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## ABSTRACT

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# What Do We Learn about the Swacch Bharat Mission from the NFHS-5 Fact Sheets?

How much did rural sanitation in India change under the five years of the Swacch Bharat Mission? The best nationally representative statistics on sanitation in India have long come from the Demographic and Health Surveys, known as the National Family and Health Surveys in India. The fifth round, conducted in 2019 and 2020, was interrupted by the pandemic, but limited summary statistics have been released for some states. Here we analyze these statistics. We conclude that about half of the rural population in the four large Indian states of Bihar, Madhya Pradesh, Rajasthan, and Uttar Pradesh continued to defecate in the open at the end of the Swacch Bharat Mission.

**JEL Classification:** O15

**Keywords:** India, sanitation, open defecation, Swacch Bharat Mission, SBM, NFHS

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## What do we learn about the Swacch Bharat Mission from the NFHS-5 fact sheets?

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How much did rural sanitation change under the five years of the Swacch Bharat Mission (SBM)? The best nationally representative statistics on sanitation in India have long come from the Demographic and Health Surveys (DHS), known as the National Family and Health Surveys (NFHS) in India. The fifth round of the NFHS (NFHS-5), conducted in 2019 and 2020, was interrupted by the pandemic. So there still is no independent, high-quality, nationally representative survey of sanitation behavior collected at the end of the SBM. But some states' data were collected before the lockdown. Fact sheets of selected summary statistics have been released for those states.

Here we ask what those fact sheets tell us about open defecation in rural India. We are particularly interested in the fraction of people who defecate in the open in the rural population of Bihar, Madhya Pradesh, Rajasthan, and Uttar Pradesh, which we call the “focus states.” These states are home to over two-fifths of the population of rural India and to a little more than half of the rural Indians who reported defecating in the open in the NFHS-4, which was the prior DHS survey round in 2015-16. With our collaborators, we have studied these focus states in our 2013-14 survey and our 2018 survey of rural open defecation behavior, as well as in our 2017 book on rural open defecation (Coffey et al. 2014, Gupta et al. 2019, Coffey & Spears, 2017).

### What can we learn from the NFHS-5 fact sheets?

The NFHS-5 fact sheets will not answer every question. For starters, they do not report anything about open defecation, exactly. Instead, they report the fraction of households with improved sanitation. One problem with this is that we don't know how many of the households without unimproved sanitation are defecating in the open or how many are using “unimproved” latrines. But this is a small problem, because we can use data from prior survey rounds to reassure ourselves that unimproved latrines are very uncommon in rural India: people there either defecate in the open or use a latrine that counts as “improved” by this standard. To be charitable to the SBM, we can assume that it built zero unimproved latrines, so the change in open defecation was the same as the change in improved latrine use.

Another problem is that the NFHS question is asked at the household level. Nothing is asked about individual persons. But we know from other, more-detailed surveys that

many rural households in the focus states have some people who use a latrine and some people who defecate in the open. We collaborated with many researchers to organize a survey experiment in rural parts of four Indian states that compared the NFHS question with a person-level question about open defecation. We found that the person-level question found more open defecation than the NFHS's household-level question (Vyas et al. 2019). So this is one reason to think there actually is more open defecation than an estimate based on the NFHS question will suggest.

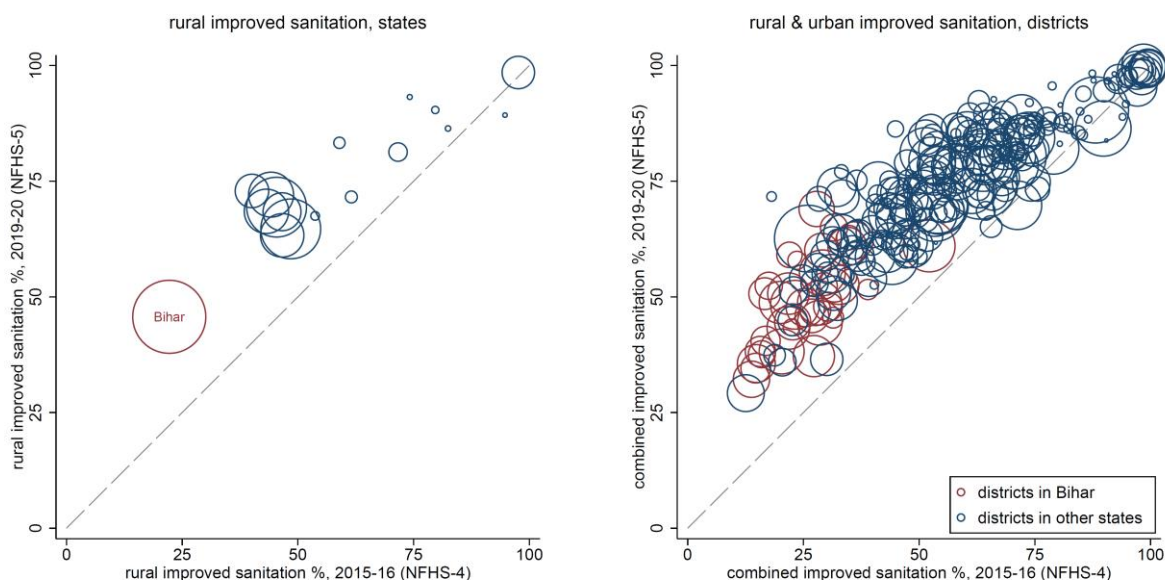
Finally, the biggest problem is that only a few aggregate statistics are available, and not for every state. Among the focus states, only Bihar has any data released at all. In the prior NFHS-4 data, the states for which NFHS-5 fact sheets are available have 16 percentage points less rural open defecation than the states that are not included. Only 41% of rural people who reported open defecation in the NFHS-4 live in a state for which an NFHS-5 fact sheet is available.

The fact sheets tell us *rural* summary statistics at the state level and *combined rural and urban* summary statistics at the district level. So we know the fraction of all rural Biharis who have improved sanitation, according to a household-level question, but not the fraction of rural people in any Bihar *district* who have improved sanitation. We will think about the numbers we have and do the best we can.

## Sanitation in the NFHS-5 resembles sanitation in the NFHS-4

Figure 1 plots improved sanitation rates in the 2019-20 NFHS-5 (the vertical axis) against improved sanitation rates in the 2015-16 NFHS-4. The NFHS-5 data were collected at the end of the SBM and the NFHS-4 data were collected before the SBM had made large changes (Coffey & Spears, 2018), so this graph is informative about before-and-after changes over the course of the SBM.

**Figure 1: Sanitation in the NFHS-5 fact sheets and the NFHS-4**



It was never realistic to expect the SBM to solve every sanitation problem. It would be unreasonable to assess any public policy by such a standard. And yet, in many public discussions, the SBM presented just such a radically transformative account of itself. In its political rhetoric, the SBM claimed for itself the highest benchmarks.

The NFHS-5, however, shows us that sanitation coverage in rural India after the SBM has increased but is still sorely in need of further attention. Figure 1 shows meaningful increases in improved sanitation, especially where sanitation was worse to begin with. The dashed diagonal line represents a scenario of no change in improved sanitation coverage, that is, if 2019 were just like 2015. Most districts are above the line, which means that sanitation coverage improved in most districts. Rural Bihar reports improving by over 20 percentage points. Averaging over all India, improved sanitation increased by 18 percentage points. UNICEF-WHO data show that countries that had high rates of unimproved sanitation in 2015 tended to subsequently improve by about 1 percentage point per year, so India's 4-5 percentage points a year is notably faster.

However, places—such as Bihar—that had worse sanitation before the SBM still had worse sanitation and places that had better sanitation before the SBM still had better sanitation, on average. Figure 1 does not show an old order swept away by transformative change: It shows that the correlation between sanitation before the SBM and after the SBM is 91%.

### **How much open defecation remains in the focus states?**

To offer any answer to this question we are going to have to make assumptions. Our first assumption is that the change in UP, MP, and Rajasthan since the time of the NFHS-4 was similar, on average, to the change in Bihar. One easy answer requires no computation: The fact sheets say that 45.7% of rural Bihar has improved sanitation, implying that 54.3% do not. Or, we can do a simple computation:

- In the rural focus states in the NFHS-4, open defecation was 70.2% (Coffey & Spears 2018).
- According to the NFHS-5 fact sheets, improved sanitation in rural Bihar increased by 23 percentage points.
- So if we can subtract these statistics, then about half of the rural population in the focus states continued to defecate in the open at the end of the SBM.

We write “about half” rather than any particular number to emphasize the imprecision of this estimate. It is not precise, but it is informative. It is around 200 million rural people in the focus states defecating in the open.

In a 2014 paper (Coffey et al. 2014), we combined regression and reweighting (a tool known in statistics as “Mister P” for multilevel regression and poststratification) to

make a projection about what a large-scale latrine building program might accomplish. Before the SBM, we wrote:

“In the four focus states, the model predicts that person-level open defecation in our sample would fall from the observed 70% to a predicted 51%. Therefore, we conclude conservatively that our data predict that even if the government were to construct a latrine for every rural household in Bihar, MP, Rajasthan, and UP that does not currently have one, more than half of all rural persons in our sample would still defecate in the open. This is not to suggest that an 18 percentage point decline in open defecation, if achieved, would not be an important advance in human development. However, even after such an ambitious construction scheme, rural India would still be very far from ending open defecation.”

We can use the same tool now to try to quantify what did happen. Because the data are incomplete, we have to use models. There are three steps:

- Estimate a simple model for NFHS-5 improved sanitation as a function of NFHS-4 improved sanitation, using all of the places for which data are available. This assumes that the changes in the places where NFHS-5 data are unavailable are similar to the changes in the places where data are available. This can be done in different ways: at the state or district level; separating or pooling rural and urban; treating Bihar separately or pooling it with the other states.
- For each district, use the NFHS-4 to estimate open defecation as a function of improved sanitation. This assumes that, although the distribution of sanitation behaviors changed over time, the *relationship* between improved sanitation and open defecation stayed constant because unimproved latrines remained uncommon.
- Compute for each district a projected rural open defecation. Assemble these districts into population-level rural averages using NFHS-4 population weights.

There are multiple ways to do each of these steps. In order not to make an arbitrary choice, we used 10 different combinations. Our 10 estimates span from a low of 45% of rural residents of the four focus states defecating in the open to a high of 54%. Or, if you prefer, you can use the simpler computation of  $70-20 \cong 50$ . Or, we can stop where we started: at the fact sheet statistic that 54% of rural Bihar has unimproved sanitation. With any of these methods, the NFHS-5 suggests that about half of rural people in the focus states defecated in the open when these data were collected at the end of the SBM.

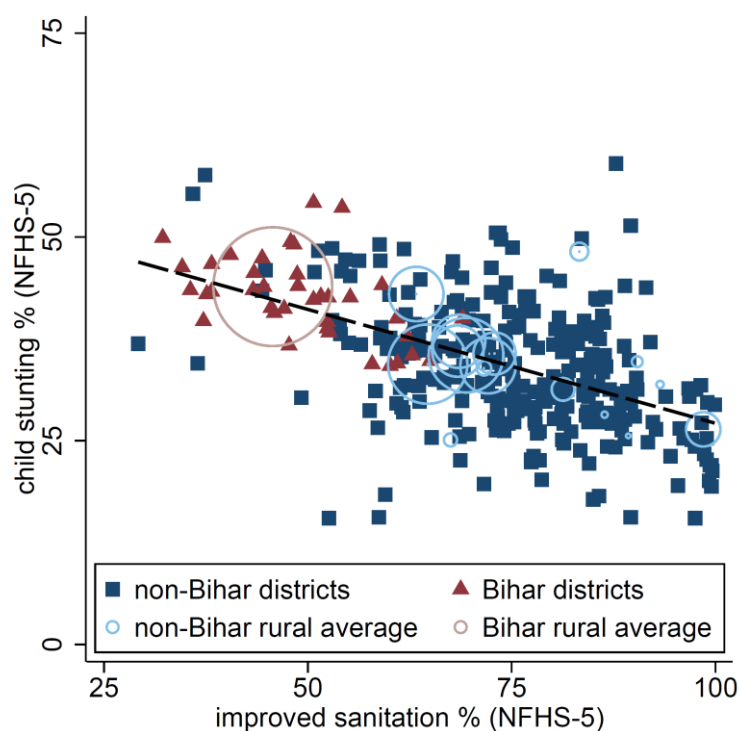
### **What about the effects of the SBM on health outcomes?**

We can say little about the effect of the SBM on sanitation behavior with these data. We can say even less about subsequent effects on health. In our prior work, we have

written about the effects of sanitation on early life health—effects that are visible in data on child height.

The NFHS-5 fact sheets do not include child height-for-age. Instead, they include only rates of “stunting” among children under 5, which is a dichotomized indicator for a particularly low level of height-for-age. In this way, stunting rates are like poverty rates: A large one is bad, but they conceal more than they reveal and they are vulnerable to statistical shenanigans. In one of our research group’s first studies of sanitation, we used DHS data from 2005 to show that dichotomized stunting rates reduce statistical power, meaning they obscure relationships that in fact exist (Spears et al. 2013).

**Figure 2: Places in the NFHS-5 fact sheets with better sanitation have lower stunting rates, on average**



With these caveats, we can see that sanitation continues to predict child height in the NFHS-5, as measured by stunting rates. Experts on child nutrition have highlighted concerns and puzzles about the stunting numbers in these fact sheets, most notably the deeply worrying fact that there has been so little improvement over time (Rukmini, 2020; Drèze, 2020). But at least in Figure 2 there is little to be puzzled about: Places with worse sanitation have more stunting, on average. Of course, this one scatterplot should be far from enough to persuade you that sanitation has a causal effect on child height if you did not already find that plausible. Our point is merely that the NFHS-5 summary fact sheets—as limited as they are—provide no new reason to be skeptical or to be confident about this relationship. Fully quantifying the consequences of the SBM will require more data.



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