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Abstract
Research on unintended fertility tends to focus on births as isolated events. This article expands previous research by examining the relationship between early unintended childbearing and subsequent fertility dynamics in the United States. Data from the 2002 National Survey of Family Growth show that 27.5% of mothers report an unintended first birth. We use event history methods to show that these women are significantly more likely than women with an intended first birth to have an unintended second birth than to either have no second birth or an intended second birth, net of sociodemographic characteristics. An unintended first birth also increases the risk of having an unintended third birth relative to no birth or an intended birth, independent of the intendedness of the second birth. We conclude that early unintended fertility is a strong signal of high risk for subsequent unintended fertility.

Keywords: unintended fertility, relationship status, higher-parity births

Unintended fertility in the U.S. is high relative to levels in other western industrialized countries, with about 50% of recent pregnancies and 38% of live births unintended (Henshaw 1998; Finer and Henshaw 2006; Barber and Emens 2006). Because unintended childbearing is negatively associated with well-being among women and children, the United States Department of Health and Human Services has declared the reduction of unintended pregnancies – and thus of unintended childbearing – a national health goal (U.S. Department of Health and Human Services 2000).

Unintended fertility is a well-studied topic, and research has generally fallen along two lines. The first type of research occurs at the aggregate level, describing trends in unintended fertility rates or the group-level correlates of unintended fertility (e.g., Finer and Henshaw 2006; Kissin et al. 2008). The second type of research is micro-level research, either focusing on the individual-level predictors of unintended fertility and studying births as independent events (e.g., Hayford and Guzzo 2006; Musick 2002; Speizer et al. 2004) or on the link between an unintended birth and subsequent well-being (e.g., Barber, Axinn, and Thornton 1999; Crissey 2005). However, recent evidence suggests a growing concentration of unintended fertility in the United States (Wildsmith, Guzzo, and Hayford forthcoming). More than 40% of women who have one unintended birth go on to have another, and this proportion appears to have increased in recent cohorts. In order to understand the cumulative process of repeat unintended fertility, we take a life course perspective on unintended childbearing, examining the relationship between unintended births and subsequent childbearing.

The life course perspective centers on the observation that early events in an individual's life shape subsequent outcomes (Elder 1998). This perspective implies that the conditions in which women enter in to family formation are likely to influence later family behaviors. Here,

we focus on how unintended births at low parities are related to fertility trajectories, using data from the 2002 National Survey of Family Growth to examine parity-specific patterns of intended and unintended childbearing. We expect that, compared to women with an intended first birth, women with an unintended first birth have a high risk of experiencing a subsequent unintended birth. This association is likely driven in part by causal processes: having an unintended birth alters women's relationship, educational, and career pathways in ways that may increase the risk of later unintended births. The association may also reflects processes of selection in to unintended fertility, if structural or psychological factors that increase the risk of unintended births persist over the life course. Although we do not explicitly model causal relationships, we use variation by parity in the patterns of fertility after an unintended birth to assess which relationships are likely to be causal, distinguishing between short-term (direct) associations and more distal relationships. We find that having an early unintended birth is a strong predictor of subsequent unintended fertility, even net of sociodemographic controls, and that having a first unintended birth has persistent associations with later intendedness.

Measuring unintended childbearing

Unintended childbearing has traditionally been divided into two categories: unwanted births and mistimed births. Unwanted births are those for which women reported that right before they became pregnant, they did not want to have *any* births at *any* point in the future (a number failure), while mistimed births are those identified as occurring any time earlier than desired (a timing failure). Unintended births are then the sum of all births identified as unwanted or mistimed. A distinction is usually made between unwanted and mistimed births because in theory they reflect different concerns over the life course and by parity, and unwanted births tend to be more strongly correlated with negative outcomes than mistimed births (Barber, Axinn, and

Thornton 1999; Santelli et al. 2003). However, these definitions have long been recognized as problematic for studying unintended fertility in the late twentieth and early twenty-first century (e.g., Klerman 2000; Santelli et al. 2003). The categories were established in a context where most unintended fertility came at the end of the childbearing years, and therefore focused on unwanted births as the most problematic. In the current context, a substantial amount of unintended fertility takes place at younger ages and low parities. The mistimed category combines births to teenagers, which are likely to be strongly disruptive, with births to older women that occur only a few months earlier than planned. Furthermore, cognitive interviews suggest that survey respondents do not interpret the unwanted category in the way survey makers intended (Klerman and Pulley 1999). Surveys show consistently high reported unwanted fertility among young women – on the order of one in five births to women age 15-19 in the period 1997-2001 (Chandra et al. 2005) – even though most young women report wanting to have children someday.

In an attempt to more appropriately classify unintended births in terms of the severity of their impact, recent research has proposed a new categorization system that combines unwanted births with some mistimed births in an effort to capture the most disruptive unintended births while moving beyond the timing/number distinction. Births mistimed by two or more years (labeled as "seriously mistimed" births) tend to resemble unwanted births, whereas those that are mistimed by less than two years are closer to intended births (Chandra et al 2005; Abma, Mosher, and Jones 2008; Lindberg, Finer, and Stokes-Prindle 2008; Pulley, Klerman, Tang, and Baker 2002). For example, Lindberg, Finer, and Stokes-Prindle (2008) found that the proportion of pregnancies mistimed by less than two years that were carried to term (63%) was closer to the proportion of intended pregnancies carried to term (78%) than the proportion of pregnancies

mistimed by more than two years that were carried to term (39%), which was close to the proportion of unwanted pregnancies carried to term (45%). Moreover, the differences in the proportion carried to term between the two mistimed groups was statistically significant, but the differences between the slightly mistimed and the intended pregnancies and between the seriously mistimed and the unwanted pregnancies were not. Similarly, women were less likely to breastfeed if they categorized their pregnancy as seriously mistimed or unwanted than if they reported their pregnancy to be wanted or slightly mistimed, but the likelihood of breastfeeding did not differ between unwanted and seriously mistimed or between slightly mistimed or wanted (Pulley et al 2002). Following this recent research, we define unintended births as those characterized as unwanted or seriously mistimed and intended births are those that are wanted or slightly mistimed. This system creates a new category that is somewhere between unwanted and the traditional definition of unintended.

There has been considerable debate about the validity of retrospective reports on birth intendedness. There is a tendency in retrospective accounts to rationalize births and a reluctance to identify a child as unwanted (Trussell, Vaughan, and Stanford 1999; Williams, Abma, and Piccinino 1999; Musick 2002). Still, the face validity of these measures of unintendedness has generally been shown to be high (Bachrach and Newcomer 1999; Joyce, Kaestner, and Korenman 2000). Measuring unintended *pregnancy* is more difficult. Many unintended pregnancies end in abortion, and abortion is known to be underreported in U.S. surveys (Jones and Kost 2006). As a result, most research on unintendedness, including this analysis, focuses on births instead of pregnancies. The underreporting of abortion makes it impossible to pinpoint the effects of abortion access or attitudes on unintended fertility, and analyses conflate the

factors leading to unintended conception and those associated with the decision to carry an unintended pregnancy to term.

Predictors of unintended fertility

Although the proposed conceptualization of unintended fertility is gaining acceptance, past research has used the more traditional definition that categorizes slightly mistimed births as unintended, so our review of past literature largely uses the standard definition of unintendedness. The high levels of unintended fertility in the United States mean that unintended births take place to women across the spectrum of age, relationship status, and socioeconomic characteristics (Barber and Emens 2006). Still, a large body of research has consistently found that certain factors are associated with higher risks of unintended fertility. On average, births to young women are more likely to be unintended than births to older women (e.g., Logan, Holcombe, Manlove and Ryan 2007). Unmarried women report more of their births as unintended than married women, with cohabiting women falling in between (e.g, Finer and Henshaw 2006). Finer and Henshaw (2006) demonstrated that African American and Hispanic women have higher unintended birth rates than non-Hispanic white women and that women with family incomes below the poverty level and women without a high school degree are more likely to have an unintended birth than women with higher incomes and more education.

Analyses of sociodemographic variation in unintended fertility have been largely descriptive, and the factors driving unintended fertility are not well understood. Unintended pregnancies may result either from a woman's failure to plan childbearing, or from a failure to carry out plans. These mechanisms are conceptually distinct, but difficult to distinguish empirically using survey data; the following discussion addresses both processes. Some differences are likely due to differences in the acceptability of childbearing in different contexts.

Although an increasing proportion of births take place outside of marriage, American women continue to report that marriage is their preferred setting for childbearing (Thornton and Young-DeMarco 2001). Thus, married women may be more likely to plan births. Behavioral differences may also contribute; for example, older women and women in more stable relationships are more likely to use highly effective coitus-independent methods of contraception such as hormonal methods and intrauterine devices (IUD) (Mosher et al. 2004). Differential access to contraception has been proposed as an explanation for the higher unintended birth rates among low-income women (e.g., Frost, Singh, and Finer 2007). However, qualitative and quantitative studies of women reporting unintended births show that lack of access to contraception is not a primary cause of unintended conception (Edin and Kefalas 2005; Frost, Singh, and Finer 2007; Sable, Libbus, and Chiu 2000). Instead, women attribute their non-use or inconsistent use of contraception to low motivation to avoid pregnancy and decision-making factors around contraceptive use. If women see little cost to unintended fertility – for example if they have low chances for high-earning jobs and thus low opportunity costs to childbearing – they may devote little effort to contracepting effectively.

Individual psychological characteristics such as self-efficacy and risk-taking tendencies have also been proposed as causes of unintended fertility (Brown and Eisenberg 1995). Self-efficacy is the belief that an individual has the ability to act in order to influence events and outcomes in life. The perception of individual control over desired outcomes is related to motivation in general and has been shown to be associated with a variety of health-related behaviors, including contraceptive use among adolescents (Grembowski et al. 1993; Longmore, Manning, Giordano, and Rudolph 2003; Schwarzer and Fuchs 1996). Women who are more risk-tolerant may also be more likely to engage in unprotected sex even if they do not want to

become pregnant. Measures of risk-taking tendencies have been shown to be positively associated with sexual activity in adolescence, though not with contraceptive use at last intercourse (Kowaleski-Jones and Mott 1998; Raffaelli and Crockett 2003).

Unintended fertility and subsequent fertility

In this article, we hypothesize that an unintended birth early in a woman's childbearing career is associated with subsequent fertility and intentionality. As Morgan and Rindfuss (1999) argued, because the occurrence, timing, and sequencing of fertility is a "nonreversible event" that affects other behaviors (such as schooling and employment), early family-formation behaviors are very likely to affect later ones. A large literature supports this idea, with much of it focusing on fertility following a teenage birth (see, e.g., Hofferth 1987; Kalmuss and Namerov 1994; Ribar 1996) or a nonmarital birth (e.g., Driscoll et al 1999; Guzzo and Furstenberg 2007).

The same underlying characteristics may drive both low-parity births and subsequent fertility behavior. For example, women with low educational attainment are likely to have low economic prospects, which may reduce their motivation to contracept at both low and high parities. Some psychological characteristics may also be long-term risk factors, as both risk-taking behavior and self-efficacy evolve over the life course (Mirowsky and Ross 2007). Having an unintended birth might thus be considered a "signal" for characteristics that are difficult to measure in large surveys but result in higher chances of going on to have more births, particularly unintended births. It is also possible that some women are consistently more willing to report a birth as unintended; consistent reporting differences would produce associations between birth intendedness across parity.

Unintended births at the start of women's childbearing may also change women's behaviors or characteristics in ways that make later unintended births more likely. The most

direct effect of mistimed fertility is to shift childbearing to earlier ages relative to ideal ages. By definition, women with mistimed births have children earlier than planned. These women may reach their desired family size at an earlier age than women with intended births (as they shift all of their childbearing earlier than they would have otherwise), and will therefore spend more time "at risk" of an unwanted birth at the end of the childbearing years. Other effects of unintended fertility may be either positive or negative, and there is likely to be variation across individuals in effects. An unintended birth may derail women's educational or employment trajectories. Reducing women's attachment to school and work may reduce the perceived costs of additional childbearing and thus increase subsequent fertility, both intended and unintended. Alternatively, the disruption caused by an unintended birth may increase women's motivation to avoid subsequent unintended births – some women may go to great pains to avoid another "mistake." In either case, the direct effect of an unintended birth is likely to take place in the short term. Unintended births may have longer-term implications as well, but these effects are likely to be mediated by measurable factors such as marital and relationship status, subsequent educational attainment, and the timing of intermediate births.

We predict that women who have one unintended birth will be more likely to have another unintended birth, both because of selection processes (individual characteristics that persist from birth to birth) and because of causal processes (changes in life circumstances brought about by the first unintended birth). We do not attempt to distinguish between these mechanisms analytically. However, we note that stable individual characteristics that persist from the first to the second birth are also likely to be present at the third birth. Selection processes will therefore be present at all parities. Causal processes, in contrast, will dissipate over subsequent births.

Data and methods

We use the 2002 cycle of the National Survey of Family Growth (NSFG), a nationally representative survey of U.S. women of age 15-44 designed to measure levels and trends in fertility. The NSFG includes detailed birth and relationship histories, as well as measures of sociodemographic characteristics and family background. The 2002 cycle interviewed 7,639 women. We limit our analyses to those who, if they had a birth, had valid information on the intendedness of that birth (excluding 125 women) and further restrict our analyses to Hispanic, non-Hispanic white, and non-Hispanic black women due to small sample sizes and the diversity of women in the "other" racial category (excluding 380 women). This leaves a sample of 7,134 women, of whom 4,067 were mothers.

The NSFG is the primary national source of information on birth intendedness, having included questions regarding the intendedness of births since its inception in 1973 (London, Peterson, and Piccinino 1995; Ventura et al. 2008). The NSFG does not directly inquire whether a birth was intended or wanted. Instead, wantedness and intendedness are constructs based on responses to a series of questions asked for every birth. Wantedness is derived from the question "Right before you became pregnant, did you yourself want to have a(nother) baby at any time in the future?" A negative answer would be characterized as an unwanted birth. If a woman responds affirmatively, she is asked about the timing of the pregnancy: "So would you say you became pregnant too soon, at about the right time, or later than you wanted?" Births that are identified as too late or at about the right time are considered wanted and intended. Births that are identified as occurring too soon are asked a follow-up question regarding the extent to which the births were too soon: "How much sooner than you wanted did you become pregnant?" We consider births occurring two or more years too soon as seriously mistimed and thus unintended

(according to the operational definition used here), while those occurring less than two years too soon are considered slightly mistimed and thus intended. Our categorization is based on the results of exploratory analyses using a more detailed classification system (later than wanted, wanted or on-time, slightly mistimed, seriously mistimed, unwanted). In preliminary analyses predicting birth intendedness type of first births, we found very few differences in the predictors between births characterized as wanted or on time, later than wanted, or two years or less too early, so we grouped these types of births together. There were some slight differences in the predictors of higher-order seriously mistimed and unwanted births, but for the sake of ease of presentation and interpretation of data, we decided to group these two categories together as well. We return to these differences briefly later in the paper.

Analytic plan

We first describe the distribution of unintended fertility among women overall and then use discrete-time event history models to examine how the intendedness of births is related to subsequent fertility. We run separate models by parity, looking at the association between first and second births and between first, second, and third births. We also predict having a first birth by intendedness as a baseline model of sorts to examine which individuals are selected into unintended fertility. By establishing a baseline, it is possible to determine whether the same characteristics that select women into starting their fertility careers with an unintended birth continue to be associated with the risk of subsequent unintended fertility. The dependent variable for the analysis of first births has three categories: no birth, an intended birth, or an unintended birth. In the analyses predicting higher-parity births, we run two sets of models: one predicting any birth, which serves to relate intendedness to overall fertility, and one using the

three-category dependent variable accounting for intendedness. We use logistic regression in predicting any birth and multinomial logistic regression for the intendedness of the birth.

All analyses use person-months as the unit of analysis. In the model predicting the first birth, women enter the analysis when they turn twelve and exit the month of their first birth or at the time of survey if they have not had a birth. For models predicting higher-parity births, women enter the month of the preceding birth (i.e., women enter the month of their first birth for models predicting a second birth and the month of their second birth for models predicting a third birth) and leave when they have a birth or at the time of the survey if they have not had a birth.

Our key independent variables are indicators of whether prior births were unintended. For models predicting the second birth, we control for whether the first birth was unintended or intended. For third birth models, we use a set of four dummy variables distinguishing women with no unintended births, women with two unintended births, women with an unintended first birth and an intended second birth, and women with an intended first birth and an unintended second birth. Our overarching hypothesis is that unintended fertility at low parities is associated with unintended fertility at higher parities. We believe that an association between fertility and the intendedness of the most recent birth is an indicator of causal forces, while an association between fertility and intendedness of earlier births capture unobserved heterogeneity.

We include a range of socioeconomic and demographic control variables. In the model predicting first birth and intendedness, we include age as a time-varying categorical variable (less than 18, 18-19, 20-24, 25-29, and 30 or older). In the models predicting higher-parity births, we include a control for the age at last birth, and duration since last birth is specified as a piecewise, time-varying linear spline (less than 24 months, 24-48 months, and more than 48

months) because of the discontinuities between duration since last birth and fertility. We include variables for non-Hispanic white women, native born (non-Hispanic) black women, foreign born (non-Hispanic) black women, native born Hispanic women, and foreign born Hispanic women. We distinguish between native and foreign born Hispanic women following research that indicates variation in family behavior according to nativity status (Landale and Oropesa 2007). Exploratory analysis indicated differences by nativity status for black women (but not white women) as well (about 10% of blacks are foreign-born); research has noted that foreign-born blacks often display dissimilar behaviors relative to their native-born counterparts in terms of educational attainment (Massey, Charles, Mooney, and Torres 2007; Bennett and Lutz 2009) and labor force participation (Gore 2005), which may reflect underlying differences in motivation that could affect fertility behaviors. Because the 2002 cycle of the NSFG did not include a detailed education or employment history as in other cycles, we have limited time-varying measures of socioeconomic status. We use data on the month a high school degree was received to construct a time-varying measure of education (high school degree or GED/no degree). In addition, we account for family background, which may also influence women's fertility behaviors and the acceptability of childbearing in different circumstances (Musick 2002), through measures of family structure at age 14 (intact, stepfamily, or other), respondent's mother's education, and whether the mother had a birth prior to age 18. Because women in relationships are more likely to have a child, all models include a time-varying indicator of whether the woman was cohabiting or married during the month. In analyses not shown here, we modeled relationships in greater detail to examine the impact of transitions in and out of relationships and changes in partners. We found that it mattered more whether women simply were in a relationship, and the type of relationship, than whether they were moving in and out of

different types relationship with the same or different partners. As such, we are using a simple indicator of relationship type rather than the more detailed relationship indicators because the main results of interest (the association between early and later unintended fertility) were not affected by relationship status, and the interpretation of relationship status effects on fertility was less straightforward even though the model fit was not substantively improved.

Results

Descriptive statistics

Table 1 displays weighted statistics describing sociodemographic characteristics and the distribution of unintended fertility across the life course for all mothers in the 2002 NSFG. 57% of mothers began childbearing in their twenties, with about a third having children in their teens, and only 13% beginning childbearing at age 30 or later. Over a third of the mothers had their first child outside of coresidential union, while 13% were cohabiting and half were married. The average number of children a mother had in 2002 was 2.19, with an average of 0.62 unintended births.[1] Slightly more than a quarter of all mothers reported that their first birth was unintended (this proportion is lower than the traditional definition of unintended; using the definition that groups slightly mistimed with seriously mistimed and unwanted, about 41% of births are unintended (not shown)). Just over 40% of women with children reported having any unintended births, suggesting that the majority of women who experienced unintended fertility experienced it with their first child.

– Table 1 here –

Of women who have 2 (or more) births, just over half (59%) reported that both their first and second births were intended. 33.5% of women reported an unintended first birth – 19.4%

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[1] This descriptive table includes mothers of all ages, many of whom have not completed childbearing. We calculated similar statistics limiting the comparison to mothers age 40-44; conclusions were not substantively different. Our multivariate analyses control for differences in age and fertility timing.

had an unintended first birth followed by an intended second birth and 14.1% had two unintended births. Relatively few mothers reported that their second birth was unintended after an intended first birth. Looking at how an unintended first birth relates to subsequent fertility overall, among women with an intended first birth, only 5.5 % of all their births were unintended, compared to three fourths of all births to women with an unintended first birth. Women who begin their fertility careers with an unintended birth have more children on average than women whose first child was intended; this difference is statistically significant, though the magnitude is modest. It appears that women with an initial unintended birth often go on to have subsequent unintended births, while a higher-parity unintended birth after an intended first birth seems to be somewhat rare, and these differences suggest that the first birth serves as a strong signal of subsequent unintended fertility. However, it is not clear to what extent the intendedness of a first birth predicts later unintended fertility net of risk factors for the first unintended birth. We consider this question in the following multivariate analyses.

Multivariate results

Table 2 shows relative risk ratios from multinomial logistic regression predicting the risk of having a first birth by intention status using discrete-time event history models. Because our focus is on unintended fertility, this discussion will focus mostly on the last column, which compares the risk of having an unintended first birth relative to an intended first birth. Consistent with previous research, the risk of having an unintended first birth relative to an intended first birth declines with age, as women are less likely to have mistimed births as they age. There are significant race and ethnic differences as well. Native-born non-Hispanic black women are 1.7 times as likely to have an unintended birth rather than an intended birth compared to non-Hispanic white women. (As the first two columns indicate, native-born non-Hispanic

black women are also more likely overall to have a birth than white women). Foreign-born non-Hispanic black women and Hispanic women have lower odds, by about 40% and 60% lower respectively, of having an unintended vs. intended birth relative to non-Hispanic white women. In contrast, the odds of having an unintended first birth rather than an intended first birth for native-born Hispanic women are not significantly different from those of non-Hispanic white women, though native-born Hispanic women are more likely to have a birth overall than non-Hispanic white women. There is no statistically significant relationship between family structure at age 14 or educational attainment (at least as measured by high school graduation) and the intendedness of a first birth. However, women whose own mother had a birth prior to age 18 are more likely to have a birth than no birth, and they are 1.2 times as likely to report this birth as unintended. Both cohabiting and married women are more likely to have a birth overall compared to their non-cohabiting, non-married counterparts, referred to here as "single." Cohabiting women are no more likely than single women but about 3 times as likely as married women (not shown) to have an unintended first birth than an intended first birth, while married women carry a much lower risk of an unintended first birth than single women (RRR=0.296).

– Table 2 here –

These models can be considered as baseline models for understanding the process of selection into an unintended first birth. They demonstrate strong associations between the intendedness of a first birth and age, race, and union status, even controlling for other factors. Turning now to predicting higher-parity births based on the intendedness of the first birth, Table 3 shows four sets of models. Model 1 is a standard event history model predicting any birth but including no covariates and Model 2 adds in covariates. Model 3 is a multinomial model predicting the intendedness of a birth with no covariates, and Model 4 adds covariates to the

multinomial model. In Models 2 and 4, age is modeled as two components, categorized age at

first birth (fixed) and interval since first birth (time-varying).

<center>– Table 3 here –</center>

In Model 1, women whose first birth is unintended are significantly *less* likely to have a

second birth (OR=.87) than women with an intended first birth. Additional models (not shown)

demonstrate that this effect largely works through relationship status, as women who have an

unintended first birth are far less likely to be in a coresidential relationship. When

sociodemographic characteristics are controlled (Model 2), the intendedness of the first birth

does not have a statistically significant relationship with overall second birth hazards. In the full

model, Model 2, several socioeconomic and relationship covariates are statistically significant

and in the expected direction (i.e., age at last birth, relationship status), consistent with the results

for first birth.

Models 3 and 4, which compare having no birth, having an intended birth, and having an

unintended birth, shows that an unintended first birth has opposite associations with the risk of

intended and unintended second births. The null relationship shown in Model 2 is the result of

these opposing relationships balancing each other out in the presence of socioeconomic and

demographic controls. Compared to a woman whose first birth was intended, a woman with an

unintended first birth is less likely to have an intended second birth (RRR=0.67) and more likely

to have an unintended second birth (RRR=2.05) relative to no birth, net of a range of

sociodemographic characteristics. Women with an unintended first birth are nearly three times

as likely (RRR=3.05) to have an unintended second birth than an intended second birth relative

to their counterparts who began childbearing with an intended birth. Note that having an

unintended first birth is a stronger predictor of having an unintended second birth – both relative

to intended births and relative to no birth – than any other variable in the model, including race, age at first birth, relationship status, and education, all powerful determinants of fertility trajectories. This association could be seen as evidence of effects of an early unintended birth on later births. However, it is also consistent with the notion that women whose first birth is unintended have some unobserved characteristic that also makes them more likely to have another unintended birth.

Many factors associated with the intendedness of a second birth are similar to those associated with the intendedness of a first birth. There are some differences, however. While there is no statistically significant difference in the intendedness of *first* births to single and cohabiting women, *second* births to cohabiting women more closely resemble those of married women. Cohabiting women are less likely than single women to have an unintended birth relative to an intended birth, and the difference between cohabiting and married women is not statistically significant (not shown). In predicting first births, black and Hispanics (regardless of nativity) are more likely to have an intended first birth relative to no birth in comparison to non-Hispanic whites but there are no race-ethnic-nativity differences in predicting a second intended birth relative to no birth. However, compared to non-Hispanic whites, all other race-ethnic-nativity groups are more likely to experience an unintended birth relative to no birth and relative to an intended birth.

Table 4 shows results for third births. Again, results from both dichotomous (any birth vs. no birth) and multinomial (no birth vs. intended birth vs. unintended birth) models are included. In the unconditional model, Model 1, women who have an unintended first and second birth are roughly 42% more likely to have a third birth relative to women whose first two births were intended. However, in the presence of socioeconomic and relationship controls, the

intention status of the first two births is not predictive of the likelihood of a third birth (Model 2). The positive association seen in Model 1 is largely driven by the earlier age of childbearing among women whose births were not intended (not shown). That is, early unintended births seem to increase third birth rates by increasing the amount of time that women are at "risk" of subsequent fertility.

– Table 4 here –

In multinomial models, intendedness of prior births works in different and countervailing directions for the likelihood of and intendedness of a third birth (Model 4). As with second births, women with earlier unintended births are *more* likely to have unintended third births and *less* likely to have intended third births; similarly, the intention status of early births are the strongest predictors in the model of the intention status of the current birth. Compared to women with no unintended births, women with an unintended first birth *or* an unintended second birth have a higher risk of an unintended third birth relative to an intended third birth. The strongest association with subsequent fertility occurs among women whose first two births were both unintended – compared to women with no unintended births, these women are more than 5 times more likely to have an unintended vs. intended third birth.

The continued relationship between the intention status of the first birth and higher-parity fertility suggests an important role of unobserved heterogeneity in explaining these relationships. If having an unintended first birth had a purely causal effect on subsequent birth timing or intendedness, this causal effect would be mediated in third birth models controlling for the age and intention status of second birth. Instead, the intention status of first birth appears to capture some characteristic of women's reproductive behavior or attitudes that has continuing associations with later births. However, the relative magnitude of the coefficients for first and

second births in the third birth models also points to some causal relationship. In fact, the

magnitude of the association between an unintended second birth and the risk of an unintended

third birth relative to an intended third birth (RRR=3.29) is close in size to the magnitude of the

association between an unintended first birth and the risk of an unintended second birth relative

to an intended second birth (RRR=3.05, Table 3, Model 4), suggesting a fairly straightforward

and consistent connection between the immediate prior birth and the subsequent birth. If having

an unintended birth were only an indicator of some other characteristic (including willingness to

report an unintended birth), women with an intended first birth and an unintended second birth

should resemble women with an unintended first birth and an intended second birth. The

stronger relationship between the more recent birth and third birth intendedness (RRR=3.29

compared to RRR=2.15) implies some distinct relationship between recent fertility and third

births. However, those women with two unintended births have the highest risk of a subsequent

unintended birth, suggesting that a small subset of women have great difficulty in managing

contractive behavior throughout their childbearing years.

Coefficients describing the relationship between sociodemographic characteristics and

the intention status of third births are generally the same sign as coefficients predicting second

births. However, the magnitudes of some coefficients are smaller, and some associations that are

statistically significant in the second birth models are not statistically different from zero in the

third birth model. In particular, race-ethnic differences in unintended fertility are smaller for

third births than for first and second births. This attenuation may be due to the smaller sample

size in the third birth model. It is also possible that the selection of women who have had a first

and a second birth into the model reduces variation in the third birth models relative to the

second birth models.

To assess the relative importance of selection and unobserved heterogeneity, we ran multilevel models (not shown) pooling person-months of exposure to the risk of unintended births, with women as the level-two unit of analysis. Person-months were nested within women, and each woman had a unique random intercept (representing individual-level variation in overall propensity to have an unintended birth). Although the individual-level random effect accounted for about 10% of the variance in likelihood of a higher-parity unintended birth, incorporating these individual unobserved effects in the model did not fully account for the observed relationship between having an unintended first birth and later unintended fertility. Since unobserved heterogeneity did not seem to completely account for the relationship between unintended early fertility and subsequent unintended fertility, we chose to use the current models because they allowed us to model third-parity births separately and consider the possible effects of both first and second birth intendedness on third-birth intendedness.

In models not shown here, we also disaggregated seriously mistimed and unwanted births in both the independent and dependent variables in the higher-parity models. Though both seriously mistimed and unwanted births predicted the risk of subsequent seriously mistimed and unwanted births, each specific type of unintended birth more strongly predicted the same type of unintended birth. That is, while a seriously mistimed prior birth significantly increased the risk of an unwanted birth (perhaps women who have a birth far earlier than they intended reach or reduced their desired family size earlier and thus face more years of risk for an unwanted birth), it more strongly and significantly increased the risk of a seriously mistimed birth, and the same is true for unwanted births. This lends further credence to the notion that the conditions of prior births are strongly likely to be repeated for subsequent births.

Discussion

Once we account for socioeconomic and demographic characteristics, we find that the intention status of first and second births is not related to the overall risk of a subsequent birth, but having an unintended birth at any parity is associated with a higher risk of a subsequent unintended birth relative to no births or an intended birth. These results suggest both causal relationships and unobserved heterogeneity at work. Having an unintended first birth is associated with unintended fertility for both second and third births, even net of mediating factors such as age, relationship status, and subsequent birth intendedness. This association is likely due to persistent unobserved factors. At the same time, intendedness of second birth is a stronger predictor of third birth intendedness than intendedness of first birth, suggesting a direct causal relationship between one birth and the next as well.

Possible persistent factors associated with unintended fertility over the life course might include psychological traits, such as self-efficacy and planfulness, and attitudes toward contraception and abortion. While these factors may change over time as individuals age and mature, there is likely some stability in these factors as these often are innate personality characteristics. Most of these factors are not easily measurable in a survey setting; however, more reliable data on abortion would allow researchers to assess whether the association between early and subsequent unintended fertility is driven by pregnancies (suggesting contraceptive use as a pathway) or by pregnancies carried to term (suggesting abortion as a pathway).

The unconditional models showed that age and relationship status are important mechanisms for the relationship between early unintended fertility and later unintended fertility. In particular, being in a cohabiting or marital relationship strongly predicted women's risk of having a birth and their characterization of their births. Having a birth outside of a committed union is less than ideal, and our results showed that it was unlikely that women who had such

births intended to become pregnant at the time. Having a birth outside of marriage decreases the likelihood of marriage in the future (Upchurch, Lillard, and Panis 2001), and women who have one birth outside of marriage are increasingly likely to have any and all subsequent births outside of marriage (Hoffman and Foster 1997; Wu, Bumpass, and Musick 2001). As such, an early unintended birth, especially one that occurs outside of a coresidential relationship, can increase the risk of a subsequent unintended birth to the extent that it limits women's future prospects for more serious unions without necessarily impacting her exposure to subsequent fertility.

Another potential pathway for an effect of early unintended birth on later fertility may arise from how such births are received by the mother, family, friends, and the larger community. In a study of socially disadvantaged single mothers, Edin and Kefalas (2005) found that while many unintended births are not initially welcomed, mothers often find within themselves reserves of strength they did not know they had. Expectant mothers "rise to the occasion" and meet their responsibilities, and this brings them an enormous sense of empowerment. Moreover, even among families that may initially respond negatively, family and friends usually rally around an expectant mother to provide her (and her child) support. The outpouring of support may send a message that unintended childbearing is not a big deal and can be handled and perhaps may even be a source an unexpected source of joy. These potential positive outcomes, combined with ambivalence about contraceptive use from partners, concerns (or misconceptions) about side effects (Kendall et al. 2005), and widespread examples of individuals with unintended (usually nonmarital) childbearing both within the community and in society overall, may simply lessen the motivation low-income women have to avoid pregnancy. It is not clear whether this possible pathway is relevant across other socioeconomic strata as well as for disadvantaged women.

Socioeconomic status may contribute to both selective and causal mechanisms linking early and later unintended fertility. Family income during childhood and adolescence is related to later economic and educational attainment: women who face financial barriers to accessing reproductive health care in adolescence and early adulthood are disproportionately likely to face similar barriers later in life. At the same time, unintended fertility has negative effects on educational attainment and may also slow professional advancement. Thus, having an unintended birth may reduce women's access to economic resources that facilitate effective use of contraception in the future, by preventing consistent use of contraceptive use (for instance, if a woman cannot afford to fill contraceptive prescriptions every month and thus cycles on and off their contraception) or forcing women to choose less expensive and less efficacious methods (such as condoms) over methods with greater reliability and less potential user-error (such as IUDs). Due to data limitations we are unable to empirically examine these pathways. The cross-sectional nature of the NSFG makes it impossible to identify socioeconomic conditions prior to or at the time of births, and the lack of an employment or educational history precludes the inclusion of time-varying socioeconomic factors. In general, we are limited by the lack of socioeconomic control variables (including insurance and other potential access factors), as it has been well established that women at risk of an unintended birth are disproportionately low-income. Better measurement of socioeconomic status might have allowed us to more accurately identify selection mechanisms.

The cross-sectional design also means we do not know women's actual fertility intentions prior to having children, and as with any work on fertility intentions, there are always concerns about retrospective accuracy. As noted earlier, women often are reluctant to label births as unintended, and there is also some evidence that reports of unintendness may shift over time as

recall error, rationalization, and other factors change. As such, our measures may underestimate unintended fertility, especially early unintended fertility, and that may affect our estimation of fertility trajectories and our coefficients. It is also worth noting that our definition of unintended as including only those births identified as unwanted or seriously mistimed may make it difficult to compare our work with earlier studies that also include slightly mistimed births, though as more researchers adopt this convention, this may be less of a problem. Finally, we should reiterate that we are focusing on births rather than pregnancies due to the under-reporting of abortions and pregnancies not carried to term. Had we explored pregnancies instead of birth, we would generally expect to see the same pattern and perhaps even a stronger relationship, given the evidence on repeat abortions (Jones, Singh, Finer, and Frohwirth 2006). However, it is also possible that attitudes toward or access to abortion is an unobserved characteristic driving these results. If some women are consistently unable or unwilling to terminate unintended pregnancies, these women will be more likely to have unintended births than women who experience unintended pregnancies and end those pregnancies by abortion. Method choice may also impact the association between early and subsequent unintended fertility, particularly if a woman becomes motivated to change her contraceptive usage in response to an unintended pregnancy (either to prevent future births more efficiently or to adjust her desired fertility preferences regarding timing and family size). Unfortunately, the 2002 NSFG collects only detailed contraceptive use data from January 1999 to the time of survey, so we cannot include time-varying measures of method use as the births in our analytical sample extend back to 1969. Although there is some data on whether women were using contraception when they became pregnant, there is no information on efficacy and consistency of use. Moreover, many women reported they were not using contraception at all; for women who were trying to get pregnant,

the lack of contraceptive use is surely endogenous whereas the reasoning behind not using contraception among those who did not want to get pregnant is far from clear. Thus, we were unable to test an underlying hypothesis that an unintended birth may affect a women's usage of contraception.

Conclusion

These findings have implications for policy makers interested in preventing unintended births. While it would be preferable to prevent women from having an unintended fertility in the first place, the lack of large and sustainable decreases in unintended fertility in the past suggests that this a fairly formidable goal. Given relatively limited funds, it might be best to focus on a smaller and more readily identifiable group of women. As such, because having an unintended birth is a strong predictor of later unintended fertility, targeting resources towards women who report an earlier unintended pregnancy may be an effective prevention technique. Regardless of whether there are causal or selective (or both) mechanisms behind the association, our results suggest that interventions to prevent unintended pregnancies might be made more efficient by focusing on women who have already had one unintended birth. Our results are also useful in understanding the dynamics of fertility and family formation in the United States. Early research on unintended fertility focused on unwanted births late in the childbearing career. As delayed marriage and childbearing have become more common, an increasing proportion of unintended births occur at low parities. The need to reassess the measurement and definition of unintended fertility in light of this shift has long been recognized (see, e.g., Klerman 2000; Santelli et al. 2003). The strong correlation between the intention status of early and later births suggests that we may need to further reorient thinking toward a conceptualization of unintended births not

simply as events that occur at the extreme ends of the childbearing career, or as isolated events,

but rather as markers that characterize the entirety of the childbearing career.

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Table 1. Weighted Descriptive Statistics for Mothers Aged 15-44 in the National Survey of Family Growth, Cycle 6 (Sample Sizes are Unweighted)

Age at 1st birth		
Less than 18	16.0%	
18-19	16.8%	
20-24	34.0%	
25-29	22.7%	
30 or older	12.9%	
Race		
Non-Hispanic White	66.5%	
Foreign-born non-Hispanic Black	1.4%	
Native-born non-Hispanic Black	14.4%	
Foreign-born Hispanic	10.0%	
Native-born Hispanic	7.8%	
Mother's education		
Missing/Less than HS	30.7%	
HS/GED	39.0%	
Some college	18.6%	
College or more	11.8%	
Family structure at 14		
Both biological parents	70.8%	
Stepfamily	9.8%	
Other	19.4%	
Mother had a birth before 18	19.3%	
Had HS/GED degree at 1st birth	68.4%	
Relationship status at 1st birth		
Not in a coresidential relationship	35.6%	
Cohabiting	13.1%	
Married	51.3%	
Average number of births	2.19	
Percent with two or more births	60.1%	
Average number of unintended births	0.62	
Percent with an unintended first birth	27.5%	
Percent with any unintended births	41.7%	
Percent of births that were unintended	28.1%	
1st and 2nd birth intendedness (percent distribution)		
Both births intended	59.3%	
1st birth unintended, 2nd birth intended	19.4%	
1st birth intended, 2nd birth unintended	7.2%	
Both births unintended	14.1%	

Intendedness of 1st birth	*Intended*	*Unintended*	
Percent with any unintended births	14.3%	100%	
Average number of births	2.13	2.30	***
Average number of unintended births	0.17	1.56	***
Percent of all births that were unintended	5.5%	74.7%	***

Mothers	4067	

*p<.05 ** p<.01 *** p<0.001 Significant differences by intendedness. May not total 100% due to rounding.

Table 2. Relative Risk Ratios from Multinomial Logistic Regression Predicting Having a First Birth by Intendedness

	Intended v. no birth		Unintended v. no birth		Unintended v. intended birth	
Age (omitted=20-24 yrs old)						
Less than 18	0.289	***	0.763	**	2.636	***
18-19	0.915		2.229	***	2.438	***
25-29	0.996		0.277	***	0.278	***
30 or older	0.815	***	0.097	***	0.119	***
Race (omitted=non-Hispanic white)						
Foreign-born non-Hispanic Black	1.753	***	1.049		0.598	*
Native-born non-Hispanic Black	1.800	***	2.992	***	1.662	***
Foreign-born Hispanic	2.203	***	0.976		0.443	***
Native-born Hispanic	1.700	***	1.941	***	1.141	
Mother's education (omitted=HS/GED)						
Missing/Less than HS	1.143	*	1.219	**	1.066	
Some college	0.896		0.854	*	0.953	
College or more	0.847	**	0.717	***	0.847	
Family structure at 14 (omitted=intact)						
Stepfamily	1.097		1.319	***	1.202	
Other	1.167	**	1.289	***	1.096	
Mother had a birth before 18	1.114	*	1.362	***	1.223	**
Had HS/GED degree	0.862	**	0.820	**	0.952	
Cohabiting during the month	6.578	***	5.698	***	0.866	
Married during the month	20.969	***	6.202	***	0.296	***
Women			7134			
Person-months			1042051			
-2 log likelihood			50722.656			

*p>.05 ** p>.01 *** p>0.001

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Table 3. Relative Risk Ratios from Multinomial Logistic Regression Predicting Second Birth by Intendedness

	Model 1	Model 2	Model 3			Model 4		
	Any birth v. no birth	Any birth v. no birth	Intended v. no birth	Unintended v. no birth	Unintended v. intended birth	Intended v. no birth	Unintended v. no birth	Unintended v. intended birth
1st birth unintended	0.871***	0.940	0.543***	2.772***	5.111***	0.671 ***	2.048 ***	3.051 ***
Age at last birth (omitted=20-24 yrs old)								
Less than 18		1.314 ***				1.267 **	1.362 **	1.075
18-19		1.130 *				1.123	1.215	1.082
25-29		0.987				1.039	0.665 *	0.640 **
30 or older		0.781 ***				0.743 ***	0.473 **	0.637
Race (omitted=non-Hispanic white)								
Foreign-born non-Hispanic Black		0.970				0.805	1.883 *	2.340 **
Native-born non-Hispanic Black		1.141 *				0.918	1.880 ***	2.049 ***
Foreign-born Hispanic		1.683 *				1.045	1.903 ***	1.821 ***
Native-born Hispanic		1.106				1.033	1.463 **	1.417 *
Mother's education (omitted=HS/GED)								
Missing/Less than HS		1.024				1.019	1.088	1.067
Some college		1.116				1.132	1.137	1.004
College or more		1.142				1.097	1.232	1.123
Family structure at 14 (omitted=intact)								
Stepfamily		1.036				1.038	1.004	0.967
Other		1.036				1.004	1.096	1.092
Mom had a birth before 18		1.073				1.108	0.984	0.888
Had HS/GED degree		0.800 ***				0.909	0.620 ***	0.682 ***
Union status during the month (omitted=not in a coresidential union)								
Cohabiting		2.033 ***				2.509 ***	1.676 ***	0.668 **
Married		2.827 ***				4.258 ***	1.283 ***	0.301 ***
Months since last birth (omitted=24-48 months)								
0-23 months		0.384 ***				0.302 ***	0.660 ***	2.186 ***
More than 48 months		0.487 ***				0.521 ***	0.425 ***	0.814
Women	4067	4067	4067			4067		
Person-months	232957	232957	232957			232957		
-2 log likelihood	28919.814	28002.378	31169.554			29902.582		

*p>.05 ** p>.01 *** p>0.001

Table 4. Relative Risk Ratios from Multinomial Logistic Regression Predicting Third Birth, by Intendedness

	Model 1	Model 2	Model 3			Model 4		
	Any birth v. no birth	Any birth v. no birth	Intended v. no birth	Unintended v. no birth	Unintended v. intended birth	Intended v. no birth	Unintended v. no birth	Unintended v. intended birth
Prior birth intendedness (omitted=1st & 2nd birth intended)								
1st & 2nd birth unintended	1.420 ***	0.995	0.689***	4.462***	6.471***	0.524 ***	2.687 ***	5.125 ***
1st birth unintended, 2nd birth intended	1.084	0.915	0.866	2.170***	2.507***	0.773 *	1.160 ***	2.147 ***
1st birth intended, 2nd birth unintended	1.118	0.934	0.715*	2.809***	3.926***	0.627 **	2.064 ***	3.291 ***
Age at last birth (omitted=20-24)								
Less than 18		1.696 ***				1.993 ***	1.366 *	0.685
18-19		1.551 ***				1.670 ***	1.308 *	0.783
25-29		0.727 ***				0.686 ***	0.725 **	1.057
30 or older		1.148 ***				0.553 ***	0.468 ***	0.847
Race (omitted=non-Hispanic white)								
Foreign-born non-Hispanic Black		1.148				1.136	1.402	1.235
Native-born non-Hispanic Black		1.246 **				1.069	1.594 ***	1.491 *
Foreign-born Hispanic		1.096				1.128	1.185	1.051
Native-born Hispanic		1.237 *				1.119	1.511 **	1.350
Mother's education (omitted=HS/GED)								
Missing/Less than HS		1.317 ***				1.429 ***	1.215	0.850
Some college		1.251 *				1.426 **	0.990	0.694
College or more		1.263 *				1.436 **	0.949	0.661
Family structure at 14 (omitted=intact)								
Stepfamily		1.056				0.978	1.198	1.224
Other		0.927				0.854	1.022	1.196
Mom had a birth before 18		0.933				0.793 *	1.080	1.362 *
Had HS/GED degree		0.895				1.003	0.775 *	0.773
Union status during the month (omitted=not in a coresidential relationship)								
Cohabiting		2.026 ***				2.567 ***	1.576 ***	0.614 **
Married		1.619 ***				2.011 ***	1.234	0.613 **
Months since last birth (omitted=24-48 mos)								
0-23 months		0.481 ***				0.349 ***	0.796 *	2.249 ***
More than 48 months		0.401 ***				0.417 ***	0.352 ***	0.845
Women	2667	2667	2667			2667		
Person-months	176904	176904	176904			176904		
-2 log likelihood	13744.698	13359.6108	14711.488			14246.4696		

*p>.05 ** p>.01 *** p>0.001