Quantifying the Effect of Infant Mortality on Prenatal and Obstetric Care Use in Bangladesh

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Abstract:

Prenatal and obstetric care have been shown to dramatically reduce infant mortality. However, this paper explores the possibility that local mortality regimes may also affect a woman's propensity to use these services in developing countries. If a woman observes a high number of infant deaths, particularly during the period when prenatal and obstetric services become available, she may devalue and avoid these services. Using data from the Bangladesh Demographic Health Surveys and employing a multi-level model with instrumental variables, this paper explores the relationship between infant mortality and a woman's likelihood to use prenatal and obstetric care. Preliminary analysis suggests that high infant mortality may reduce an individual's likelihood of receiving prenatal or obstetric care and seasonality of birth may serve as an instrument which predicts the number of infant deaths a woman observes but not her propensity to use care.

Introduction:

While it is commonly accepted that appropriate prenatal and obstetric care use could dramatically reduce infant mortality worldwide, local infant mortality regimes may also affect a woman's propensity to use this care in developing countries (Montgomery, 2000). If a woman observes a high number of infant deaths, particularly during the period when prenatal and obstetric services become available, she may devalue and even avoid these services (Montgomery, 2000). At an aggregate level, negative attitudes about prenatal and obstetric care could lead to a vicious cycle in which women avoid seeking these services, causing mortality to remain high and reinforcing community beliefs that medical care is ineffectual (Montgomery, 2000). Few studies have tested whether past infant mortality conditions influence a woman's health care seeking behaviors although mortality has been shown to influence later fertility decisions (Sandberg, 2006; Preston, 1975).

Using data from the Bangladesh Demographic Health Surveys and employing a multi-level model with instrumental variables, this paper explores the relationship between infant mortality and a woman's likelihood to use prenatal and obstetric care. Specifically, this study seeks to answer three questions:

1. Is there any relation between an area's prior infant mortality regime and a woman's likelihood of receiving prenatal or obstetric care?

2. Over what geographic area do mortality conditions exert an effect on a woman's likelihood to use prenatal or obstetric care?

3. Over what time period do mortality conditions affect a woman's likelihood to use prenatal or obstetric care?

By examining these questions, we can shed light on how local mortality regimes could be contributing to persistently low rates of health service use and high rates of infant mortality in certain development contexts (Finlayson and Downe, 2013). Bangladesh serves as a useful case study for exploring these questions, as infant mortality remains high and service use remains relatively low.

Our preliminary analysis suggests that an increase in the number of deaths in a woman's district in the nine months prior to when she gives birth increases both her propensity to not use formal prenatal care and not give birth in a hospital. Early analysis also suggests that the month when a woman gives birth is a promising instrument which predicts the number of deaths that occur in an area but is independent of the likelihood that a woman will use prenatal or obstetric care.

Data:

To estimate the effect of past infant mortality on a woman's propensity to seek prenatal and obstetric care, we use data from the 1996-1997, 1999-2000, 2007, and 2011 Bangladesh Demographic Health Surveys (BDHS). The BDHS selects a nationally representative sample of women in their reproductive ages (15-49) within localized areas (referred to as clusters in the DHS) derived from Bangladesh Census data. Each round of BDHS data includes women's reproductive histories, health care usage, and economic well being. We analyze each round of BDHS data separately but compare findings across survey rounds to check the robustness of our conclusions over time.

Dependent Variables:

We model two key dependent variables as indicators of health service use: (1) whether a woman use no prenatal care during pregnancy, and (2) whether a woman gave birth in a hospital. This data is available for all women in the sample who have given birth within the past five years.

Independent Variables:

Our independent variable of interest is the number of deaths of children under the age of 1 reported by women in the BDHS in a given area and period prior to when women in the sample experienced their most recent birth. Specifically, we explore the effects of four measures of infant mortality on prenatal and obstetric care:

1. infant mortality that occurred in a woman's cluster in the nine months prior to when she gave birth.

2. infant mortality that occurred in a woman's district in the nine months prior to when she gave birth.

3. infant mortality that occurred in a woman's cluster in the 18 months prior to when she gave birth.

4. infant mortality that occurred in a woman's district in the 18 months prior to when she gave birth.

We focus on the number of infant deaths as opposed to the more conventional infant mortality rate because personal perceptions of local mortality regimes are more likely based on absolute numbers of deaths as opposed to proportions or rates(Montgomery, 2000).

Controls and Instrumental Variable Strategy:

To limit potential confounding factors, we control for a number of women-specific factors such as age, education, marital status and parity as well as the regions and clusters where women were interviewed. Additionally, as there are likely unobserved factors that influence both the number of deaths and the likelihood that a woman will use prenatal care, we use seasonality of birth as an instrumental variable to isolate the effect of mortality conditions on likelihood of receiving care. Our early analysis suggests that this is a very promising instrument. Women who give birth between February and May experience a greater number of infant deaths in their area but display no differential health care seeking behaviors. Mortality differs by birth seasonality but health care utilization does not (Table 1).

Variable in 2007 DHS	**February-May**	**Other Months**	**T Statistic**	**One Tailed P Value**
Mortality 9 Months Prior	9.73 Deaths	8.92 Deaths	-2.06	**0.02**
Mortality 18 Months Prior	19.8 Deaths	18.5 Deaths	-1.88	**0.03**
Hospital Birth	12.3%	15.6%	0.92	0.82
No Prenatal Care	37.7%	44.4%	-1.01	0.15

Table 1: Instrumental Variable

Methods:

For each outcome, prenatal and obstetric care, we employ a multi-level model with instrumental variables to simultaneously estimate the effects of a woman's local mortality regimes–cluster mortality and region mortality– on the likelihood that a woman will use prenatal or obstetric care. Specifically, we follow a strategy described in Gelman (2007) . We use a multi-level model with instrumental variables in order to simultaneously estimate the effect of mortality at different geographic areas while adjusting for problems of endogeneity that may bias our estimates of the effect of mortality on propensity to use prenatal or obstetric care. A multi-level approach allows us to identify any association between mortality and health service use (Aim 1) and determine the geographic span over which mortality matters (Aim 3). We will run and test separate models that include the number of deaths in the nine and 18 months prior to childbirth, separately, in order to determine the duration of time during which past infant mortality takes place that is most relevant to health care-seeking behavior (Aim 2).

Preliminary Results:

As part of our preliminary analysis we ran a series of logistic regressions using data from the 2007 BDHS in which we estimated the effect of cluster and district mortality in the nine months prior to when a woman gave birth on the likelihood that a woman will use no prenatal care or will give birth in a hospital, controlling for the woman's age, region, whether she lived in an urban/rural setting, and her total number of children. These results are shown in Table 2. Coefficients are reported as odds ratios and suggest, consistent with theoretical expectations, that an increase in the number of deaths within a woman's district increases the likelihood that a woman will use no prenatal care and decreases the likelihood that a woman will give birth in a hospital. There is no similar effect of cluster mortality on a woman's likelihood of receiving prenatal or obstetric care.

	(1) No Prenatal Care	(2) Hospital Birth	(3) No Prenatal Care	(4) Hospital Birth
Deaths in Region 9 Months Prior	1.018^{+}	0.955^{*}		
	(1.65)	(-3.44)		
Deaths in Cluster 9 Months Prior to Birth			1.165	1.338
			(0.65)	(0.87)
Observations	4890	6594	636	941

Exponentiated coefficients; t statistics in parentheses
$^{+}$ $p < 0.10$, * $p < 0.05$

Table 2: Preliminary Results From Logistic Regressions

Future Analyses:

Future work on this project will consist of three tasks. First, we will further ascertain that seasonality is a reliable instrument for estimating the effects of mortality on propensity to use health care services following criteria for instrument evaluation described by Angrist and Krueger (2001)). Second, we will estimate the multi-level model as described in **Methods**. Third and finally, we will run this model using multiple rounds of BDHS data in order to assess the robustness of our findings over time.

Limitations and Sensitivity Checks:

In conducting this work, there are a number of limitations that we acknowledge and plan to address in an intensive sensitivity analysis. First, as we are using mortality data from the Demographic Health Surveys, we do not have information on the exact number of deaths that occurred in a localized area (the DHS cluster) or in the district, rather we only have an estimate from a sample of women. While the DHS surveys are designed to be representative of district and national conditions, our mortality estimates could still be biased due to retrospective reporting–only women who survive can report on infant deaths and women may err when reporting the infant's age at the time of death. To check the robustness of the BDHS mortality data we are currently working to obtain mortality information collected and published by the Bangladesh Statistics and Informatics Division. Our study currently only looks at infant mortality and a woman's likelihood of receiving prenatal or obstetric care, but it is also possible that child and neonate specific mortality may affect a woman's behaviors. Thus in sensitivity analyses, we will also construct measures of the number of neonate deaths (deaths that occurred within the first 28 days of life) and deaths of children under 5 to check if these measures also affect a woman's use of prenatal and obstetric care. Additionally, while past literature suggests that women may base their behavior on the number of deaths as opposed to the mortality rate, we will also check to see if infant mortality rates do affect the likelihood of

a woman receiving prenatal or obstetric care. Our final sensitivity check will be to vary the measures of prenatal and obstetric care to check if conclusions are sensitive to the measure used.

Possible Findings and Their Implications:

Our preliminary findings suggest an association between mortality conditions and the likelihood that a woman will use prenatal or obstetric services. If mortality significantly predicts service use after employing the instrumental variable strategy, this suggests that, under our theoretical and analytical assumptions, the observed association between mortality and prenatal/obstetric care can be interpreted as a causal effect. We will determine the salience of mortality by geography and time by evaluating both the magnitude and statistical significance of coefficients included in our model. In studying these questions we will assess whether infant mortality regimes, a factor rarely considered, can affect a woman's use of prenatal and obstetric care.

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