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Health care at birth and infant mortality: Evidence from nighttime deliveries in Nigeria

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ABSTRACT

High rates of home births in developing countries are often linked to high rates of newborn deaths, but there is considerable debate about how much of this is causal. This paper weighs in on this question by analyzing data on the timing of birth, health care utilization, and mortality for a sample of births between 2009-2014 in 7021 rural Nigerian households. First, we show that timing of birth is strongly linked to use of institutional care: women with a nighttime birth are significantly less likely to use a health facility because of the difficulties associated with accessing care at night. In turn, this is associated with a sharp increase in the rate of newborn mortality at night. Leveraging variation in household proximity to a health care facility that offers 24-h coverage, we show that this increase in mortality is plausibly due to lack of formal health care at the time of birth: infants born at night to households without a nearby health care facility that offers 24-h coverage, experience an increase in mortality equivalent to about 10 additional newborn deaths per 1000 live births. In contrast, when households have a nearby health facility that provides care at night, there is no detectable increase in mortality. These results suggest that well-designed policies to increase access to (and quality of) formal care at birth may lead to significant reductions in newborn deaths.

1. Introduction

There is an ongoing debate about the relative effectiveness of supply- and demand-side interventions in terms of reducing rates of newborn and maternal mortality in developing countries. The returns to institutional delivery is an important point of contention that lies at the heart of this debate. Notwithstanding the recent emphasis on shifting deliveries to institutional settings, there is little robust empirical evidence showing that use of health facilities at birth leads to lower newborn mortality (Chinkhumba et al., 2014). On the one hand, a large number of observational studies in low-to-middle income country settings suggest that institutional delivery has a moderate-to-large impact on newborn mortality (Tura et al., 2013), but on the other hand, rigorous evaluations of recently implemented demand-side interventions such as the Janani Suraksha Yojana program in India have found mixed results (Lim et al., 2010; Powell-Jackson et al., 2015).

We contribute to this debate by utilizing rich data that we collected on the timing of birth, use of institutional delivery, and newborn mortality in Nigeria. We use these data to quantifiably assess the importance of institutional care at birth, by asking what happens to the outcomes of newborn infants when events outside a mother's control 'force' her to give birth at home. Our empirical strategy relies on plausibly exogenous variation in the timing of birth for spontaneous deliveries. The importance of the timing of birth in this context is due to the fact that access to institutional health care varies systematically by time of day. Importantly it worsens at night: Not only is it harder for women to find safe transportation at night, but health facilities are more likely to be closed, and health providers less likely to be present. Because the timing of birth is a variable that is largely outside the control of women, it provides a natural experiment that allows us to assess the effect of institutional delivery on birth outcomes. In developing country settings, caesarean rates are very low (Betrán et al., 2016); as a result, most women do not know exactly when labor will start – it often comes as a surprise – and once it starts, it cannot be delayed until a more opportune time.

We find that women who give birth at night (between the hours of 8pm and 8am) are indeed significantly less likely to give birth in a health facility (there does not however appear to be any change in the rate of home deliveries attended by skilled providers). At the same time, we find a marked increase in the rate of newborn mortality for night births. Leveraging variation in household proximity to a health care facility that offers 24-h coverage, we show that this increase in

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mortality is plausibly due to lack of formal health care at the time of birth. We find that infants born at night to households without a nearby health care facility that offers 24-h coverage experience an increase in mortality equivalent to about 10 additional newborn deaths per 1000 live births. In contrast, when households have a nearby health facility that provides care at night, there is no detectable increase in mortality. The results are robust to changes in sample restriction and model specification, and to the inclusion of an extensive set of controls. We discuss, and attempt to rule out, alternative explanations, including selection, and lower quality of care at night.

Our findings suggest that the returns to institutional delivery (at least in terms of newborn health) may be substantial, but given data limitations we are cautious about placing a causal interpretation on these findings. This paper should therefore be seen as a complement to the existing literature (for two recent contributions see Godlonton and Okeke, 2016; Daysal et al., 2015). Our results have clear policy implications: they indicate that while policies promoting institutional deliveries have the potential to improve newborn outcomes (see for example Feng et al., 2011), additional investments in improving health care availability and quality will likely prove necessary to unlock these benefits.

The rest of the paper is organized as follows: in Section 2 we provide some additional details about the study context and the data; in Section 3 we discuss our empirical strategy and present the results; in Section 4 we discuss the policy implications of these results, and in Section 5 we conclude.

2. Study setting and data

2.1. Study setting

This study was carried out in Nigeria. Nigeria is of significant global health interest because it is one of five countries that together account for more than half of all newborn deaths worldwide (Lawn et al., 2014). Nationally, only about 36% of births take place in a health care institution (National Population Commission and ICF International, 2014). Primary health care facilities providing basic preventive and curative care (including maternal and child health services) serve as the point of entry for most individuals into the Nigerian health care system. In 2012, there were 30,098 primary health care facilities in Nigeria (90% of all health care facilities), 72.5% of which were public facilities.

2.2. Data

The data used in this paper come from a set of surveys that we conducted in 2014. Ethical approval for the study was granted by Institutional review boards at RAND, Aminu Kano Teaching Hospital, Nigeria, and the University of Nigeria Teaching Hospital, Nigeria. The study sample consists of 386 public sector primary health care facilities located in predominantly rural areas across 12 states, and 7021 households with a birth within the preceding five years resident in the catchment or service areas of these health facilities. Two states each were randomly selected from each of the six geopolitical zones in Nigeria. Trained data collectors visited the health facilities to collect data on facility characteristics, and also visited approximately 20 randomly sampled eligible households in each catchment area to interview all female household members who reported giving birth within the last five years. They collected information about household and individual characteristics along with detailed information about each birth in the preceding five years, including use of antenatal care, place of birth, time of birth, whether the birth was normal or assisted, and the survival status of the infant.

Measurement error due to recall bias is an important consideration in this context given the self-reported nature of the data. This is less of a concern for mortality where we have good evidence that women are able to accurately recall newborn deaths, though with some tendency towards rounding (Beckett et al., 2001). To account for this we have extended the definition of newborn mortality out to 30 days, even though the strict clinical definition is a death within the first 28 days. Potential inaccurate reporting of time of birth is a concern and merits consideration. In countries like Nigeria, where only a small fraction of births is registered with civil authorities (skewed naturally towards mothers who gave birth in a health institution), the only way to therefore get broadly representative information about timing of birth is by asking mothers. Based on our pilot findings we asked women to choose from several broad time intervals: 8am-12pm, 12-4pm, 4–8pm, 8–11pm, 11pm-1am, 1–3am, 3–5am, and 5–8am (see Fig. 1). To the extent that any measurement error is classical in nature, it will tend to attenuate the estimated effect of a nighttime birth (i.e., our estimate will be a lower bound). To address this potential issue, we have restricted the sample for the main analysis to include only the most recent birth for each woman (although we also show that our results do not hinge on this restriction) and as a further sensitivity check we show that the results hold when we further restrict the sample to focus on only

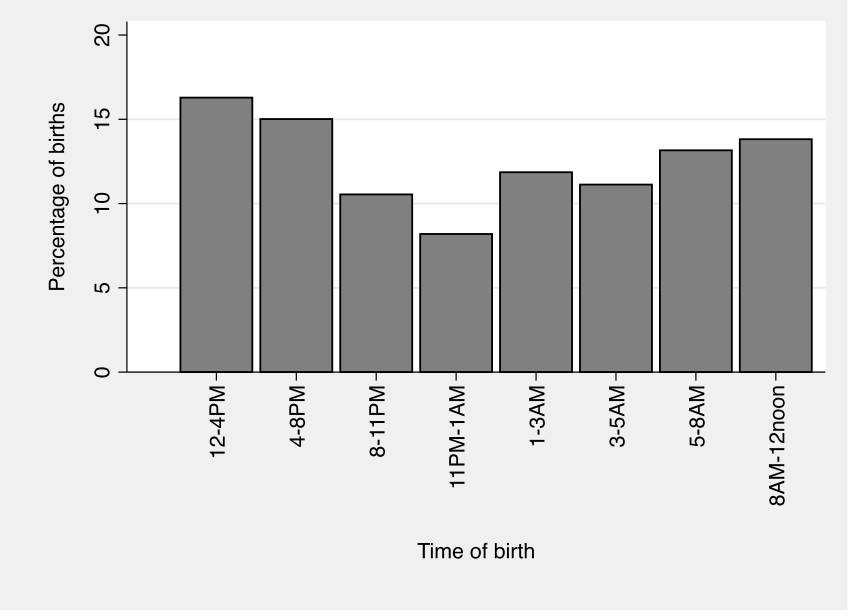

Fig. 1. Sample distribution by time of birth.