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Impact of hospital delivery on child mortality: An analysis of adolescent mothers in Bangladesh

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ABSTRACT

New medical inventions for saving young lives are not enough if these do not reach the children and the mother. The present paper provides new evidence that institutional delivery can significantly lower child mortality risks, because it ensures effective and timely access to modern diagnostics and medical treatments to save lives. We exploit the exogenous variation in community's access to local health facilities (both traditional and modern) before and after the completion of the 'Women's Health Project' in 2005 (that enhanced emergency obstetric care in women friendly environment) to identify the causal effect of hospital delivery on various mortality rates among children. Our best estimates come from the parents fixed effects models that help limiting any parents-level omitted variable estimation bias. Using 2007 Bangladesh Demographic Health Survey data from about 6000 children born during 2002–2007, we show that, ceteris paribus, access to family welfare clinic particularly boosted hospital delivery likelihood, which in turn lowered neo-natal, early and infant mortality rates. The beneficial effect was particularly pronouncedamong adolescent mothers after the completion of Women's Health Project in 2005; infant mortality for this cohort was more than halved when delivery took place in a health facility.

1. Introduction

With scientific and technological advancements such as vaccines and diagnostic methods, the potential to save children's lives continues to expand. Emergence of effective interventions is, however, not enough by itself unless they reach the children and mothers who need them most (Bryce et al., 2003). In this paper we assess the causal impact of a direct public health intervention, namely, institutional/hospital delivery (as opposed to home) on mortality risks among children aged five or below. Mortality risks are concentrated around the time of birth: a quarter of all neonatal births takes place within first twenty four hours of birth and three quarter within the first week (WHO, 2006). The underlying rationale for encouraging births in health facilities as opposed to home delivery is that it gives mothers access to trained health professionals, who are better able to recognize and manage delivery complications and perform essential and timely interventions using modern diagnostic tests, medicines as well as newborn resuscitation (Filippi et al., 2006). We are particularly interested to assess the effect on adolescent mothers, who bear additional risks: using demographic health survey data from fifteen developing countries Reynolds et al. (2006) found that compared to babies born to women aged 20–29 years, babies born to women younger than 20 have a 34 percent higher risk of death in the neonatal period, largely because of their increased risk of being low-birth-weight, and a 26 percent higher risk of death by age five.

Bangladesh is an important case in point. Despite its success in meeting the Millennium Development Goal (MDG) of reducing child mortality by 2015 primarily attributable to successful implementation of immunization, control of diarrheal diseases and Vitamin A supplementation, there remain important inequalities. Its 120,000 annual newborn deaths account for more than half (55 percent) of Bangladesh's under-5 child deaths in 2007 and impede the country's progress towards the MDG of reducing the infant mortality rate by 2015 (Planning Commission, 2013). Increasing child survival rates, especially in the neonatal period, is therefore an issue of significant concern for Bangladesh. To a large extent, this high incidence of infant mortality in the country is related to early marriage and early childbirth (Akter et al., 2007). In this context, our analysis considers the impact of hospital delivery, especially after the completion of the Women's Health Project in 2005 that

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strengthened the emergency obstetric care (EmOC) in a woman friendly environment (see Section 2).

A variety of policies have been adopted to protect the interests of young yet high risk mothers including girls' scholarship to ensure girls' school completion (which may in turn delay child birth), introduction of laws relating to the minimum age at marriage, incentives to increase contraceptive use (see Schuler et al., 1995) in Bangladesh. *Indirect* policies of this nature have had limited success for a number of reasons: (i) there are issues of sustaining the short run gains. (ii) There are social costs associated with some of these policies, which are not fully taken into account. For example, while it is true that each additional year of delayed marriage in Bangladesh is associated with 0.30 additional years of schooling and 6.5% increase in the probability of being literate, it also comes at the cost of substantial increase in dowry (see for example Field and Ambrus, 2008). Similarly, introduction of family planning is found to be associated with 80% rise in dowry in Bangladesh (Arunachalam and Naidu, 2008). The present paper therefore advocates for a more *direct* public health policy intervention, namely hospital/institutional (as opposed to home) delivery, which may yield immediate effect. The fact that most mothers (an overwhelming 85% in the 2007 demographic health survey; our calculation) deliver at home without a skilled attendant means that few resources are available for neonatal care in cases of complications. Often home deliveries take place in the presence of female family members (sometimes in the presence of traditional birth attendants (*dais*)), in unhygienic conditions, thus increasing the chance of infection in both the mother and the child. The situation is worse among young adolescent mothers: it is well documented (e.g., see Senderowitz and Paxman, 1985) that there are adverse physical/health consequence of early child bearing for both the mother (for example anaemia, haemorrhage, sepsis, preeclampsia, obstructed labour) and the baby (e.g., low birth-weight, malnutrition, early death). Young mothers are also less likely to be knowledgeable enough to adequately care for her child (Geronimus and Korenman, 1992).

Arguably, institutional delivery may help averting premature death of young children. There are however two important considerations here: (i) Supply: the market for health care in Bangladesh is characterised by coexistence of modern (provided in hospital and other health facilities, public or private) and traditional (faith-based or herbal based) health care (Haque et al., 2014). The likelihood of hospital delivery then depends not only on access to various modern health care facilities in the locality, but also access to traditional health care facilities which offers an additional health care choice to households. (ii) Demand: Choice of a specific type of health care depends on the demand forces, derived from household maximization of utility derived from consumption of health and other goods, subject to underlying costs and household budget constraints within a Beckerian framework. Although 'free', use of public health facilities may entail costs on various accounts: there are high out-of pocket expenses for modern health inputs (e.g., see Costello and Nahar, 1998) available in public health facilities (especially high and rising prices of modern medicine), poor access to quality public care (Chaudhary and Hammer, 2004), absence of women friendly environment in public facilities (http://www.unicef.org/bangladesh/health_nutrition_407.htm) even when it is available. In contrast, traditional health care, e.g., faith-based Unani facilities, is not only cheaper, but also is likely to be more appealing to households with traditional religious values, e.g., people with Islamic faith. In reality, we observe the realized health care choice as reflected in hospital or home delivery as well as child health outcomes (mortality or not) among other consumption goods, determined by both supply and demand considerations described above (see further discussion in Section 3). This structure helps explaining the coexistence of traditional and modern health care facilities in a country like Bangladesh.

Our final aim is to assess the impact of hospital delivery on child health measured by various mortality risks. Identification of the effect of hospital or more generally institutional delivery on child mortality is thus likely to be econometrically challenging because of the inherent simultaneity: just as choice of institutional/home delivery affects child mortality, likelihood of child mortality may also influence choice of institutional delivery. Many existing studies thus suffer from the underlying estimation bias while assessing the impact of institutional delivery (or related proxies) on health outcomes and find both positive and negative effects of choice of health inputs (see discussion below). We adopt a novel approach here and exploit the exogenous variation in access to local health facilities, both traditional and modern, to instrument hospital delivery. Our analysis is based on the 2007 Bangladesh Demographic Health Survey (BDHS), which was the first round that provided information on access to different types of modern (including hospitals, maternal and child welfare centres (mcwc), thana health centre (thc) and family welfare centre (fwc)) and traditional (unani and/or ayurvedic) health facilities. Since a woman's choice of institutional delivery is unlikely to be random in the determination of child mortality, we first determine hospital delivery in terms of the exogenous variation in the access to these traditional and modern health facilities available at the local level (defined by the primary sampling unit), which is beyond the control of the individual households; we then use the predicted value of the variable as a valid instrument to determine the causal effect of institutional delivery on early, neonatal, infant and child mortality indices among children born during 2002–07, paying specific attention to those born to young adolescent mothers. We also compare the effect of hospital delivery on child mortality before (2002–05) and after (2006–07) the completion of the Women's Health Project in 2005 (see further details in Sections 2–4).

Our analysis contributes to a limited but growing literature on the use of health inputs on child health outcomes in developing countries. The literature is somewhat diverse in the choice of specific health inputs (pre-natal medical care, hospital delivery or presence of skilled birth attendant) as well as index of child health outcome (mortality risks, birth weight etc.). Panis and Lillard (1994) and Maitra (2004) both identified that prenatal medical care and institutional delivery have strong beneficial effects on child survival in Malaysia and India respectively, while using a meta-analysis Darmstadt et al. (2009) find a negative effect of skilled birth attendant on child health outcome. None of these studies however redress the estimation bias arising from endogeneity of health input chosen by individuals/households. More recently, Randive et al. (2014) find that although inequality in access to institutional delivery care persists in India, its extent has been reduced since the introduction of Janani Swastha Yojana (JSY) in 2005 that promotes institutional delivery by offering a financial incentive of Rs. 500/- available uniformly throughout the country to poor pregnant women holding below poverty line (BPL) status. Mazumdar et al. (2011) exploit the spatial and temporal variation in introduction of the financial incentives for institutional delivery as part of the JSY program in India at the district level and find no effect of the program on either neonatal mortality (defined as deaths within 28 days), or early neonatal mortality (defined as deaths within the first 24 h), despite finding a statistically significant increase in the rate of institutional deliveries. We, in contrast, assess the impact of institutional delivery on child mortality which is our central aim, specifically focusing attention on the adolescent mothers. As such we also contribute to the literature on health and socio-economic consequences of teen pregnancy in developed countries (Senderowitz and Paxman, 1985; Geronimus and