% of the time, they were not asked further about other birth control method consistency. To obtain a

[2] We plan to add women interviewed in the 2002 NSFG, which will both add substantially to sample size and to comparability of years with those of the NLSY97.

percentage, we divided the number of times she used birth control by the times the respondent 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). Respondents gave a percentage, 0 to 100%, as an estimate of how many times they used birth control in the last year.

Once we obtained a percentage of times that the woman used birth control in the last year, we divide the women into three categories of use: 0% birth control use is non-use; 1-99% is inconsistent use; and 100% is consistent use. We use up to two years before the birth 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 categories of 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', but also do not fit well with the non-planners, as married women have some of the lowest rates of unintended pregnancies (Finer 2016). Ever-consistent 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. The ever-consistent women are those who in the year before birth use contraceptives inconsistently or not at all, and in two years before the birth use contraceptives 100% of the time. Never-consistent women are those who use contraceptives either 0% of the time and are unmarried every year until they have a birth, or those with a mix of non-use and inconsistent use until having a birth. To avoid the inclusion of contraceptive failure, we did not include any women in any category who may have

gotten pregnant after using contraceptives 100% of the time in the year before birth. About 19% of the births to women in the NLSY97are due to contraceptive failure. This is higher than the national average of 10-12% (Sundaram et al. 2017). The higher rates can be attributed to the coding of birth and its correspondents to the contraception in the year before, which we hope to address in future iterations of this project. The higher contraceptive failure rate, 40% of which are pill users, points to the conclusion 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.) More detailed distribution of the contraceptive sequences can be found in Table A1 of the Appendix.

NSFG

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. For example, for interviews done on August 2011 it covers information from January 2008 trough August 2011. The number of months available for each respondent depends on the date (month/year) of his or her interview. Nevertheless, the design is made to ensure at least a window of three years of contraceptive questions for each respondent (National Center for Health Statistics 2016).

Restricted to women who declare at least one experience of sexual intercourse with a man, the survey collects for this three year period whether they had sexual intercourse (yes, no, refused, don't know). Additionally, the NSFG collects data on the contraceptive methods that the respondents used during this period. The monthly contraceptive question allows at most 4 contraceptive methods. We used the number of methods used per month coded as none, one, two or more to calculate the percentage of months using some contraceptive method. Following the same procedure as for the NSLY97, we distinguished among women using contraceptives 0% of

the months, 1%-99% of the months, and 100% of the months, and put them into the same categories of ever-consistent, never-consistent, and non-use married (More detailed distribution of the sequences can be found in Table A2 of the Appendix).

Poverty

NLSY97

Round 1-7 (1997-2003) the NLSY97 collected income information on all members of the household; therefore we have a gross household income measure. 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 12% of the possible sample has missing poverty data.

An important predictor of current poverty status is poverty status in the year before. Therefore, we use poverty status in the year before the survey as a lagged dependent variable. Due to the same processes that leave some missing values in poverty after birth, approximately 18% of the possible sample has missing values for poverty in the year before[3].

NSFG

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. The family income includes all relatives as

[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.

well as a resident nonmarital partner. The income-to-poverty ratio is then calculated using annual poverty thresholds as assigned by the U.S. Census Bureau.

Social 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. Education, age, and marital status in the model are measured at the end of the birth exposure period.

Analyses

We estimate three regression models. The first (Model 1) includes only the contraceptive consistency variable among the regressors. Model 2 includes contraceptive consistency plus the socio-demographic 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). Model 3 includes a regressor, pre-birth poverty status, available only in the NLSY97. We used cross-survey multiple imputation (MI) to impute this variable from the NLSY97 to every observation in the NSFG. This cross-survey MI method allows our preferred regression specification, that including pre-birth poverty status as one of the regressors in predicting post-birth poverty status, to be used for the pooled-survey estimation, whereas otherwise this specification could only be used on the NLSY97 sample. As a result, our best specification can be estimated on a sample whose size is substantially larger than that of the

NLSY97 alone. We show below that estimates of the socio-demographic and contraceptive consistency associations with post-birth poverty status are generally weaker after controlling for pre-birth poverty status. 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 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 (Rendall et al. 2013; and see Baker, Rendall, and Weden 2015 for an example of this model-fitting procedure applied to pooling of two surveys to estimate early childhood obesity). 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. 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 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 over direct estimation methods is the separation of the handling of missing data from the estimation of the analysis model. This allows for greater flexibility in the choice of analysis model. For example, the complex sample designs of both surveys are handled easily using the SAS SURVEYLOGISTIC procedure in the analysis model[4]. We are able to implement both the imputation and analysis steps using statistical package software from SAS Version 9.4, 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 to account for oversampling and attrition. Using the MIANALYZE command allows us to confidence intervals, standard errors, and significance tests adjust 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.

Results

In Table 1 we find that the NSFG and the NLSY97 compare well on most of the demographic predictors. The NLSY97 and the NSFG are similar in their partnership distribution and age

[4] In the present version of the paper, the complex survey design features are not adjusted for, but will be in the final version of the paper. These adjustments are, in general, expected to increase the standard errors and widen the confidence intervals over those presented here. As a consequence the gains to pooling observations across the two surveys will generally be greater after adjusting for the complex survey design

averages. The NSFG is a slightly higher educated sample with 28.1% of women having a bachelor degree or more, compared to 18.7% in the NLSY97. Compared to the general U.S. population, the percentage of people in the NLSY97 who are highly educated is slightly lower than the national average (U.S. Census Bureau 2005). This can be attributed to the younger age range and survey attrition of individuals when they reach college graduation ages. The NLSY97 sample includes a higher percentage of White women and less Hispanic women than the NSFG. The percent of women in poverty after a birth is 38.9%, this is significantly higher than the NLSY97 and can possibly be partially attributed to the NLSY97 using household poverty (which included non-family members as well) for the first seven rounds.[5]

[TABLE 1 HERE]

Our measures of contraceptive consistency are quite similar between the NLSY97 and NSFG. Using the NLSY97, we estimate that 52.6% of women are in the planned behavior category (ever-consistent), 37.4% are never-consistent, and 9.9% are non-use, married. Using the NSFG, we estimate that 47.7% of women are ever-consistent, 43.6% are never-consistent, and 8.7% are non-use, married. (More detailed distribution of the sequences can be found in Tables A1 and A2 of the Appendix).

[TABLE 2 HERE]

Table 2 shows the distribution of contraceptive use sequences before a birth. What we find is that a larger percentage of women are in the ever-consistent group as education increases in both surveys. Consequently, women tend to move out of the never-consistent category as

[5] The higher overall poverty in the NSFG than the NLSY97 will be subjected to more detailed diagnostic analyses in a future version of this paper.

education increases. There is a slight increase in percentage of women in the non-use married category as education increases in the NSFG, but no real increase in the NLSY97.

[TABLE 3 HERE]

Table 3 includes all the logistic regression models. The baseline model (Model 1) shows that women who have a contraceptive use sequence where they never display 100% contraceptive use (never-consistent), are approximately twice as likely ($p<0.01$) to be poor after the birth as those who use contraceptives 100% of the time once in the two years before the birth (ever-consistent". These results are seen in both the NSFG and NLSY97. When adding in the socio-demographic predictors (Model 2, NSFG) the odds ratio for never-consistent contraceptive sequence decreases to 1.87 ($p<0.01$), meaning women who have a contraceptive sequence that is never-consistent are about 87% more likely as ever-consistent women to be in poverty after birth, after controlling for their socio-demographic characteristics. In the NLSY97, the never-consistent Odds Ratio also decreases, but stays statistically significant with never consistent users being 64% more likely to be in poverty than ever-consistent users. The NSFG and the NLSY97 also show an emerging relationship between non-use married women being three times as likely (NSFG) and 1.62 (NLSY97) times as likely to be in poverty after a birth. Other strong predictors of poverty after birth are being Black (compared to White women), having a high school or less education (compared to women with some college education), and having no resident partner (compared to being married).

The final model, Model 3, which can only estimated in a single-survey analysis with the NLSY97, includes the lagged dependent variable, poverty in the year before the year of the birth. Due to missing poverty information, we have a smaller sample of women who have both non-missing values for current and last years poverty. After controlling for poverty in the year

immediately prior to birth, the strength of several effects decreased. In Model 3, Black women are now 1.71, $p<0.01$ (vs. Odds Ratio=2.14, $p<0.01$ in Model 2) times more likely to be in poverty after birth compared to White women, controlling for contraceptive use, education, prior poverty, and partnership status. As expected, being in poverty in the year immediately prior to birth increases the likelihood of being in poverty after birth 7.46 ($p<0.01$) times. To assess the sensitivity of the smaller sample size for Model 3, we ran Models 1 and 2 with Model 3 specifications and found no significant differences in the outcomes (not shown).

Most importantly, we see that when controlling for socio-demographic predictors of poverty and poverty prior to birth, we still observe that women who used contraceptives never consistently before a birth were 1.44 ($p<0.05$) times more likely to be in poverty than women whose behavior appears to be planned. There was no support to show that non-use married women had any significantly different chance of being in poverty compared to women who were ever-consistent users.

Our most statistically precise estimates are those that pool the NLSY97 and NSFG. Following the model-fit assessments described in the Method section above, Model 1 and Model 2, NSFG+NLSY include the "NSFG" intercept. Our main findings from the NSFG and NLSY separately are confirmed, but with narrower confidence intervals about the estimated Odds Ratios. When controlling for socio-demographic predictors in Model 2, the never-consistent Odds Ratio decreases slightly to 1.69 from 2.06, but remains strongly significant ($p<0.01$). In contrast, with the control of socio-demographic predictors we also see a strengthening of a relationship between non-use married women and ever-consistent women, with the former being twice as likely to be in poverty after a birth.

Our preferred model is the Model 3, NSFG+NLSY (with MI). This, as with the other pooled-survey estimates (Model 1 and Model 2), includes an "NSFG" intercept. This was the best fitting model (using the BIC Criterion, as recommended by Rendall et al 2013, p.498) between the three possible specifications for incorporating survey differences (see Table A3 and Methods section above). Compared to the Model 3 regression results using the NLSY97 only, the magnitude of the Odds Ratio for the never-consistent" in the pooled NLSY97 and NSFG model is similar, as expected), at 52% greater odds of being poor after the birth than the reference category ever-consistent" contraceptive use (OR=1.52). The confidence interval of 1.20 to 1.92, however, is noticeably more precise than for the NLSY97-only estimate. Looking across Models 1, 2, and 3 in the pooled NSFG+NLSY97 estimates, the magnitude of the never consistent Odds Ratio is seen to be reduced first from 2.06 without other covariates to 1.69 with socio-demographic covariates only, and to 1.52 after adding also pre-birth poverty status. This is as expected, implying that higher-poverty-risk socio-demographic characteristics associated with contraceptive inconsistency is part of the explanation for that variable's positive association with poverty risk after the birth. Nevertheless, a robust difference between never-consistent and ever-consistent women's poverty risks after the birth of women who is seen both after controlling for socio-demographic characteristics and poverty in the year before the year of the birth.

We were not expecting to find that non-use married women would have significantly higher chances of being in poverty, often times with an Odds Ratio greater than that of having never-consistent use. As discussed in our literature review, unmarried women are the most at risk for an unintended birth, therefore finding high poverty in married non-users (seemingly long term planners) is puzzling. We plan to explore this relationship further, possibly looking at parity of birth and specific timing of marriage.

Discussion

In this study we have taken advantage of the availability of nationally-representative retrospective and panel 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 initial hypothesis, was that women whose behavior does not include any consistent contraceptive use prior to a birth have a higher chance of being in poverty relative to women whose contraceptive use appears to mirror planned behavior. This finding of a link between inconsistent contraceptive use and newborn child poverty thereby offers indirect support to studies calling for provision of long acting reversible contraceptive methods (LARCs), as these methods are correctly argued to solve the problem of inconsistent contraceptive use once inserted (Wu and Mark 2018, Trussell et al. 2013). 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). Giving all women a fair chance at meeting their contraceptive needs may therefore mean not only promoting safe, consistent, and affordable contraceptive practice, but also promoting child wellbeing and development.

In our multivariate analyses, the additions of socio-demographic factors, which partially explain contraceptive use in the literature (Glei 1999), reduced but did not remove the association of inconsistent contraceptive use on poverty after a birth, and nor did inclusion of poverty in the year before the year of the birth. Other factors that are protective against poverty after a birth are being White, highly educated, and married. Having a cohabiting partner was somewhat protective compared to having no resident partner.

A woman's education is a variable we expect 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. When we viewed the distribution of contraceptive use behavior prior to a birth by education, we found that as education increased, a larger percentage of women fell into the ever-consistent category, while fewer women were never consistent before a birth. We found that women who never use contraceptives consistently are disproportionately high school graduates or less. All women, regardless of socioeconomic status, may be sexually active, but unintended births are unevenly distributed amongst disadvantaged women, consistent with previous findings (e.g, Reeves and Venator 2015). Education therefore appears to be moderately related to more planned behavior, but other socio-economic factors such as whether the woman was in poverty as a child or her mother's education may help us better understand the mechanisms by which education affect this behavior. An important factor that we cannot currently explicitly show, however, is that higher education women are more likely to get an abortion because they often have more access to those services (Reeves and Venator 2015), therefore some inconsistent behavior may be unidentified because we do not observe abortion outcomes.

Limitations

Like many projects engaging with new definitions, there are several limitations to consider, and to potentially address in our subsequent analyses. First, our panel data source, the NLSY97, gives us no way to gauge *any* attitudes about pregnancy and birth. To truly use the most up to date version of the Theory of Planned Behavior, it would be useful to capture the pre-birth and post-birth attitudes toward childbearing to support the use of purely behavioral measures. 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). The NLSY97 collects information on retroactive sexual and contraceptive behavior; therefore the assumption that these are perfect would be flawed. We cannot ask the respondent exactly after each sexual activity.

By using also the NSFG, 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 the NLSY97 alone. We have not yet, however, taken full advantage of the NSFG's additionally including questions on contraceptive and pregnancy attitudes, and how these relate to observed contraceptive behavior. We plan to do this as a next step. Additionally, we plan to more carefully explore the timing of birth relative to the timing of the stopping of contraceptive use. We currently define inconsistent use in the NLSY97 if the times using contraceptives does not line up with the times one had sex. By looking at individuals who had a pregnancy mid-year, we may be able to capture any seemingly inconsistent use that is actually reflective of stopping birth control due to "trying" for baby midyear. These steps may help us better understand the sometimes-consistent women in the NLSY97 who fall in between perfect planning and no planning.

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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.

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 A this is the income in $\{t\text{-}1,t\}$). For the poverty status before the birth, we take the income from the year before birth exposure (in Table A it is in interval $\{t\text{-}2,t\text{-}1\}$). 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.

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 A it is time *t*).

Education and Age
Education is determined as the current completed education after the birth (in Table A it is time *t*). Age relates to the age right after the birth (in Table A it is time *t*).

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 do not in the present version of our regression models use the all design variables for the sampling stratum and clustering of observations. In particular, the present estimates do not adjust for women appearing multiple times in our analyses when they had more than one birth in the observed period 1999. This implies that our presented results may overstate somewhat the precision of the estimates.

NSFG

NSFG 2006-2010, 2011-2013 and 2013-2015 combined
Following the recommendations to combine data across years we combine the data of females respondents for the following years 2006-2010, 2011-2013 and 2013-2015. Each database has independent observations. Even though, there was a 15 month gap in interviewing from mid-June 2010 through mid-September 2011, but for simplicity we refer to the database considering the first and last year (2006-2015). All the variables that we used are available for the period 2006-2015.

Birth
We identified women with births during the last year using the information from the NSFG for the year-month for the respondent most recent live birth (cmlastlb) and the year-month of the interview (cmintvw). Hence, for the analysis, we distinguished women who had a birth in the 12 months (t-1,t) before to the interview (t).

Contraceptive consistency

To determine the contraceptive consistency per period (t-2,t-1 and t-3,t-2) we use two variables available for the 48 year-month covered by the survey. First, the intercourse occurred per specific year/month (monsx 1-48) and second, the number of methods reported per specific year/month (nummultx 1-48). We count the number of months with sexual intercourse and the number of months using contraceptive methods for both periods. The ratio between number of months using contraceptive and number of months with sexual intercourse gives a percentage for each period (t-2,t-1 and t-3,t-2). Because the number of months using at least one contraceptive method is independent of the sexual active situation of the women for that month (for example, sterilized women are using the method even they have not sexual intercourse a given month) we found women (8% for the t-3,t-2 period) using contraceptive more than 100% of the months. We used this percentage- from 0 to 100% months- as a similar estimate of how many times they used birth control in each year (t-2,t-1) and (t-3,t-2).

Poverty

The "poverty level income" variable combines the family income from all sources in the calendar year before the interview, divided by the weighted average 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[6]. This estimation gives values between 0 and 500 to each respondent. We identified as poor women with values equal to or lower than 100 in the "poverty level income variable". The number of members of the household (NUMFMHH variable) uses to estimate the threshold by family size includes all the household member's related to the respondent (husband/wife, male/female partner, biological child, step-child, adopted child, grandchild, niece/nephew, biological parent, step- parent, adoptive parent, grandparent, aunt/uncle, brother/sister, other relative) plus any other usual resident. In addition, if the women declares a partner as a member, the NFSG`s format explicitly displays for the income question (TOTINC variable): "total combined income of your family" includes your income plus your partner's income, and income from any of your family members that live here, before taxes.

Partnership Status

Respondents are asked for their informal marital status at the interview moment (rmarital). The variable allow the following answers: married, not married but living with opposite sexual partner, widowed, divorced, separated or never been married. We distinguished women who declared being married at the interview from those who no (in Table A it is time *t*).

Education and Age

Education is determined as the current completed education (time t) (based on hieduc variable with alternatives for 9th grade or less to professional degree). First, we fixed the variable for the 2006-2010 as suggested by the NSFG official documentation[7]. Second, we made a variable distinguishing three levels: high school or less, some college and bachelor degree or more. The Age corresponds to the current age at the interview (age_a).

[6] https://www.icpsr.umich.edu/icpsradmin/nsfg/variable/recode_spec/cycle8.1/preg/POVERTY.pdf
[7] https://www.cdc.gov/nchs/data/nsfg/HIEDUC_correction_2006_2010.pdf

Weights and Survey Design Adjustments

We used the final post-stratified, fully adjusted case weight for 2006-2010 (WGTQ1Q16) and for the 2011-2015 (WGT2011_2015); both are the same variable in our combined dataset. The latter, was designed to represent population totals at the approximate midpoint of data collection (July 2013) over the 2011-2015 period. In the present version of this study, We do not in the present version of our regression models do not all use the design variables for the sampling stratum (SEST) and cluster (SECU) to obtain correct standard errors for their estimates, implying some of our estimates overstate the precision of our estimates.

[TABLE A1, A2, A3 HERE]

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

	NSFG		NLSY97				NSFG+NLSY97	
	Model 1&2	χ^2	Model 1&2	χ^2	Model 3	χ^2	Model 1&2	χ^2
Contraceptive Consistency		***		***		***		***
Ever Consistent	0.477		0.526		0.514		0.512	
Never Consistent	0.436		0.374		0.378		0.392	
Non-Use Married	0.087		0.099		0.108		0.096	
Poor at Birth	0.389		0.232		0.206		0.278	
Poor in year immediately prior to birth	-		-		0.177		-	
Education		***		***		***		***
High School or Less	0.541		0.566		0.540		0.559	
Some College	0.178		0.247		0.256		0.227	
Bachelors Degree +	0.281		0.187		0.204		0.215	
Age	25.5		24.5		24.8		24.8	
Race		***		***		***		***
White	0.527		0.712		0.719		0.658	
Black	0.172		0.148		0.145		0.155	
Hispanic	0.254		0.126		0.123		0.163	
Other	0.047		0.014		0.013		0.024	
Married		***		***		***		***
No Resident Partner	0.201		0.201		0.174		0.201	
Cohabiting	0.277		0.223		0.209		0.239	
Married	0.522		0.575		0.616		0.560	
Unweighted N	879		2,119		1,782		2,998	

Notes: All proportions are weighted

Group differences from chi-squared (poor vs non poor), + p<0.10, * p<0.05, ** p<0.01, *** p<0.001

Sources: National Longitudinal Survey of Youth 1997 (NLSY97) and the National Survey of Family Growth 2006-2015

Table 2: Distribution of contraceptive use sequence by education, women aged 17-31, giving birth

		Education					
		NSFG			**NLSY97**		
		High School or Less	Some College	BA or more	High School or Less	Some College	BA or more
Contraceptive Use Sequence	Ever Consistent	0.395	0.371	0.555	0.325	0.401	0.487
	Never Consistent	0.536	0.557	0.313	0.575	0.495	0.413
	Non-Use Married	0.069	0.071	0.132	0.100	0.105	0.100

Unweighted N: NLSY97=2119 NSFG=879

Source: NLSY97 and NSFG

Table 3: Logistic Regression of Poverty on Contraceptive Consistency and Socio-demographic variables, ages 17 to 31, 1999 to 2015, NSFG, NLSY, and pooled NSFG+NLSY

	NSFG		NLSY			NSFG+NLSY		
	Model 1	Model 2	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
	Weigthed Odds Ratios	Weighted Odds Ratios	Weigthed Odds Ratios	Weighted Odds Ratios	Weighted Odds Ratios	Intercept only Weigthed Odds Ratios	Intercept only Weighted Odds Ratios	Multiple Imputation
Contraception sequence before birth (Reference: Ever Consistent)*								
Never Consistent	2.32 ***	1.87 ***	1.90 ***	1.63 ***	1.44 **	2.06 ***	1.69 ***	1.52 ***
	[1.73, 3.11]	[1.33, 2.62]	[1.52, 2.38]	[1.27, 2.09]	[1.06, 1.95]	[1.72, 2.46]	[1.39, 2.06]	[1.20, 1.92]
Non Use Married	1.52	3.31 ***	0.83	1.62 **	1.48	1.05	2.04 ***	2.11 ***
	[0.91, 2.54]	[1.81, 6.05]	[0.55, 1.26]	[1.01, 2.61]	[0.85, 2.58]	[0.76, 1.45]	[1.41, 2.93]	[1.38, 3.23]
Other Predictors								
Age		0.97		0.91 ***	0.93 ***		0.93 ***	0.96 *
		[0.57, 1.02]		[0.88, 0.95]	[0.89, 0.98]		[0.91, 0.96]	[0.93, 1.00]
Race/ethnicity (Reference: White)								
Black		0.95		2.14 ***	1.71 ***		1.67 ***	1.48 ***
		[0.60, 1.53]		[1.58, 2.89]	[1.17, 2.49]		[1.29, 2.15]	[1.12, 1.95]
Hispanic		1.53 **		1.14	1.01		1.33 **	1.10
		[1.04, 2.24]		[0.83, 1.58]	[0.67, 1.51]		[1.05, 1.70]	[0.84, 1.43]
Other		1.25		1.49	0.58		1.41	0.94
		[0.57, 2.75]		[0.64, 3.47]	[0.18, 1.87]		[0.79, 2.52]	[0.42, 2.11]
Education (Reference: Some College)								
High school or less		2.05 ***		2.34 ***	1.78 ***		2.26 ***	1.71 ***
		[1.37, 3.08]		[1.75, 3.13]	[1.26, 2.51]		[1.79, 2.86]	[1.32, 2.22]
Bachelor degree +		0.33 ***		0.18 ***	0.23 ***		0.29 ***	0.40 ***
		[0.19, 0.59]		[0.08, 0.40]	[0.10, 0.53]		[0.19, 0.44]	[0.25, 0.63]
Partnership Status (Reference: Married)								
No Resident Partner		5.03 ***		2.58 ***	2.49 ***		3.09 ***	3.09 ***
		[3.09, 8.20]		[1.90, 3.50]	[1.70, 3.64]		[2.40, 3.99]	[2.30, 4.15]
Cohabiting		1.88 ***		1.92 ***	1.74 ***		1.86 ***	1.86 ***
		[1.26, 2.82]		[1.44, 2.56]	[1.22, 2.48]		[1.47, 2.35]	[1.40, 2.48]
Poor before birth					7.46 ***			6.75 ***
					[5.52, 10.09]			[5.19, 8.78]
NSFG indicator						2.23 ***	2.81 ***	2.92 ***
						[1.88, 2.65]	[2.29, 3.44]	[2.28, 3.74]
Constant	0.40 ***	0.36	0.21 ***	0.69	0.33 *	2.23 ***	0.38 **	0.13 ***
	[0.32, 0.50]	[0.10, 1.32]	[0.18, 0.26]	[0.27, 1.77]	[0.10, 1.11]	[0.17, 0.23]	[0.18, 0.81]	[0.06, 0.33]
Sample N	879	879	2119	2119	1782	2998	2998	2661

Confidence intervals in brackets

Notes: *** p<0.01, ** p<0.05, * p<0.1

Source: NLSY97 and NSFG (2006-2015)

*A birth is defined by the longer of two years or time since first sex.

Table A1: Contraceptive Sequence, NLSY97

	N	Proportion Group	Proportion All	(t-3,t-2)	(t-2,t-1)	Birth(t-1,t)
Ever Consistent						
	214	0.2695	0.1010	Consistent	Nonuse	
	580	0.7305	0.2737	Consistent	Inconsistent	
Total	794		0.3747			
Non-use Married						
	198	0.9802	0.0934	Nonuse	Nonuse	*
	4	0.0198	0.0019	[redacted]	Nonuse	*
Total	202		0.0953			
Never Consistent						
	122	0.1086	0.0576	Nonuse	Nonuse	**
	9	0.0080	0.0042	[redacted]	Nonuse	**
	512	0.4559	0.2416	Inconsistent	Inconsistent	
	44	0.0392	0.0208	[redacted]	Inconsistent	
	128	0.1140	0.0604	Nonuse	Inconsistent	
	308	0.2743	0.1454	Inconsistent	Nonuse	
Total	1123		0.5300			
Total All	2119					

*=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						
	23	0.0607	0.0109	Consistent	Nonuse	
	356	0.9393	0.1680	Consistent	Inconsistent	
Total	379		0.1789			
Non-use Married						
	69	0.3416	0.0326	Nonuse	Nonuse	*
	7	0.0347	0.0033	[redacted]	Nonuse	*
Total	76		0.0359			
Never Consistent						
	80	0.0712	0.0378	Nonuse	Nonuse	**
	15	0.0134	0.0071	[redacted]	Nonuse	**
	154	0.1371	0.0727	Inconsistent	Inconsistent	
	40	0.0356	0.0189	[redacted]	Inconsistent	
	41	0.0365	0.0193	Nonuse	Inconsistent	
	94	0.0837	0.0444	Inconsistent	Nonuse	
Total	424		0.2001			
Total All	879					

*=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
AIC	3,497.3	3,416.8	*	3,417.3	2,968.5	2,870.7		2,862.1
BIC	3,515.3	3,440.8	*	3,453.3	3,034.6	2,942.8	*	2,994.3

* best fitting model (lower = better fit)

Sources: National Longitudinal Survey of Youth 1997 (NLSY97) and the National Survey of Family Growth 2006-2015

Notes: "NSFG intercept" indicates that the pooled-survey (NLSY97 and NSFG) regression model specification includes a dummy variable for observation's coming from the NSFG sample. "NSFG intercept and regressor interaction" indicates that the pooled-survey (NLSY97 and NSF 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. See Table 3 for Model specifications.