

Associations between Fathers' Prebirth Pregnancy Intentions and Involvement with Their Child 15 Months Later: A Propensity Score Analysis

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Abstract

Objective: This study examined whether fathers' prebirth pregnancy intentions were associated with fathers' involvement with his child 15 months later. **Method:** Propensity score matching was used to assess the effects of fathers' pregnancy intentions (self-reported before the birth of the child) on three measures of father involvement (residency with child, engagement in caregiving activities, and engagement in social cognitive play) in a large sample of young, diverse, and low-income fathers ($N = 2,008$). **Results:** In this sample matched on sociodemographic and interpersonal factors, fathers reporting an intended pregnancy had significantly higher levels of social and cognitive play with their child, compared to fathers reporting an unintended pregnancy. However, intentions were not significantly associated with fathers' residency with child or caregiving activities. **Conclusion:** Results suggest that fathers' pregnancy intentions are predictive of certain types of

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father involvement and emphasize the importance of controlling for factors associated with both fathers' intentions and involvement.

Keywords

childcare, father–child relationship, gender and family, parent/child relations, research methods

Almost half of pregnancies every year in the US (2.8 million) are unintended (Finer & Zolna, 2016). Unintended pregnancy is commonly defined as a pregnancy that was either unwanted or mistimed (Santelli et al., 2003). Over two-thirds of these births are covered by public insurance, usually Medicaid, costing over \$20 billion annually to federal and state systems (Sonfield & Kost, 2015). Likely due to inequitable access to reproductive health care and social circumstances, unintended pregnancies are concentrated among individuals who are poor, young, racial minorities, and unwed (Finer & Zolna, 2016; Santelli et al., 2003). Furthermore, although research is limited by a number of methodological limitations and studies find mixed results with varying strengths of associations, unintended pregnancy has been associated with a wide range of negative outcomes for the child and family including maternal and infant health, socioeconomic status, education, and relationship factors (Gipson et al., 2008; Hummer et al., 2004; Li et al., 2019).

Women who have an unintended pregnancy are more likely to receive inadequate prenatal care and to smoke and drink during pregnancy, factors that contribute to greater risk of delivering a premature or low-birth-weight infant (Cheng et al., 2009; Shah et al., 2011). Postbirth, women who had unintended pregnancies are less likely to breastfeed their infant and are at greater risk of postpartum depression (Gauthreaux et al., 2017; Taylor & Cabral, 2002) and psychological distress (Stykes, 2019). Among men, unintended pregnancy is associated with greater depressive symptoms (Santelli et al., 2009; Stykes, 2019), and less supportive behaviors to the mother during pregnancy (Shah et al., 2011). In the long-term, mothers' and fathers' pregnancy intentions are associated with child well-being too. Unwanted or mistimed pregnancies, as well as parental discordance in pregnancy intentions, are associated with kindergarten children's lower socioemotional development (Saleem & Surkan, 2014).

In the current study, we focus on fathers' prebirth pregnancy intentions as a predictor of father involvement with his child, specifically, fathers' residency with the child and fathers' participation in caregiving and play activities when the child was approximately 15 months of age. Our examination of fathers' pregnancy intentions and subsequent father involvement is embedded within Lamb and colleagues' (1985) theory of father involvement, which

conceptualized *accessibility*, *responsibility*, and *engagement* as distinct but related dimensions of father involvement (Lamb et al., 1985). Accessibility is defined as a father's availability to his child (e.g., living with the child). Responsibility is defined as a father's efforts to ensure that his child is well cared for, such as providing financial resources. Engagement involves direct interaction with the child, including caregiving and play activities.

Thus, in the current study, fathers' residency with the child is considered a measurement of *accessibility*, that is, whether the father has consistent access to the child as a basic precursor to father involvement. Fathers' caregiving and play activities with the child are a measure of his *engagement*. The distinction between accessibility and engagement is important. Father's residence is a basic precursor of his ability to engage in caregiving activities. On average, in comparison to residential fathers, nonresidential fathers have significantly lower levels of involvement in daily caregiving tasks such as feeding their child, putting their child to bed, and diapering their child (Jones & Mosher, 2013). Studies show the benefits to children of fathers' accessibility (Cabrera et al., 2008, 2011). While nonresidential fathers may lack the same level of accessibility to their child, engagement is considered an indication of the *quality* of involvement (Volling & Cabrera, 2019). Pleck's (2010) revised framework further highlighted the quality of father engagement, noting that while caregiving is an important domain, optimal engagement is interactive and promotes child development; in other words, goes beyond "basic childcare" such as feeding and diapering, to include "other child care" that includes play and reading, with the latter representative of high-quality father-child interactions (Lamb et al., 1985; Pleck, 2010). Nonresidential fathers who have high quality engagement with their child may still exert an important influence on their child's well-being, even as the quantity of the interactions may be lower.

In addition, although few studies have examined fathers' pregnancy intentions in relation to later father involvement, there are reasons to hypothesize such linkages. For example, rates of father involvement are lower among parents who are more likely to experience unintended pregnancy, such as parents who are unmarried at the time of their child's birth (Carlson & McLanahan, 2010). Having a child is a major life-changing event that brings a level of stress and additional responsibilities to any individual (Pearlin, 1989). When a pregnancy is unexpected and experienced in the context of financial or relationship instability, it is likely that engagement with one's child may be more strained or challenging. For example, in a qualitative study of 30 mothers and 30 fathers who experienced an unintended pregnancy, fathers in particular reported added stress and relationship struggles, which often led to feeling that they spent too little time with their children and that the other parent took on greater childcare responsibilities (Kavanaugh et al., 2017).

There are few studies examining prenatal precursors of father involvement, especially among disadvantaged fathers. Prior research using the Early Childhood Longitudinal Study, Birth Cohort (ECLS-B) found that whether or not fathers perceived a pregnancy as intended was not associated with fathers' participation in caregiving at 9 months (Bronte-Tinkew et al., 2007a), but fathers' perception that the pregnancy was unwanted or mistimed (i.e., unintended pregnancy) was negatively associated with fathers' engagement in stimulating activities when the child was 24 months old (Bronte-Tinkew et al., 2009a). Most fathers in this sample were residential (83.4% were married) and White (roughly 70%), and fathers' reports of pregnancy intentions were measured when the child was 9 months old. Consequently, the results may not generalize to less advantaged families, and there is risk of recall bias based on the timing of the pregnancy intention question. Another study utilizing the National Survey of Family Growth (NSFG) found that fathers reporting a mistimed pregnancy were less likely to live with their child than fathers reporting an intended pregnancy. Among nonresidential fathers, unintended pregnancy was associated with less contact and less involvement (Lindberg et al., 2017). Although this study was able to compare residential and non-residential fathers, fathers' pregnancy intentions were asked up to 5 years after the child's birth, again raising the issue of recall bias.

Methodological Limitations in Studies of Pregnancy Intentions

To date, many studies that examine fathers' pregnancy intentions utilize nationally representative samples (e.g., ECLS-B, NSFG) that suffer from methodological limitations. First, most studies use retrospective reports of pregnancy intentions, that is, they ask about pregnancy intentions after the child is born (Bronte-Tinkew et al., 2007a, 2009a; Lindberg et al., 2017; Stykes, 2019). Retrospective assessment of pregnancy intentions increases the risk of recall bias, as there may be a greater likelihood of the parent recalling that the pregnancy was intended *after* the birth of the child (Stykes, 2018). Retrospective measures of intentions are likely influenced by the presence of the infant and tend to be increasingly positive over time (Rocca et al., 2019; Santelli et al., 2003). A second limitation is that a number of studies rely on mothers' proxy reports of fathers' pregnancy intentions (Stykes, 2018; Williams, 1994), which may be problematic because mothers may not be aware of the fathers' pregnancy intentions (Stykes, 2018). Indeed, research from the ECLS-B suggests that using mothers' proxy reports of fathers' intentions may systematically underestimate parental disagreement in intentions (Stykes, 2018). Third, a number of prior studies of fathers' pregnancy intentions used data from the ECLS-B (Bronte-Tinkew et al., 2009a; Martin et al.,

2007). Although fathers in the ECLS-B were asked to self-report their pregnancy intentions, men who were Black, foreign-born, and less educated, as well as men who were not married to the child's mother, were undersampled (Stykes, 2018). This form of selection bias is particularly problematic in studies of pregnancy intentions (Stykes, 2018) because unintended pregnancy rates are higher for Black women and among unmarried parents (Finer & Zolna, 2016; Santelli et al., 2003). Thus, one concern is that research utilizing the ECLS-B may not present an accurate picture of fathers' pregnancy intentions among men who are most at-risk of unintended pregnancy (Stykes, 2018). Though the NSFG does not appear to have these sampling issues, it is still limited by retrospective reports of intentions.

The Current Study

This study uses fathers' prebirth reports of pregnancy intentions (i.e., asked when mother was pregnant) to examine the effects of fathers' intentions on involvement with the child 15 months later. Data are from fathers who participated in Building Strong Families (BSF), a large-scale randomized controlled trial of a healthy marriage and relationship intervention for low-income, unmarried couples (Woodet al., 2010). In so doing, this study overcomes several significant limitations of prior studies and offers a unique contribution to prior research that utilized nationally representative samples (i.e., ECLS-B, NSFG). These benefits include a large sample of unwed, low-income, and diverse young men, as well as their prebirth, self-reported pregnancy intentions. To assess both quantity and quality of father involvement we used multiple measures, including residency with the child and direct engagement with the child (participation in caregiving and play activities) at 15 months. Because father involvement and pregnancy intentions are correlated with sociodemographic, individual, and interpersonal factors (Bronte-Tinkew et al., 2007b; Pleck, 2007), we used propensity score matching (PSM) to construct groups of fathers matched on key baseline covariates that may predict both unintended pregnancy and father involvement in order to isolate the effects of pregnancy intention on subsequent father involvement.

Method

Study Design and Sample

The BSF project evaluated healthy marriage and relationship education programs designed to strengthen the relationships of low-income unmarried couples who were expecting a baby or had a baby within 3 months of

enrollment (Wood et al., 2010). Couples were recruited to participate in BSF if they were in a romantic relationship but not married when they *became* pregnant. A small proportion of couples married after learning they were pregnant and before the baseline interview. The BSF evaluation recruited 5,102 couples across eight sites in the United States, couples were randomly assigned into intervention ($n = 2,553$) and control ($n = 2,549$) groups. The BSF program showed no intervention effects on key outcomes, including couples' relationship quality, likelihood of marriage, and father involvement (Wood et al., 2014); thus, we used data from both control and intervention families in our analyses.

The current study uses data from the baseline enrollment questionnaire for covariates and the first follow-up survey (wave 2) for outcome variables, which occurred 15 months postbaseline. The BSF study had 27.8% attrition for fathers at wave 2, resulting in a sample of 3,685 fathers. Because we focused on prebirth reports of pregnancy intention, the analytic sample only included fathers who completed the baseline interview when the mother was still pregnant ($n = 2,171$). The sample was further reduced because (a) data on engagement (dependent variable) were not collected for fathers who had not seen their child in the past month ($n = 78$, 3.6%), (b) fathers had missing data on at least one of the 13 covariates ($n = 46$, 2.1%), (c) fathers had missing data on one or both of the questions determining pregnancy intention ($n = 43$, 2.0%). This resulted in a final analytical sample of 2,008 fathers who completed the baseline assessment before the mother gave birth, completed the wave 2 assessment, had seen their child in the last month, and were not missing covariates or the independent variable.

We utilized PSM to construct groups of fathers who were similar on key baseline covariates, which allowed us to better isolate the effect of pregnancy intentions on father involvement. PSM techniques are designed to improve estimates of a treatment effect (in this case, intending a pregnancy) by creating a comparison group (in this case, of fathers reporting an unintended pregnancy) matched on potentially confounding covariates (e.g., race, income, education, age) that are related to both the independent and dependent variables. In comparison to traditional regression models that control for covariates, PSM approaches that involve matching on covariates produce less-biased estimates of treatment effects and allow for more rigorous adjustment of baseline differences between groups (Guo & Fraser, 2010).

Measures

Outcome variables. Fathers' reports at 15 months (wave 2) were used to assess father involvement with the child using three variables: father accessibility

(i.e., residency with the child), and father engagement in caregiving activities, and cognitive and social play.

Father accessibility. Fathers were asked whether they lived with the child, 1 = *all of the time*, 2 = *most of the time*, 3 = *some of the time*, or 4 = *none of the time*. We created a dichotomous variable and coded responses of *all* or *most of the time* as residing with the child (1), and responses of *none* or *some of the time* as not residing with the child (0). Residence with child is a common measure of father accessibility throughout the father involvement literature (Cabrera et al., 2011; Edin et al., 2009).

Father engagement in caregiving, and cognitive and social play (hereafter referred to as “play”). Fathers reported the frequency of their engagement in three caregiving activities (“helped child to get dressed,” “changed child’s diapers or helped him or her use the toilet,” “gave child a bottle or something to eat”) ($\alpha = .87$) and five play activities (“played peek-a-boo,” “sang songs with child,” “read or looked at books with child,” “told stories to child,” “played with games or toys with child”) ($\alpha = .82$) in the past month using a 6-point scale (1 = more than once a day to 6 = not at all). Responses were reverse scored so that higher scores reflected more engagement. These items measuring fathers’ caregiving activities and play have been used in other large-scale studies (e.g., National Evaluation of Early Head Start; Fragile Families and Child Well-being Study; Wood et al., 2014).

Independent variable. To measure pregnancy intentions when the mother was pregnant, we used fathers’ responses to two questions at baseline: (a) Right before pregnancy, did you want to have a baby with [mother] (definitely yes, probably yes, probably no, definitely no), and (b) would you say the pregnancy came sooner, right time, or later than you wanted? (1 = sooner, 2 = right time, 3 = later, 4 = did not care). Fathers who responded *definitely no* to the first question were not asked the second question. We used a common definition for an intended pregnancy, that it is both *wanted* and *timed*. If a father answered *definitely* or *probably yes* to the first question and *right time*, *later*, or *didn’t care* to the second, the pregnancy was considered intended. If the father responded *probably no* to the first question, but *right time* or *later* to the second question, we also considered the pregnancy to be intended. Fathers who answered *definitely no* to the first question, or *sooner* to the second question were coded as unintended. Additionally, fathers who responded *probably no* to the first question and either skipped the second or responded *didn’t care* were also coded as unintended. This resulted in 48.3% ($n = 970$) of the analytical sample being coded as having an intended

pregnancy, and 51.7% ($n = 1,038$) being coded as having an unintended pregnancy.

Covariates. Though recommendations regarding matching covariates vary, Stuart (2010) generally recommends including variables known to be related to both the treatment assignment and the outcome. Thus, we utilized the majority of variables assessed in the BSF baseline interview. Fifteen baseline covariates, including father demographics and relationship with the mother, were used to match fathers who reported an intended pregnancy to fathers who reported an unintended pregnancy.

Race/ethnicity was dummy coded into four variables: African American, Latino, White, or another race. Year of birth was used to create a variable for father age. For analytical purposes, father age was transformed to age squared to improve matching across the age distribution. Father's primary language was assessed as English, Spanish and other language (coded as English = 1 and non-English = 0). Education level was assessed with the question, "Do you have a high school diploma, GED or equivalent?" and coded 0 = none, 1 = high school, 2 = GED, 3 = Other). Economic status was assessed with current employment status (1 = employed, 0 = unemployed) and past 12-month income (8-point scale from \$0 to above \$35,000). Depressive symptoms were a mean of six items experienced in the past 30 days ($\alpha = .70$). Covariates regarding relationship with child's mother included: being married (1 = married, 0 = not married; though eligibility for the study excluded couples who were married when they became or learned that they were pregnant, a small proportion of couples were married *after* learning they were pregnant and *before* the baseline interview; being in a romantic relationship (1 = in a romantic relationship, 2 = on again off again with mother of child); living with the mother (1 = all of the time, 2 = most of the time, 3 = some of the time, or 4 = none of the time); having additional children with the mother; and having children with another partner (i.e., multiple-partner fertility). Though the BSF intervention showed no significant effects, BSF program status (treatment or control) was also included as a covariate since the intervention sought to change outcomes like father involvement.

Analysis

Fathers with intended and unintended pregnancies were matched based on propensity scores to produce matched treatment and comparison groups. A propensity score is defined as the conditional probability of receiving a treatment given a vector of observed covariates (Rosenbaum & Rubin, 1983). The

estimation of average treatment effects on the treated (ATT) follows a counterfactual framework, and is the expected father involvement outcome if all fathers had an intended pregnancy minus the expected father involvement outcome if all fathers had an unintended pregnancy (i.e., the average difference in father involvement) (Guo & Fraser, 2010). Because it is not possible and is unethical to randomly assign individuals to experience an intended or unintended pregnancy, PSM provides the next-best method for the construction of a counterfactual that matches fathers who reported an intended pregnancy with fathers who reported an unintended pregnancy on a set of observable characteristics that may be confounded with the treatment (i.e., pregnancy intention) and outcome (i.e., father involvement), thus better isolating the effects of pregnancy intention on father involvement. While PSM is advantageous to multivariate regression adjustment, it is also important to note that it is not a complete solution to problems of heterogeneity of groups.

The propensity score approach relies first on estimating a logit equation that predicts whether the respondent reported an intended or unintended pregnancy. The independent variables of this equation are factors associated with intendedness. From the logit estimates, the predicted probabilities of an intended pregnancy are generated for all participants. These predicted probabilities (i.e., propensity scores) are how treatment respondents are matched to those in the comparison group.

This study utilized Stata's `teffects psmatch` command with two nearest neighbors to estimate propensity scores using a logit model fitted with 15 covariates associated with pregnancy intendedness. The `teffects psmatch` command relies on the work of Abadie and Imbens (2011), which established a method of calculating standard errors that take into account that propensity scores are estimated rather than known. We examined a range of matching methods including, nearest neighbor matching with one to four neighbors, radius matching, and caliper matching. Results across these methods were robust and demonstrated similar ATTs. Given the wide variety of matching options, and limited evidence for a "best" matching approach, we ultimately chose our final matching method (two nearest neighbors) based on improvements in standardized mean differences (SMD) and variance ratios across covariates (Stuart, 2010; Zhang et al., 2019). We also opted for a minimum of two nearest neighbors based on the work of Austin (2010), which suggests that one to two neighbors are preferable in most settings. Equivalence between the groups was assessed through Stata's `tebalance` command, which yields SMDs and variance ratios. For SMDs, the closer to 0 the better, though there is consensus that continuous variables should be less than .25, and that categorical covariates should be less than 0.10 (Stuart, 2010; Zhang et al., 2019). For variance ratios, approaching 1 is evidence of balance and indicates

that the variances of propensity scores between the two groups are roughly equal. Variance ratios less than 2 are generally considered acceptable (Zhang et al., 2019).

Results

Table 1 displays descriptive statistics of the sample ($n = 2,008$) used to estimate the propensity scores, as well as bivariate statistics of differences on each covariate between fathers reporting an intended or unintended pregnancy. Roughly half of this sample (48.3%) reported an unintended pregnancy at baseline, before the mother had given birth. Nearly two-thirds identified as African American, two-thirds had a high school diploma or equivalent, three-quarters were employed, and a large majority reported English as their primary language. Almost half of the sample made less than \$10,000 over the past 12 months and were 26 years old on average. The vast majority were unmarried, over three-quarters cohabitated with the mother of the child all or most of the time. Fewer than 15% had additional children with the mother, and nearly one-third had one or more children with other partners. Precisely half of fathers were in the BSF intervention, and half were in the control group.

Table 1 also shows bivariate associations between each of the covariates and pregnancy intentions. Statistically significant differences were found between groups on race, English as primary language, age, education level, having more than one child with the mother, being married to the mother at baseline, and cohabitating with the mother at baseline. Table 2 shows the SMDs in the raw (i.e., unmatched) sample and the matched sample. Similarly, the SMDs indicate that before matching was applied 8 of the 15 covariates were imbalanced between the groups of fathers who reported an intended and unintended pregnancy, as evidenced by SMDs that were near or above 0.10 for categorical variables and 0.25 for continuous variables (Zhang et al., 2019). Table 2 also shows that in the matched sample, all SMDs were at or below .06 and variance ratios were approaching 1, indicating roughly equal variances (Zhang et al., 2019). Successful matching between the two groups is also evidence by the matched sample yielding considerable improvements on SMDs and variance ratios for nearly all covariates. Though, past year income, education, and depression showed some exceptions to this, income and education had a minimal increase in SMD and variance ratio, while depression had an increase in variance ratio, although still well below the 2 threshold (Zhang et al., 2019), but strong improvement in SMD.

Table 3 displays results of the estimated ATT on the unmatched and matched samples including mean outcomes among fathers with intended and

Table 1. Baseline Bivariate Descriptive Statistics of Sample Before Matching (N = 2,008).

Covariate	Sample Before PSM	Intended (n = 970)	Unintended (n = 1,038)	χ^2/t -Test
	%/M(SD)	%/M(SD)	%/M(SD)	
Race				
African American	62.4%	61.5%	63.1%	61.7***
Latinx	19.5%	25.4%	14.0%	
White	15.6%	10.8%	20.0%	
Other	2.6%	2.3%	2.9%	
Father age	26.0 (6.4)	26.6 (6.9)	25.4 (5.8)	22.2***
Education				
Less than high school/GED	34.6%	38.7%	30.8%	25.3***
GED	12.6%	11.2%	13.9%	
High school diploma	47.8%	47.0%	48.6%	
Other degree	5.0%	3.1%	6.7%	
Employed	74.3%	73.6%	74.9%	1.5
Past year income				
Did not work–\$0	13.3%	14.4%	12.3%	3.4
\$1–4,999	16.9%	15.6%	18.1%	
\$ 5,000–9,999	14.6%	14.2%	14.9%	
\$10,000–14,999	18.4%	18.7%	18.1%	
\$15,000–\$19,999	12.7%	12.7%	12.8%	
\$20,000–\$24,999	10.5%	11.1%	9.9%	
\$25,000–\$34,999	8.0%	7.9%	8.0%	
\$35,000 or above	5.6%	5.4%	5.8%	
Father depression symptoms (range: 0–4)	0.94 (0.7)	.86 (.7)	1.0 (0.7)	–4.9
Married to mother of child (mom)	6.7%	8.8%	4.8%	12.5***
Relationship with mom				
In a romantic relationship	90.2%	91.0%	89.4%	1.5
On again off again	9.8%	9.0%	10.6%	
Cohabiting with mom				
None of the time	9.8%	7.3%	12.1%	38.3***
Some of the time	11.2%	8.0%	14.2%	
Most of the time	10.5%	10.2%	10.7%	
All of the time	68.5%	74.4%	63.0%	

(continued)

Table 1. (continued)

Covariate	Sample Before PSM	Intended (<i>n</i> = 970)	Unintended (<i>n</i> = 1,038)	χ^2/t -Test
	%/M(SD)	%/M(SD)	%/M(SD)	
> 1 child with mom	13.7%	24.2%	20.0%	5.1*
Multiple partner fertility	29.7%	31.4%	29.2%	1.2
English primary language	85.9%	79.4%	91.9%	64.8***
BSF program	50.7%	49.7%	50.3%	1.6

* $p < .05$, ** $p < .01$, *** $p < .001$.

Table 2. Standardized Mean Differences and Variance Ratios in Matched and Unmatched Samples.

	Standardized Mean Differences		Variance Ratios	
	Raw	Matched	Raw	Matched
Latinx	0.29	-0.02	1.58	0.97
White	-0.26	0.02	0.60	1.04
African American	-0.03	0.02	1.02	0.99
Education	-0.22	0.00	0.81	0.94
Employed	-0.03	-0.06	1.03	1.07
Past year income	0.00	-0.02	1.01	1.03
Father age (squared)	0.19	0.05	1.61	1.26
Father depression	0.22	0.04	1.02	1.18
Married to mom	0.16	0.00	1.74	1.00
Relationship with mom	-0.05	0.02	0.86	1.06
Cohabiting	-0.27	0.01	0.71	1.03
> 1 child with mom	0.10	0.05	1.15	1.06
Multipartner fertility	0.05	0.01	1.04	1.00
English primary language	-0.36	0.03	2.20	0.96
BSF program	0.06	0.00	1.00	1.00

unintended pregnancies and whether these means are statistically significantly different from one another. In the unmatched sample, fathers reporting an unintended pregnancy were less likely to live with their child all or most of the time compared to fathers reporting an intended pregnancy ($p < .001$). However, following PSM, the association of pregnancy intention to living with child was no longer significant ($p = .949$). No significant differences

Table 3. Matched and Unmatched Sample Mean Outcomes and Average Treatment on the Treated (ATT) Effect ($N = 2,008$).

Outcome	Sample	Intended (<i>m</i>) <i>n</i> = 970	Unintended (<i>m</i>) <i>n</i> = 1,038	Coefficient	S.E.	<i>p</i>
Residence	Unmatched	0.82	0.78	0.042	0.018	***
	Matched	0.82	0.82	-0.001	0.019	
Caregiving	Unmatched	4.24	4.19	0.052	0.046	
	Matched	4.24	4.17	0.074	0.057	
Play	Unmatched	3.71	3.54	0.166	0.046	***
	Matched	3.71	3.55	0.159	0.060	**

* $p < .05$, ** $p < .01$, *** $p < .001$.

were found in caregiving between fathers reporting an intended or unintended pregnancy in the unmatched ($p = .269$) or matched ($p = .194$) samples. Fathers reporting an unintended pregnancy had significantly lower average engagement in cognitive and social play with their children in both the unmatched ($p < .001$) and matched ($p = .008$) samples.

Discussion

This study applied PSM to a large dataset of young, diverse, and low-income fathers who were mostly unwed at the time of their child's birth, to examine whether their self-reported prebirth accounts of pregnancy intentions were associated with involvement after their child was born. Prior studies have examined fathers' pregnancy intentions, however, to our knowledge all do so using retrospective or postbirth measures. This study is unique in that it utilizes father-reported, prebirth intentions (i.e., when the mother was still pregnant), and his later self-reported parenting behaviors. Further, this study is unique in that it includes a highly disadvantaged and racially diverse sample, reflective of men who are at greatest risk of experiencing an unintended pregnancy, and employs PSM to adjust for baseline differences between fathers who reported intended and unintended pregnancies. The current study results provide rigorous evidence that fathers' pregnancy intentions are associated with some forms of fathers' parenting behaviors but not others and do so even among a particularly disadvantaged group of fathers.

Results showed that fathers who reported that their partners' pregnancy was unintended engaged in fewer cognitively stimulating and social play behaviors with their 1-year-old child, an indication of the *quality* of engagement, when compared to a rigorously matched sample of fathers who reported that the pregnancy was intended. Pregnancy intentions had no effect on

whether the father resided with his child, an indication of accessibility, or on father involvement in caregiving activities. This suggests that fathers' pregnancy intentions were not associated with activities that indicate basic involvement, such as caregiving for their children and residency, but intentions were associated with activities that indicate quality of engagement, or the extent to which fathers engaged in enriching parenting practices like play and reading to their child.

The results of the current study can be interpreted in light of theories of father involvement that highlight the importance of *quality* of father engagement, above and beyond involvement in routine caregiving activities, to support young children's development. Our study supports the notion that accessibility and engagement are unique dimensions of father involvement (Lamb et al., 1985; Volling & Cabrera, 2019) and that unintended pregnancy may be more closely associated with fathers' quality rather than quantity of involvement (e.g., presence in the home, routine caregiving activities). That is to say, regardless of whether the pregnancy was intended or not fathers are present and take care of their children similarly, but their pregnancy intentions may affect the amount of stimulating interaction fathers engage in with their children. Similar to prior studies conducted with mothers (Cheng et al., 2009; Claridge et al., 2017; Gauthreaux et al., 2017; Shah et al., 2011; Taylor & Cabral, 2002), it appears that fathers' pregnancy intentions are an important factor that can ultimately influence their children's well-being (Lamb & Tamis-LeMonda, 2004), as fathers' involvement in early childhood supports their children's language, cognitive, and socioemotional development (Cabrera et al., 2007).

Various studies document that unintended pregnancy can bring a range of positive to negative experiences (Aiken et al., 2015; Kavanaugh et al., 2017). In a qualitative study of 30 mothers and 30 fathers who experienced an unintended pregnancy, participants reported both positive and negative impacts from an unintended pregnancy (Kavanaugh, et al., 2017). However, authors concluded that various prebirth and postbirth factors contributed to the degree of negative experiences following an unintended pregnancy, such as financial stability and relationship quality with the other parent (Kavanaugh et al., 2017). As shown in the current study, when rigorously matching groups on prebirth characteristics like financial resources and relationship status, strength of negative associations between fathers' pregnancy intentions and involvement decreased; however, intentions still had a significant negative association on cognitive and social play. It is possible that the relationship between fathers' pregnancy intentions and the quality of engagement with his child is mitigated by several postbirth factors as well. For example, studies have documented that fathers who reported unintended pregnancies experienced more

depressive symptoms, as well as relationship and psychological distress (Bronte-Tinkew et al., 2009b; Santelli et al., 2009; Stykes, 2019). Also, Kavanaugh et al. (2017) found that lacking resources and structural factors, like workplace inflexibility and lack of childcare, exacerbated challenges experienced from an unintended pregnancy. It is likely that social and structural resources provided after the birth of the child that help parents navigate the challenges experienced in unexpected childbearing could buffer the negative relationship between fathers' unintended pregnancy and engagement in enriching parenting practices like cognitive and social play.

The current study results are largely consistent with the several existing studies showing that unintended pregnancy is related to less father engagement in stimulating parenting practices among a wide range of fathers. Similar to the current results, two studies have shown that unintended pregnancy was associated with fathers' lowered engagement in play activities (Bronte-Tinkew et al., 2009a; Lindberg et al., 2017). In regard to caregiving and residence with child, some differences in findings emerge. Bronte-Tinkew and colleagues (2009b) also found that unintended pregnancy had no association with caregiving (Bronte-Tinkew et al., 2009b). However, Lindberg et al. (2017) reported that mistimed pregnancies were associated with fewer caregiving activities and that unintended pregnancy was associated with fathers' residency status. It is important to note that Lindberg et al. (2017) used fathers' retrospective reports of pregnancy intendedness. It is possible that the current study findings differ from this earlier study because of recall bias; that is, fathers who are currently living with their child may be more likely to remember the pregnancy as intended. Additionally, differences in results on residence may be due to differences in how pregnancy intentions were operationalized between studies. Lindberg et al. (2017) created three groups of pregnancy intentions (i.e., intended, unwanted, and mistimed), whereas the current study collapsed mistimed and unwanted pregnancies into a single unintended group. Ultimately, this BSF sample, consisting of parents who were highly socioeconomically disadvantaged, offers a unique contribution to the prior work using the NSFG and the ECLS-B. Unintended pregnancies are not distributed equitably, and the characteristics of this BSF sample, as well as the associations found in this study between fathers' pregnancy intentions and involvement, may be most reflective of parents who are most at-risk for unintended pregnancies.

Limitations

As noted previously, the BSF sample offers a unique contribution to prior work, though this sample comes with several limitations. First, the BSF

sample consists of parents from specific geographic areas who were in a committed relationship and were willing to be a part of the BSF study and intervention. Thus, it is likely that this sample had greater interest in strengthening their parenting skills and their relationship than a broader population of disadvantaged parents. Additionally, those experiencing an unintended pregnancy may be underrepresented in the data to the extent that those couples that were not together and did not qualify to enroll in BSF may also reflect couples for whom mothers, fathers, or both parents were most ambivalent about the pregnancy in the first place.

An additional limitation is that there was attrition of fathers between baseline and the second wave of data collection at 15 months postpartum. PSM helps to address these selection bias issues, and the analyses reported herein revealed no statistically significant differences between reports of intended and unintended pregnancies between those who were lost at wave 2 and those who completed wave 2 interviews. As noted in the *Method* section, PSM is advantageous over multivariate regression adjustment; however, it does not resolve all problems of unobserved heterogeneity between groups. This is especially important to note when studying topics like pregnancy intentions, which are closely tied to a wide range of economic and social conditions.

This study is also limited by the use of certain measures. Namely, this study used a dichotomized variable for pregnancy intention that classified intentions as intended or unintended. Research in this area now recognizes that pregnancy intentions are more complex than simply intended or unintended. In response, studies often group pregnancy intention as intended, mistimed, or unwanted (Gipson et al., 2008; Lindberg et al., 2017). We opted for a dichotomous measure of intentions, which may conflate differences between mistimed and unwanted groups, because our sample size was limited by the choice to focus only on fathers whose intentions were observed prebirth. In addition, our sample consisted of only unmarried and young couples, who experienced a more similar context for their pregnancy than samples representative of the entire U.S. population. The dichotomous measure of education (i.e., high school vs no high school) may also conflate distinctions between family patterns and behaviors, though was reasonable given the uniqueness of this sample that was both young and representative of highly disadvantaged groups. Lastly, though residence with child has been used throughout the literature to assess father involvement and specifically fathers' accessibility (Cabrera et al., 2011; Edin et al., 2009), it is a crude measure of this more complex construct.

Despite the limitations, there are several key strengths to this study and its findings. First, fathers were asked directly about their pregnancy intentions

and their involvement with the child. Many studies use the mothers' proxy reports of fathers' pregnancy intentions and involvement. This can be biased by the mothers' perceptions, as well as relationship status and relationship quality (Charles et al., 2018; Mikelson, 2008). Such factors may be particularly salient among socioeconomically disadvantaged, young couples who were unwed. Second, fathers were asked about their pregnancy intentions while the mother was pregnant and before the birth. Other studies of fathers' pregnancy intentions among low-income families (e.g., Fragile Families and Child Well-being Study, NSFG) asked about pregnancy intentions after the child was born and much older (e.g., 9 months old to 5 years old), which can affect recall of intentions and is known to produce bias (Santelli et al., 2003).

Conclusion

This study found that father's pregnancy intentions predicted the quality of his engagement with his child (i.e., in social and cognitive play) but were not a significant predictor of his residency with the child or providing basic caregiving to the child at 15 months old. Future research is needed to examine mediators and moderators of fathers' intentions and subsequent engagement with their child; particularly essential to this is understanding resource and structural factors (e.g., childcare support, workplace flexibility) that support quality of engagement for fathers facing an unintended pregnancy in the context of numerous challenges. Additionally, more research is needed on how mothers' and fathers' prospective intentions and their discordance may predict other forms of father involvement, including long-term outcomes of involvement with their child at older ages and child-specific outcomes among disadvantaged populations. Further, pregnancy intentions are complex, and analyses by type of unintended pregnancy (i.e., unwanted, mistimed, ambivalent) may elucidate differences across outcomes and studies. Finally, in all future research, prospective reports of intentions, as well as strong methods for controlling for sociodemographic differences, such as PSM, are critical.

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