Cheaper and better? Explaining a newborn mortality advantage at public vs. private hospitals in India

Nathan Franz, PhD candidate: nathanfranz@utexas.edu

University of Texas at Austin, Department of Economics and Population Research Center

Summary

- Births in public health facilities have lower neonatal mortality than in private facilities, but do public facilities causally reduce mortality?
- Two complementary empirical strategies:
  1. **Birth-mix strategy**: compares outcomes across villages with different fractions born in public facilities
  2. **Borders RD strategy**: compares outcomes near borders between districts with different fractions born in public facilities
- Both reveal a substantial decrease in mortality due to delivery in public facilities
- Evidence suggests quality-of-care practices (skin-to-skin) drive the effect

Puzzle: Richer patients pay more to deliver in riskier facilities

- Neonatal mortality rate for births to rural residents in *private* health facilities (51 per thousand) is higher than in *public* facilities (32 per thousand)
- But private facilities serve wealthier households and out-of-pocket costs are 5 times as high

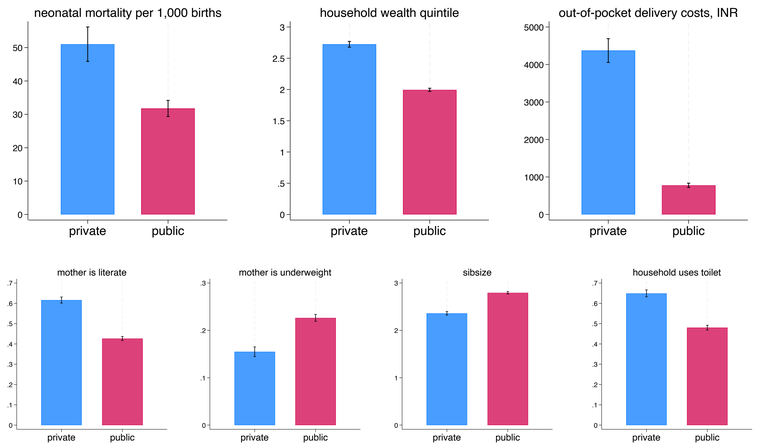


Figure 1. Neonatal mortality is higher in private, but so is socio-economic status

Possible explanations of the puzzle

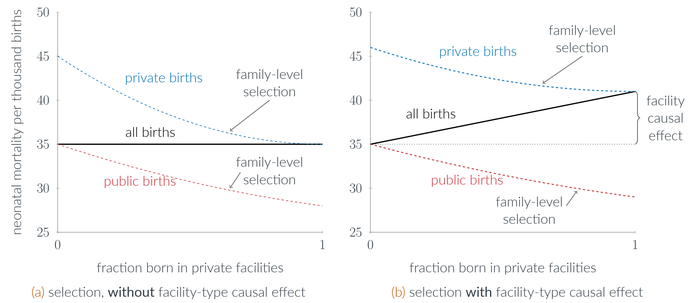
- **Family-level selection.** Mothers who expect complications may select into private facilities
- **Village-level selection.** Mothers who live in villages with more private birth may be less healthy than mothers in villages with more public birth
- **Quality of care differences.** Public facilities may provide more life-saving (or less harmful) natal care than private facilities, causally reducing NNM

Data: India's DHS surveys

- **Data.** Nationally representative DHS surveys of India, conducted 2015–2016 (NFHS-4) and 2019–2021 (NFHS-5)
  - Mothers' and children's health behavior and outcomes—for facility of birth, neonatal mortality, and skin-to-skin contact at birth (2019–2021 only; likely a noisy proxy for a bundle of care)
  - Household characteristics—for demographic controls
  - Village geographical coordinates—for distances to borders
- **Unit of analysis.** An institutional birth in the five years preceding the survey whose mother lives in rural Uttar Pradesh or Bihar
- **Outcome.** Neonatal mortality (month-level granularity)

Empirical strategy 1: village-level mortality vs. birth-mix

- If no facility-type effect, then switching births across facility types will not affect village-level neonatal mortality
- If there *is* a facility-type effect, then the village-level neonatal mortality rate will change as the fraction born in each facility type changes
- The slope of the overall neonatal mortality rate identifies the facility-type causal mortality effect if selection only operates at the family level



(a) selection, **without** facility-type causal effect (b) selection **with** facility-type causal effect

Figure 2. Econometric framework: slope of overall mortality line identifies causal effect

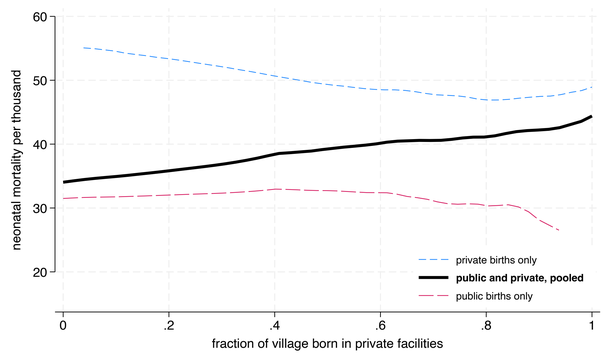


Figure 3. **Main result 1**—Overall mortality slopes up (OLS coef: 17.4, SE: 5.3)

- Upward slope could arise in the absence of causal effect if villages with higher fraction born in private also have worse underlying health, *but the opposite is true*

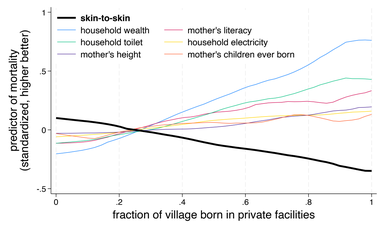


Figure 4. Villages with higher fraction born in private have *better* underlying health

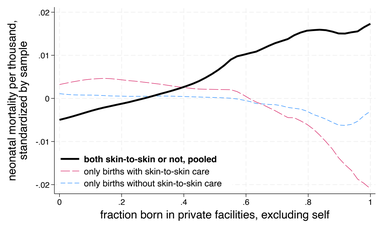


Figure 5. Stratified by **skin-to-skin care**, more private birth predicts survival

- Mechanism: skin-to-skin care trends against the demographic predictors, less likely where there's more private birth
- Considering separately births that received skin-to-skin care and births that did not, the mortality trend reverses and follows expected pattern

Empirical strategy 2: district borders regression discontinuity

- Addresses village-level selection concern
- I focus on "neighbors," who have access to the same facilities and have more similar underlying health
- **Identifying variation**: District borders induce variation in the fraction of births that take place in a public facility

Why do district borders induce variation?

- At the border, facility choice sets and costs for private care are identical in expectation
- But cost of public care varies:
  - Local health care workers help families navigate own district
  - Social insurance programs easier to access inside own district
  - Non-emergency ambulances function within own district
  - Referrals happen within own district

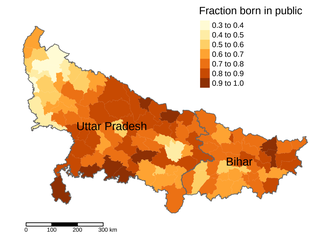


Figure 6. District-level variation in fraction born in public; UP and Bihar, NFHS-5

RD methods

- I use local linear regressions with 8 km bandwidth and triangular kernel, pool both DHS rounds
- For each district border, I compare the district-level birth-mix: less public birth is on the left, more public birth is on the right
- I exclude district borders with similar birth-mixes—less than 5 p.p. difference

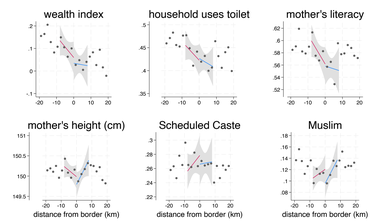


Figure 7. No discontinuities in demographic predictors of mortality at district borders

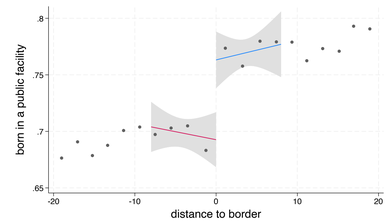


Figure 8. First-stage—public birth increases by 7.1 p.p. (SE: 1.8) at district borders

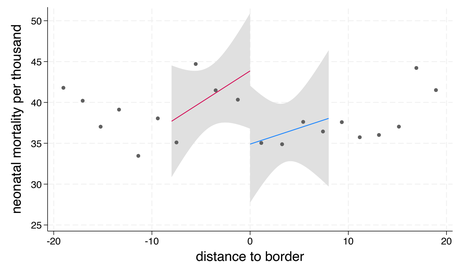


Figure 9. **Main result 2**—NNM decreases by 9.0 p.p. (SE: 5.2) at district borders

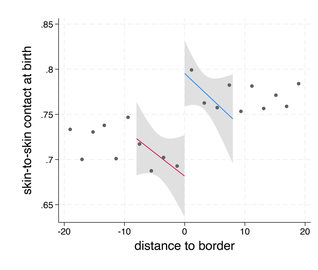


Figure 10. Mechanism: **Skin-to-skin care** increases: 11.4 p.p. (3.0)

Comparing fuzzy RD effect estimate to birth-mix effect estimate

- The fuzzy RD estimate is much larger but much less certain than the first estimate

$$\frac{\text{11.3 per thousand increase in NNM [90\%CI: 0.9–21.7]}}{\text{10 p.p. increase in public birth}}$$

$$\text{versus } \frac{\text{1.7 per thousand increase in NNM [90\%CI: 0.9–2.6]}}{\text{10 p.p. increase in public birth}}$$

- A larger effect in the RD strategy is consistent with a downward bias in the birth-mix empirical strategy from village-level selection in the opposite direction of the effect