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Article

The best of intentions: Prenatal breastfeeding intentions and infant health

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ABSTRACT

Health organizations recommend that mothers exclusively breastfeed infants for the first six months of life. The current study contributes to a growing body of research that examines whether the purported benefits of breastfeeding are causal. We systematically evaluated the role of an expectant mother's prenatal breastfeeding intentions, which reflect not only demographic characteristics, but also knowledge, attitudes, and social norms about infant feeding, and therefore serve as a proxy for positive maternal selection into breastfeeding. We used the Infant Feeding Practices Study (IFPS) II ($n = 1008$) to examine a heretofore overlooked group of mothers—those who intended to breastfeed but did not actually breastfeed. Results suggest that mothers who intended to breastfeed had infants with fewer ear infections and respiratory syncytial viruses, and used fewer antibiotics in the first year of life compared to infants whose mothers did not intend to breastfeed, irrespective of whether they actually breastfed. Because breastfeeding intention is a confounding characteristic that proxies for positive maternal selection and does not represent a causal mechanism for infant health, we further examined how mothers who intended to breastfeed differed from mothers who did not intend to breastfeed. Results suggest that mothers who intended to breastfeed had more knowledge about potential food contaminants and consulted more sources of information about nutrition and diet than mothers who did not intend to breastfeed. Taken together, our results underscore the need for new policy interventions aimed at improving infant health.

1. Introduction

One of the very first decisions a new mother will make is how to feed her newborn infant. This is an important decision, as early nutrition is related to health in infancy and later in life (Almond, Currie, & Duque, *in press*). Given evidence that breastfeeding is associated with positive infant health outcomes, the World Health Organization (WHO) and the American Academy of Pediatrics (AAP) recommend that mothers exclusively breastfeed for six months, and then continue for one year or longer according to the preferences of the mother and infant (American Academy of Pediatrics, 2012; World Health Organization, 2003). The AAP further asserts that breastfeeding “should be considered a public health issue and not only a lifestyle choice” (American Academy of Pediatrics, 2012). This message has been internalized by the medical community and the general public, as evidenced by national, state, and local policies that promote breastfeeding (Naylor, 2001; U.S. Department of Health and Human Services, 2010).

Despite being endorsed as an important factor for infant health, the evidence on the causal effect of breastfeeding is mixed. Although some research suggests that breastfeeding is linked with infant health benefits (Ip et al., 2007; Kramer, 2010), there is also evidence that the benefits

are overstated due to selection bias, a specific type of confounding that can bias statistical estimates if unaddressed (Colen and Ramey, 2014; Der, Batty, & Deary, 2006; Evenhouse & Reilly, 2005). Most studies draw on observational data, and must therefore carefully account for the fact that mothers who breastfeed tend to be more advantaged compared to mothers who formula feed. Without accounting for baseline maternal differences through research design or fully including all confounding variables, statistical models may overstate the positive relationship between breastfeeding and infant health.

The novelty of our study is to critically re-evaluate the relationship between breastfeeding and infant health outcomes by examining a proxy for maternal characteristics and advantage—the mother's prenatal intention to breastfeed. This also allows us to evaluate a heretofore overlooked group: mothers who intended to breastfeed but did not actually breastfeed. Prenatal breastfeeding intentions may capture maternal characteristics that are largely overlooked in existing studies. There is evidence that maternal breastfeeding intentions are a stronger factor in predicting breastfeeding behavior than demographic characteristics alone (Donath & Amir, 2003). Prenatal breastfeeding intentions reflect sociodemographic characteristics and maternal knowledge, attitudes, and social norms about infant feeding methods (Barnes, Stein,

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Smith & Pollock, 1997; Humphreys, Thompson, & Miner, 1998; Mitra, Khoury, Hinton & Carothers, 2004; Persad & Mensinger, 2007), all of which may play a critical role in infant health.

In this study, we draw on longitudinal data from the Infant Feeding Practices Study (IFPS) II, and address two specific research questions: (1) do prenatal breastfeeding intentions serve as a proxy for positive maternal selection into breastfeeding, a specific type of confounding characteristic that lessens or fully accounts for the association between breastfeeding behavior and three infant health outcomes in the first year of life?; (2) how do mothers who intend to breastfeed differ from mothers who do not intend to breastfeed, in terms of their knowledge of nutritional practices and access to information?

By probing these questions, our research makes two important contributions. First, ours is the first study to account for the mother's prenatal intention to breastfeed when estimating the relationship between breastfeeding and infant health. Second, we move beyond regression adjustment to understand how intending and non-intending mothers differ in their health knowledge. Prior research focuses on demographic characteristics as potential confounders and therefore identifies population groups that are less likely to breastfeed, but this strategy does not uncover the mechanisms that account for better health among breastfed babies compared to formula-fed babies. This prior research therefore does little to improve our understanding of how to enhance infant health via program or policy interventions, apart from encouraging breastfeeding among these groups. If intending and non-intending mothers differ in terms of access to information and health knowledge, this may suggest a different course of action than simply promoting breastfeeding in targeted populations to improve health in infancy and throughout the life course.

2. Background

2.1. Breastfeeding and infant health

There is mounting evidence to support a positive causal relationship between early nutrition and improved individual outcomes throughout the life course (Almond et al., forthcoming; Currie & Rossin-Slater, 2015). The most rapid period of physical growth and neural development is between birth and age 3, making early nutrition an especially important foundation for current and later health (Case & Paxson, 2010). Therefore, an important issue for mothers, doctors, and policymakers is to understand the nutritional value of breastmilk relative to the most likely alternative: infant formula.

Randomized controlled trials, the gold standard for establishing causal relationships, are difficult to implement in breastfeeding studies due to logistical and ethical concerns. Nevertheless, there is one oft-cited randomized controlled trial of a breastfeeding intervention in Belarus that provides some evidence of a causal link between exclusive and prolonged breastfeeding and children's health (Kramer, Chalmers, Hodnett, Sevkovskaya, Dzikovich & Shapiro, 2001). Using a sample of about 17,000 mothers in Belarus from 1996–1997, this study found that breastfeeding reduced the risk of gastrointestinal infections and eczema in the first year of life, but was unrelated to the risk of respiratory infections (Kramer, 2010; Kramer et al., 2001). This study implicitly accounted for prenatal breastfeeding intentions by limiting the sample to mothers who intended to breastfeed, but could not explicitly examine the confounding role of positive selection into breastfeeding. Furthermore, these findings may not be generalizable to an American context. For example, Belarus's drinking water, a crucial ingredient for infant formula, is historically of poor quality (The World Bank, 2013). These conditions may not be generalizable to the United States.

A comprehensive meta-analysis of observational studies in developed countries found evidence that breastfeeding is associated with several health benefits for infants and children, including reduced risk of ear infections (acute otitis media), eczema (atopic dermatitis), severe lower-respiratory tract diseases, diarrhea (non-specific gastroenteritis),

and Sudden Infant Death Syndrome (Ip et al., 2007). The meta-analysis found weak or inconclusive evidence on the link between breastfeeding and asthma, obesity, cardiovascular disease, diabetes, childhood leukemia, infant mortality, and cognitive development. The study also noted that existing research often yields mixed or inconclusive evidence, in part due to the inconsistent quality of the studies, sample selection criteria, and varying ability to adjust for potentially confounding factors (Ip et al., 2007).

A central challenge for observational studies of breastfeeding is addressing selection bias, which is the nonrandom sorting of women who breastfeed or formula feed. Breastfeeding mothers are more likely to be well-educated, white, married, and have higher income than non-breastfeeding mothers (Centers for Disease Control and Prevention, 2013; Forste and Hoffmann, 2008; Jones, Power, Queenan & Schulkin, 2015; Wen, Kong, Eiden, Sharma & Xie, 2014). It is possible that these sociodemographic advantages are related to both successful breastfeeding and better infant health outcomes. Indeed, several studies have found that when these demographic and socioeconomic characteristics are taken into account, the long-term benefits of breastfeeding are weak or insignificant (Cesur, Sabia, Kelly & Yang, 2017; Colen & Ramey, 2014; Der et al., 2006; Evenhouse & Reilly, 2005; Grube, Von Der Lippe, Schlaud & Brettschneider, 2015; Jenkins & Foster, 2013; Jiang, Foster, & Gibson-Davis, 2011; Kramer, 2010; for exceptions see Belfield & Kelly 2012; Rees and Sabia 2015; Wehby 2014). In other words, the nonrandom selection of mothers who successfully breastfeed confounds estimates of infant health outcomes.

Sibling fixed effects studies, which compare a breastfed sibling to a formula-fed sibling, may help to address some concerns about the confounding variables attributable to maternal selection bias. In this quasi-experimental design, the assumption is that many of the time-invariant characteristics of the family, such as genetic endowments or parental quality, are held constant while only the breastfeeding treatment varies. Several studies employing this strategy found that among breast and formula-feeding discordant sibling pairs, outcomes were similar for children regardless of whether they were breast or formula fed. This suggests that most physical health benefits associated with breastfeeding are likely attributable to demographic characteristics such as race and socioeconomic status, and other difficult to measure unobservable characteristics (Cesur et al., 2017; Colen & Ramey, 2014; Evenhouse & Reilly, 2005). While studies that employ sibling fixed-effects have several advantages, they are limited to families with siblings who were fed differently, and cannot evaluate families with only one child or siblings who were fed the same way. In addition to generalizability concerns, these models also assume that the feeding method is randomly assigned and not associated with other factors such as infant or maternal health, or some other omitted time-varying characteristics (Rees & Sabia, 2009), and this assumption may be difficult to justify.

While breastfeeding provides excellent nutrition for infants, mixed research evidence shows the tradeoffs between breastmilk and formula are not well understood. The “breast is best” message has been so deeply internalized that failure to meet breastfeeding recommendations makes many mothers feel inadequate (Shah, 2013), placing them at increased risk for maternal depression (Borra, Iacovou, & Sevilla, 2015). Exclusive breastfeeding for 6 months requires a significant investment from mothers and may be difficult to achieve, particularly for mothers who work outside the home, face physiological challenges, or have little social support. It is important to contextualize breastfeeding research in light of the realistic trade-offs that many mothers face (Colen & Ramey, 2014).

2.2. Breastfeeding intentions as a proxy for positive maternal selection

Many mothers make breastfeeding plans when they are pregnant (Lawson & Tulloch, 1995). Prenatal breastfeeding intentions (hereafter “intentions”) are an antecedent to breastfeeding behavior that may provide insight into relevant maternal characteristics. The theory of

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