Maternal Bed Rest and Infant Health

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Preliminary
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February 17, 2014

Extended Abstract[3]

Bed rest during pregnancy is frequently prescribed to reduce the likelihood of miscarriage and premature birth. Prior literature suggests that almost 20 percent of pregnant women receive physician recommendations for bed rest. Although more recent medical literature on the efficacy of bed rest is mixed, findings tilt toward a negative or zero relationship between bed rest and infant health. This is not surprising given the difficulty of navigating a crucial threat to identification: conditions leading to bed rest recommendations are correlated with infant health outcomes. In this paper, we take a new look at the relationship between bed rest and infant health using a large, population-based dataset with rich individual characteristics, the Pregnancy Risk Assessment Monitoring Survey (PRAMS) data. After limiting our sample to women who experience a medical issue during pregnancy, we compare outcomes of infants born to mothers who are observationally similar yet differ in whether or not they are recommended bed rest using OLS and matching methods. Like much of the medical literature, we find a positive relationship between bed rest and the likelihood of low birth weight (<2500g) or prematurity (<37 weeks). We, however, present evidence that bed rest decreases the incidence of very low birth weight (<1500g) or very premature (<33 weeks) outcomes, suggesting that the margin of infant health examined is important and that infants at risk of being born at worse margins are more likely to

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benefit from this treatment. This is a policy-relevant result since extremely premature or extremely low birth weight infants, on average, will be the most costly infants to treat.

In the U.S. in 2009, just over 12 percent of all babies were born prematurely (before 37 weeks). Of these, 70 percent were late preterm births (34-36 weeks) and about 16 percent were very preterm (before 32 weeks) (Martin et al, 2011). Infant mortality is highly related to prematurity. Thirty-six percent of the infant deaths in the U.S. in 2007 were "pre-term" related. (Matthews et al, 2011). The likelihood and degree of adverse health outcomes, including death, rises nonlinearly the earlier the infant is born. Although very preterm infants only account for approximately 2 percent of births, they comprise over 50 percent of infant deaths, suggesting this is a very important health margin to consider. When babies who are born prematurely survive, they are more likely than babies born full term to experience worse short and long run health outcomes including jaundice, respiratory distress syndrome and other breathing problems, bleeding in the brain, infection, problems controlling body temperature, trouble communicating and making sounds, vision and hearing problems, cerebral palsy and other neurological problems, intellectual disabilities, developmental delays, and feeding and digestive problems (ACOG, 2011; CDC, 2011). Due to these health issues, premature infants often have longer hospital stays in the Neonatal Intensive Care Unit (NICU) than full term infants.

There are a number of medical risk factors for premature birth including multiple gestation, having a previous preterm birth, problems with the uterus or cervix (such as premature rupture of membrane, or incompetent cervix), preeclampsia, certain infections during pregnancy, chronic health problems in the mother (such as high blood pressure, diabetes, or clotting disorders), and adverse health behaviors before or during pregnancy (such as cigarette smoking, alcohol use, or illicit drug use) (Bigelow and Stone, 2011; CDC, 2011). There is additional variation in prematurity by mothers' demographic factors including race. African American women have the highest risk of premature birth. Approximately 17.5 percent of their babies are born prematurely, compared with 10.9 percent of white women, and 12.0 percent of Hispanic women (Martin et al, 2011). Despite these known correlative factors, what causes preterm birth and who will be afflicted by it is not well understood (Maloni, 2010). Despite this, factors that are correlated with preterm birth are used to assign individuals to treatments thought to reduce the incidence of prematurity, like bed rest.

In addition to prematurity, low birth weight (weight less than 2500g or 5 lb, 8 oz.) is a factor in short and long run infant health and other outcomes such as mortality, diminished educational, and labor force outcomes (Behrman and Rosenzweig, 2004; Black, Devereux and Salvanes, 2007; Oreopoulos, Stabile, Walld, and Roos, 2008; and Royer, 2009). Furthermore, infants who are born preterm and are on the lower end of the observed birth weights for their gestational age experience higher infant mortality (Alexander et al, 2003).

Medical interventions that can be used to improve initial infant health are a key area of interest because improvements to early child health have been shown to be important for both short run and long run outcomes (Almond and Currie, 2010). Medically prescribed bed rest during pregnancy is often used as a treatment intended to reduce premature births, which is expected to improve infant health and reduce costly neonatal medical interventions. In this paper, we explore whether maternal bed rest during pregnancy (antenatal bed rest) improves infant outcomes at the usual margins (premature; low birth weight) and at more extreme margins (very premature; very low birth weight).

The biggest barrier to studying the relationship between bed rest and infant health is that the very characteristic(s) that would lead a doctor to recommend bed rest may also be correlated with an infant's health. In other words, a mother's diminished health status may lead to both poor infant health and adverse pregnancy conditions that would lead her doctor to recommend bed rest. It is misleading to examine the simple difference in average infant health between infants born to women recommended and not recommended bed rest. Results of such analyses could lead researchers to conclude that bed rest is harmful when in fact women who are recommended bed rest may have, on average, infants with worse outcomes regardless of treatment. We address this potential threat to identification in several ways. First, we utilize a large set of observable characteristics, many of which are not used in the medical literature. Second, we limit our sample to women who are at risk of a bed rest recommendation: specifically women who report at least one of a substantial number of medical problems experienced during pregnancy. Importantly, women who experience the same pregnancy problems and are otherwise similar vary in whether they are recommended bed rest. This variation in assignment is likely due to ambiguity in the medical literature regarding bed rest effectiveness, as we describe in our background section. Under the assumption that assignment to bed rest is random conditional on our observables, we use OLS and matching methods (propensity score matching and entropy balancing, a pre-

processing method) to compare infants born to observationally similar women who vary by whether or not they were recommended bed rest.

Results, regardless of method, suggest that the margin of infant health being examined is important. As with much of the medical literature, we find a positive relationship between bed rest and likelihood of low birth weight (<2500g) and prematurity (<37 weeks). We, however, also find that bed rest decreases the incidence of very low birth weight (<1500g) or very premature (<33 weeks) outcomes. These results are consistent with the idea of bed rest shifting outcomes from a more severe into a less severe state, and suggest that the response to bed rest varies across the potential birth weight distribution.