

Early Paternal Support Behaviors Moderate Consonant Smoking Among Unmarried Parents

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ABSTRACT. Objective: Unmarried mothers have high rates of smoking, including during late pregnancy and after pregnancy, thus increasing their children's risk for negative health outcomes associated with maternal tobacco use. Few studies have examined whether partners' smoking exacerbates or attenuates maternal smoking risk. The current study examines how fathers' behaviors during the third trimester of pregnancy and after pregnancy influence maternal smoking across the first 9 years of a child's life. **Method:** Unmarried parents ($N = 2,580$ pairs) from the Fragile Families and Child Wellbeing Study were measured four times. Paternal and maternal tobacco use during the third trimester was assessed via retrospective report at baseline (the time of the child's birth). Parents also reported tobacco use 1 year, 5 years, and 9 years later. Paternal supportive behaviors were self-reported at baseline. **Results:**

Paternal tobacco use predicted maternal tobacco use. This association was moderated by paternal supportive behaviors as reported by fathers ($b = 0.51$, 95% CI [0.22, 0.81], $p = .001$; adjusted odds ratio = 1.67, 95% CI [1.24, 2.25]). Paternal smoking predicted maternal smoking for fathers who reported both high and low levels of supportive behaviors, but this relationship was stronger for fathers who engaged in the highest levels of support. **Conclusions:** Unmarried fathers' smoking had a stronger relationship to maternal smoking during late pregnancy and postpartum when fathers engaged in more support behaviors. The results of this study suggest that targeting fathers' smoking cessation may help improve the effectiveness of tobacco cessation programs for at-risk unmarried mothers. (*J. Stud. Alcohol Drugs*, 80, 129–133, 2019)

APPROXIMATELY 17%–20% of men and 13%–17% of women in the United States smoke (Ng et al., 2014). In 2016, 7.2% of pregnant women used tobacco during pregnancy (Drake et al., 2018), in contradiction to recommendations from the American Academy of Pediatrics. Maternal smoking during pregnancy exposes the fetus to nicotine and is associated with significantly higher risk of such health problems as sudden infant death syndrome, low birth weight, and preterm birth (Castles et al., 1999). Although approximately 45% of women who smoke quit during pregnancy, up to 50% of these relapse after childbirth (Carmichael & Ahluwalia, 2000). Therefore, children often continue to be exposed to secondhand smoke, which is associated with cardiovascular and respiratory problems (Barnoya & Glantz, 2005; Treyster & Gitterman, 2011).

Numerous interventions support women's smoking cessation during pregnancy and help prevent postpartum relapse (Chamberlain et al., 2013). However, one understudied factor is the smoking behaviors of women's partners. Couples' smoking behaviors are highly concordant. Relationship partners influence the initiation, continuation, quitting, and relapse of smoking (Etcheverry & Agnew, 2008; Hemsing et al., 2012; McBride et al., 2004). Assortative mating theories suggest that this concordance may occur because people select partners who already share similar health behaviors (Etcheverry & Agnew, 2008) or share an environment that

promotes similar behaviors (Meyler et al., 2007). Similarly, theories of direct or indirect social control suggest that partners may set a norm of smoking that is shared by both (Umberson, 1987). Partners may be especially influential during and after pregnancy because this time is sensitive to decision-making and relapse. Women are more likely to relapse postpartum if their partner smokes (Fang et al., 2004). Thus, partners play an important role in determining the smoking status of women during and after pregnancy.

Most research on couples' smoking concordance has examined married couples, although unmarried women smoke more (Schneider & Schütz, 2008) and have a higher risk of relapsing postpartum (Polanska et al., 2011). Moreover, among unmarried parents, there is considerable variability in fathers' involvement (Isacco et al., 2010), and few studies have examined how paternal support among unmarried parents relates to maternal smoking behaviors. Supportive fathers (defined here as fathers who exhibited supportive behaviors before and immediately after pregnancy, such as providing financial support to the mother during pregnancy and being present at the birth) may have more opportunities to influence their partner's smoking compared with fathers who are less supportive (Teitler, 2001). Martin et al. (2007) measured paternal involvement similarly and found that among both married and unmarried couples, greater paternal involvement predicted a lower risk of maternal smoking during pregnancy.

However, the Martin et al. (2007) study was not longitudinal and did not account for fathers' smoking. Thus, it is unclear whether fathers' disengagement would still predict greater maternal smoking if fathers abstained from smoking. Moreover, it is unclear how disengagement predicts maternal smoking over time, as risk for maternal smoking

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may increase after pregnancy. It is possible that the association between paternal support and maternal smoking is more complex based on fathers' own behaviors, and that this relationship is dynamic over time. Fathers' early support predicts greater involvement later in the child's life, because support is associated with greater likelihood to gain employment and share a residency with the mother after the birth (Cabrera et al., 2008). Residential employed fathers are more stable and able to provide more for their children. Thus, early support may be associated with greater support across time.

To address the gaps in the literature, we used the Fragile Families and Child Wellbeing Study (FFCWS), which has a large sample of unmarried lower income couples, to examine the combined influence of fathers' early supportive behaviors and tobacco use on maternal smoking among unmarried couples. We hypothesized that paternal support would moderate the relationship between paternal and maternal smoking, such that paternal support would strengthen the association of paternal smoking to maternal smoking. The current study examined consonance, or the correspondence between fathers' and mothers' smoking behaviors, during the third trimester of pregnancy and up to 9 years postpartum. Given that many prior studies of partner concordant health behaviors are cross-sectional, the present study extends pioneering findings on the role of father support in maternal health (Martin et al., 2007; Teitler, 2001).

Method

Study sample

Data were from the FFCWS, a birth-cohort study that followed a large sample of couples in 20 U.S. cities following the birth of a new child (Reichman et al., 2001). Mothers and fathers were interviewed when the child was born (baseline interview; 1998–2000) and when the child was 1 year, 5 years, and 9 years old (2007–2010). This study was approved by the research team's university institutional review board, and parents consented to participate (for more information regarding the study procedure, see Reichman et al., 2001). The sample at baseline included 3,711 unmarried couples. Families were excluded from analysis if the father was not interviewed at baseline ($n = 932$, 25.1%), if he was incarcerated ($n = 133$, 4.8%), or if the mother did not respond or responded "No" to the question, "Do you want [BABY'S FATHER] involved in raising your child (children)?" ($n = 66$; 2.5%). The final analytic sample included 2,580 pairs of unmarried parents at baseline; 1,612 pairs at Year 1; 1,385 pairs at Year 5; and 1,115 pairs at Year 9.

Measures

Paternal support. Paternal support was measured at birth (baseline interview) via the sum score of answers to

four binary items. Fathers were asked if they were present at the child's birth, had held the baby, gave the mother money to buy supplies, or helped in other ways, (e.g., providing transportation to the prenatal clinic or helping with chores). This variable was derived in accord with prior research, which suggests that fathers can demonstrate their support through behaviors that increase the likelihood of positive pregnancy outcomes (Alio et al., 2010). According to fathers' reports, 66.2% engaged in all four behaviors, 23% engaged in three, 7.3% in two, 2.4% in one, and 1.1% in zero. Mothers also reported whether fathers engaged in these behaviors. Mothers' and fathers' reports of support were correlated, $r(2577) = .49$, $p < .001$, indicating some consensus on fathers' level of support. However, the results reported here only hold when paternal support is reported by the father.

Smoking. At each time point, mothers and fathers reported whether they smoked in the past 1–3 months. Therefore, the baseline measure represents an estimate of the prevalence of smoking in late (third trimester) pregnancy. A separate dichotomous variable was coded as 1 for smokers and 0 for nonsmokers at each time point.

Time-invariant baseline control variables

Relational variables. To control for characteristics of the parental relationship that may confound paternal support, the present analysis included mothers' reports of how long she knew the father before the pregnancy, and reports of relational engagement, relational agreement, and relational affection measured at baseline. For relational engagement, mothers reported whether they engaged in four activities (e.g., visited with friends, went to a movie) with the father during the last month ($\alpha = .64$). For relational agreement, mothers used a scale of 1 (*never*), 2 (*sometimes*), and 3 (*always*) to report how often they agreed with the father on six topics, including money and the pregnancy ($\alpha = .66$). For relational affection, mothers used the same scale to report how often the father was affectionate via five items ($\alpha = .61$) (e.g., "How often would you say that he expressed affection or love for you?").

Health and sociodemographic variables. At baseline, mothers rated their general health from 1 (*excellent*) to 5 (*poor*), recoded such that higher scores indicated greater health. Mothers also reported the month in which they first sought prenatal care. Higher scores represented a greater delay of prenatal care. Participants reported their age, education, number of previous children, household income, and race.

Statistical analysis

We tested the longitudinal effects of paternal supportive behaviors, paternal smoking status, and the interaction of

paternal supportive behaviors and paternal smoking status on maternal smoking across the first 9 years of the child's life using a generalized linear mixed model with logit link and binary distribution. The likelihood of maternal smoking across time was predicted based on paternal smoking across time and paternal support during pregnancy, while controlling for several relevant variables. Smoking was measured at four time points, whereas paternal support and the control variables were measured only at baseline. There were high attrition rates in FFCWS among unmarried fathers. Therefore, we estimated one model without missing values imputed, and one with missing values imputed using STATA (StataCorp LP, College Station, TX). Both models included fixed effects of time (entered into the model as three dummy variables with pregnancy as the referent; e.g., Year 1 was coded as pregnancy = missing, Year 1 = 1, Year 5 = 0, Year 9 = 0), paternal smoking, paternal supportive behaviors, their interaction, and the relational, health, and demographic control variables. The model tested was:

$$\text{logit}(\text{Pr}(Y_{it} = 1 | X)) = \beta_0 + \beta_1 * \text{paternal smoking}_{it} + \beta_2 * \text{paternal support}_i + \beta_3 * \text{paternal smoking}_{it} * \text{paternal support}_i + \beta_4 * \text{time}_t + \beta_5 * \text{years known father}_i + \beta_6 * \text{relational engagement}_i + \beta_7 * \text{relational agreement}_i + \beta_8 * \text{relational affection}_i + \beta_9 * \text{self-rated health}_i + \beta_{10} * \text{month prenatal care initiated}_i + \beta_{11} * \text{mother's age}_i + \beta_{12} * \text{father's age}_i + \beta_{13} * \text{mother's education}_i + \beta_{14} * \text{father's education}_i + \beta_{15} * \text{number of previous children}_i + \beta_{16} * \text{household income}_i + \beta_{17} * \text{mother's race}_i + \beta_{18} * \text{father's race}_i$$

where β_i represents the rate of change for an individual i and t represents each year.

Thus, the interdependence of each participant's multiple time points is accounted for through the random effect of participant. We did not conduct a dyadic analysis because the interdependence of mothers' and fathers' smoking is the outcome of interest. Because imputed and nonimputed results were consistent, the imputed results are reported below for parsimony (for nonimputed results, see the online-only supplemental materials that accompany this article on the journal's website).

Results

During the third trimester, 22.2% of women and 45.9% of men smoked. Among women, 30.8% at Year 1, 35.4% at Year 5, and 34.4% at Year 9 reported smoking. Among men, 47.2% at Year 1, 45% at Year 5, and 45.3% at Year 9 reported smoking. The majority of women who smoked after pregnancy also smoked during pregnancy, with 17.6% of women smoking for the first time after pregnancy. Demographic variables (e.g., race and self-rated health) varied by prenatal smoking status and were included in the model (see the supplemental materials).

TABLE 1. Results of multilevel model predicting maternal smoking from father-reported paternal support and paternal smoking with imputed values

Variable	AOR [95% CI]	<i>t</i>
Paternal smoking	2.92 [2.20, 3.89]	7.52***
Time		
Year 1	3.61 [2.88, 4.54]	11.05***
Year 5	6.08 [4.70, 7.85]	13.79***
Year 9	5.63 [4.31, 7.36]	12.70***
Paternal support	0.73 [0.55, 0.97]	-2.16*
Paternal Smoking × Paternal Support	1.67 [1.24, 2.25]	3.42**
Relational variables		
Years known father	0.99 [0.94, 1.04]	-0.46
Relational engagement	1.18 [1.00, 1.40]	1.91
Relational agreement	0.29 [0.17, 0.48]	-4.79***
Relational affection	0.64 [0.36, 1.15]	-1.49
Health variables		
Self-rated health	0.90 [0.73, 1.09]	-1.09
Month prenatal care initiated	1.13 [1.00, 1.28]	2.42
Sociodemographic variables		
Mother's age	0.96 [0.92, 1.01]	-1.44
Father's age	1.10 [1.06, 1.15]	5.12***
Mother's education	0.30 [0.18, 0.50]	-4.64***
Father's education	1.11 [0.67, 1.83]	0.40
No. of previous children	1.00 [0.86, 1.16]	0.01
Household income	1.00 [1.00, 1.00]	-3.34**
Mother's race	0.53 [0.28, 1.01]	-1.93
Father's race	1.43 [0.75, 2.74]	1.09

Notes: Odds ratios greater than one indicate higher likelihood of maternal smoking. AOR = adjusted odds ratio; CI = confidence interval; no. = number.

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

Paternal supportive behaviors

There were significant main effects of paternal smoking and paternal support. Mothers were less likely to smoke if the father did not smoke and if fathers engaged in more supportive behaviors (Table 1). Each time variable was significant, indicating that mothers' likelihood of smoking increased over time. Consistent with our hypothesis, fathers' engagement in supportive behaviors moderated the effect of fathers' smoking on the likelihood of mothers' smoking ($b = 0.51$, 95% CI [0.22, 0.81], $p = .001$; adjusted odds ratios [AOR] = 1.67, 95% CI [1.24, 2.25]).

We probed the interaction at one standard deviation above and below the mean of paternal support, which indicated that among fathers who were highly supportive, smoking yielded a change in log odds of maternal smoking of 1.51 (AOR = 4.51). Among fathers with lower support the pattern was similar, but the relationship between paternal and maternal smoking was weaker: Smoking yielded a change in log odds of maternal smoking of 0.67 (AOR = 1.95). Mothers were more likely to smoke when the father was highly supportive and a smoker, and less likely if he was less supportive and a smoker. The model without imputed values replicated these results (see the supplemental materials). Further, when allowing the effect to vary across time, we did not see a significant interaction ($ps > .316$; see the supplemental materials), suggesting that this association was consistent across time. Fathers' early supportive behaviors were associated

with greater consonant smoking behaviors among parents at each time point.

Discussion

This study examined the relationship between paternal smoking and support on maternal smoking beginning during late pregnancy up to 9 years postpartum. Paternal smoking predicted the likelihood of maternal smoking over time. However, consonant smoking was exacerbated by fathers' greater engagement in supportive behaviors during late pregnancy and after birth. Specifically, fathers' smoking predicted mothers' smoking for fathers at both high and low levels of support, but this relationship was stronger for fathers who reported the highest levels of supportive behaviors. This suggests, perhaps counterintuitively, that engaged fathers who have yet to reduce their smoking may pose a risk for maternal health behaviors and downstream child health. This relationship may be attributable to greater contact between parents if the father is supportive. Moreover, this association was consistent at each time point, up to 9 years after birth.

This study suggests that the interaction of unmarried fathers' support and smoking uniquely predicts maternal smoking risk, above and beyond key sociodemographic factors. Results highlight the importance of partners and co-parents in influencing tobacco use during and after late pregnancy. Currently, prenatal smoking cessation and postpartum relapse interventions among men are scarce. A recent meta-analysis of 87 psychosocial smoking interventions found only one study that used partner support as the main intervention strategy and three counseling interventions that included support for partners to quit smoking (Chamberlain et al., 2013). These interventions involving fathers demonstrated mixed or nonsignificant effects on women's abstinence in later pregnancy (Chamberlain et al., 2013). Similarly, a review of postpartum relapse prevention interventions only identified three studies that included partner support as an intervention strategy, with nonsignificant effects on women's postpartum abstinence (Su & Buttenheim, 2014). Although partners may influence women's smoking behaviors, current prenatal and postpartum interventions are unable to consistently leverage partner support to tangibly promote unmarried women's abstinence. Future interventions may incorporate the present results by tailoring smoking interventions to include unmarried fathers.

The results are also relevant to extant behavioral genetics work on the role of environmental and genetic factors underlying associations between maternal smoking during pregnancy and child outcomes (D'Onofrio et al., 2008). This work suggests that familial or social environmental factors may be associated with both maternal smoking risk and detrimental child outcomes, underscoring the importance of a child's familial environment because of high concordance

between parents' smoking. The detrimental outcomes associated with exposure to nicotine and toxins in utero may also be influenced by the familial smoking environment that persists postpartum (Knopik, 2009). Future behavioral genetics research may explore the ability of parental consonant smoking to index an assortative mating phenotype that could underlie the associations between maternal prenatal smoking and poor child health outcomes.

The present longitudinal study draws from a large sample of lower income, unmarried couples. However, there are important limitations to consider. The generalizability of the results is limited to unmarried, lower income parents. Furthermore, social desirability concerns may contribute to retrospective underreporting of behaviors such as smoking frequency. Although many control variables were included, it is possible that other variables (e.g., the amount of time couples spend together) account for the observed associations. Future research should investigate the process through which fathers' support and smoking influence mothers' smoking. For example, early paternal engagement in supportive behaviors implies greater contact, which may increase exposure to parents' smoking. Another factor to consider is the health behaviors in support networks that include other family members and close friends.

Early father support in unmarried couples is associated with many beneficial health outcomes (Martin et al., 2007). This study extends past work by demonstrating that the influence of fathers' support on mothers' smoking depends on fathers' own behaviors. Specifically, unmarried fathers' early support behaviors exacerbated the influence of their smoking. Thus, fathers' early supportive behaviors were a protective factor if they abstained from smoking, and their early supportive behaviors emerged as a risk factor if fathers smoked, an effect that held for the 9 years of this study.

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