Do public health facilities reduce early-life mortality compared to private facilities in rural parts of nine high-risk Indian states?

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Three-sentence summary

I investigate whether the local variation in ambulance use can be used as an instrument for delivery in a public facility. The setting is nine high-mortality states in India, for which I use NFHS and AHS data. I find that a greater proportion of facility births being transported by ambulance is associated with higher probability of delivery in a public health facility and with lower neonatal mortality risk. I assess the validity of the identifying assumptions for this research design.

Background

My co-authors and I previously documented that public health facilities have robustly lower mortality than private health facilities in rural areas in eight high-risk states in India. However, that research does not address the possibility of pregnant women selecting a higher-quality but costlier health facility if they expect complications.

Ambulances in India

Birth in health facilities in the nine high-risk states I study has increased from 22% of births in 2001-2006 to 84% of births in 2015-2021, during which time public facilities have been a large, nearly constant share of institutional births. Over that interval, the use of government ambulances has grown from about 2% to about 28% of institutional births. This growth in use is due to the increased availability and salience of state-level government ambulance programs and decentralized district-level public-private partnerships. The increase in ambulance use has not been uniform, however, as Figure 1 depicts.

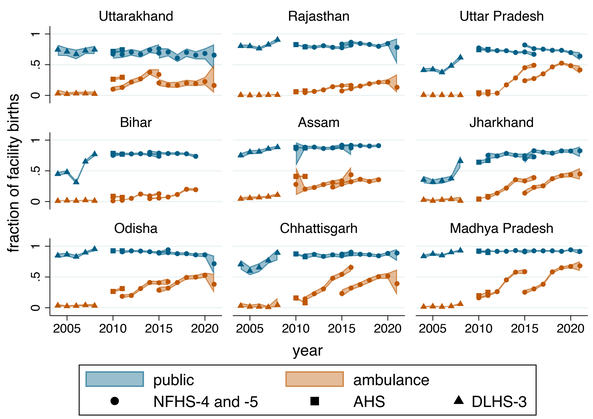


Figure 1. Share of facility births born in public health facilities and transported by ambulance, 2004-2021 by state

Data

The primary data sources for this are:

- **DHS India, 2014-15.** Nationally representative survey, 2010-2015
- **DHS India, 2019-21.** Nationally representative survey, 2015-2020
- **AHS.** Representative survey of the nine states used in this analysis, 2007-2012
- **DLHS-3.** Nationally representative survey, 2004-2008

Mortality outcomes and health facility choice and controls are from the NFHS. Ambulance use is from both the NFHS and the AHS.

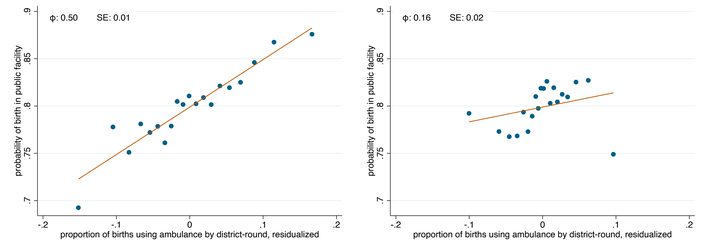
Empirical strategy

A unit of observation is a birth. The following graphs present regressions of the form

$$y_{idst} = \phi a_{idst} + \kappa_d + \kappa_{st} + h(X_{idt}) + u_{it}.$$

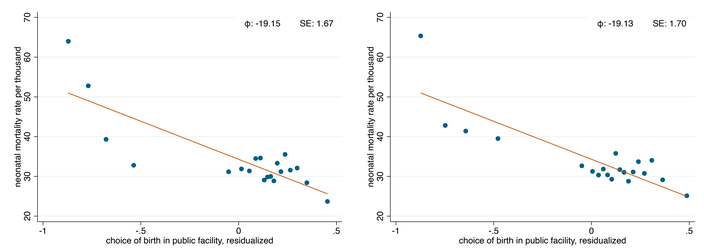
The coefficient ϕ is presented in figures below by regressing y on the residuals of the regression of a on the controls and fixed effects (FEs). I include controls for sex, mother's literacy, caste, wealth quintile, religion, village average wealth quintile, village proportion Hindu, a quadratic of mother's age at birth, birth order, and village average mother's height. Furthermore, I present two sets of results: using (a) state-year FEs and (b) district and state-year FEs.

Evidence: correlations among neonatal mortality, public facility birth, and ambulance use



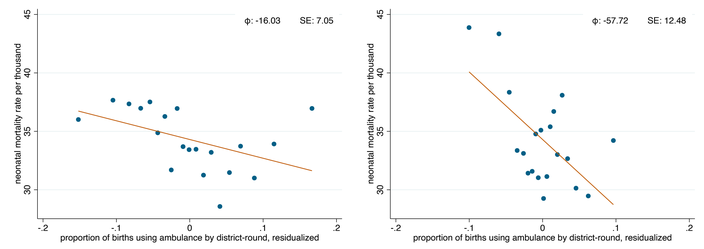
(a) state-year FEs (b) district and state-year FEs

Figure 2. Greater local prevalence of ambulance use predicts more public facility use



(a) state-year FEs (b) district and state-year FEs

Figure 3. Public facility use predicts lower neonatal mortality risk



(a) state-year FEs (b) district and state-year FEs

Figure 4. Greater local prevalence of ambulance use predicts lower neonatal mortality risk

Ambulance use as an instrument?

Figures 2 and 4 present evidence that ambulance use satisfies two basic properties of an instrumental variable: correlation with the "treatment" and outcome variables.

I propose the two-stage least squares regression equations

$$pub_{idst} = \lambda \overline{amb}_{dt} + \gamma_d + \gamma_{st} + g(X_{idst}) + \nu_{idst} \text{ and}$$
$$\Pr(NNM_{idst}) = \beta \widehat{pub}_{idst} + \alpha_d + \alpha_{st} + f(X_{idst}) + \epsilon_{idst}$$

where i is a birth in the district d in the state s during the year t.

In these equations,

- $\overline{amb}_{dt}$ is the fraction of facility births that use ambulances in the district-year (excluding i),
- pub_{idst} indicates whether birth i occurred in a public facility,
- $\widehat{pub}_{idst}$ is the predicted value of pub_{idst} from the first-stage regression, and
- NNM_{idst} indicates whether birth i ends in death within the first 30 days of life.

f and g are functions of vector of controls X, γ_d and α_d are district fixed effects. The coefficient of interest is β, the local average treatment effect (LATE) of public facilities on neonatal mortality.

Examining the IV assumptions and the local average treatment effect

Exclusion restriction

The primary threat to identification in the proposed design is violation of the exclusion restriction (that is, the assumption that the instrument has no direct effect on the outcome and that nothing causes changes in both). In this context, one way this might be violated is if ambulances save babies' lives by care during transit to a facility or by transporting mothers to hospitals quicker than other methods. However, prior research shows that ambulances in several places in India provide no such care or speediness.

One falsification test is that the instrument does not predict an effect when it shouldn't. I propose running two-stage least square regressions of the type above, but with an outcome such as mother's height that cannot possibly be influenced by the instrument.

Localness of the LATE

A perennial problem with the LATE is the applicability of that estimate to populations outside of the "compliers". The difficulty here is that the population of mothers who are induced to deliver at a public health facility based on local prevalence of ambulances might differ in important ways from the general population. They may be especially likely to otherwise choose a low-quality private facility. But this population is especially relevant for the feasible policies the government of India might implement to increase use of public facilities rather than private facilities.

Another concern is that the increase in ambulance services is due to a package of government programs designed to both get more people to use health facilities and to improve public health facilities. By identifying off the places with ambulance service increases, I may also be focusing on places with simultaneous quality improvements in public facilities, which could overestimate the effect of merely switching births from private to public health facilities.

References

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