

Open Defecation in Rural India, 2015–16

Levels and Trends in NFHS–4

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The Government of India's NFHS–4 offers the best new data on open defecation in rural India to be released in over a decade. Although open defecation has become less common than it was 10 years ago, it is still highly prevalent, with more than half of rural households reporting open defecation. On average, change has been slow, even during the period of the Swachh Bharat Mission.

Reducing open defecation is an urgent policy priority: it kills thousands of children each year, and stunts the growth and development of those who survive. As a result, the United Nations has included the elimination of open defecation globally by 2030 among its Sustainable Development Goals. The Government of India (GoI) has set an even more ambitious schedule: the Swachh Bharat Mission (SBM) aims to end open defecation by October 2019.

According to the World Health Organization and the United Nations Children's Fund Joint Monitoring Report (2017), more than half of the open defecation that occurs anywhere in the world occurs in rural India. According to the 2011 Census, 90% of Indian households that lack a toilet or latrine are rural. Although village life is changing quickly in many respects, the census and other data sources suggest that latrine adoption is occurring slowly. This article investigates patterns of rural open defecation using the newly released National Family Health Survey–4 (NFHS–4), a large-scale nationally representative survey collected between January 2015 and November 2016. The NFHS is conducted as a collaboration between the International Institute of Population Sciences, ICF International, and the Ministry of Health and Family Welfare of the GoI.

Studying the NFHS–4 offers special advantages over other data sources. First, the NFHS is part of an international health monitoring programme called the Demographic and Health Surveys (DHS), which are widely regarded as high quality data. These internationally comparable surveys ask the same questions in many countries around the world. Results from the NFHS–4 are, therefore,

readily comparable to evidence from other countries.

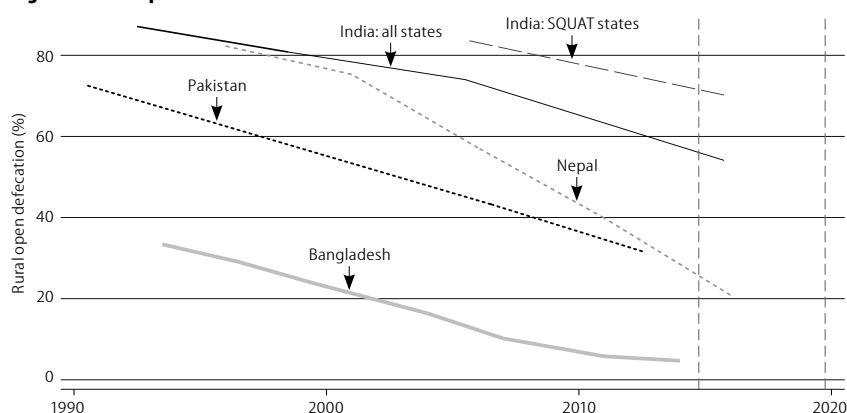
We note, however, that the NFHS data on open defecation has one important weakness: it asks about sanitation behaviour at the *household* level,¹ rather than the individual level, which, when combined with data on population density, is the indicator most relevant for health.² The difference between a household-level question and an individual-level question is important because there are many households in which some people use the latrine while others defecate in the open (Coffey et al 2014). This is especially true of government-provided latrines, which are more likely to be used by only some household members than privately constructed latrines (Coffey and Spears 2017). Asking about household-level behaviour, therefore, underestimates the prevalence of open defecation.

Despite the fact that the question asked by the NFHS underestimates individual-level open defecation, the release of the household-level data from the NFHS–4 nevertheless provides an important opportunity to deepen our understanding of the levels and trends of rural open defecation. In short, we unfortunately find that the NFHS–4 offers little evidence that the decline in open defecation in rural India has accelerated radically in recent years, despite the high profile efforts of the SBM, which began in October 2014. Although households are more likely to report latrine or toilet use than before, change has been slow, and familiar regional patterns remain.

Prevalence of Open Defecation

Figure 1 (p 11) compares estimates of household-level rural open defecation from the NFHS–4 to estimates from India's three prior NFHS, and to estimates from DHS surveys collected between 1993 and 2016 in Nepal, Pakistan, and Bangladesh. It finds that in India, open defecation is more common, and has declined more slowly, than in the other countries. In contrast with rural India, where about 55% of households report defecating in the open, open defecation has been almost eliminated from

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Figure 1: Rural Open Defecation in South Asian DHS Rounds

Vertical lines indicate the beginning and end of the SBM. SQUAT states, in the above figure, refer to Bihar, Madhya Pradesh, Rajasthan, and Uttar Pradesh.

Sources: NFHS-4; Bangladesh DHS (1993–94, 1996–97, 1999–2000, 2004, 2007, 2011, 2014); Nepal DHS (1996, 2001, 2006, 2011, 2016); Pakistan DHS (1990–91; 2006–07; 2012–13).

Bangladesh and has recently declined rapidly in Nepal.

The top, dashed line of Figure 1 restricts the NFHS-4 data to the four “focus states” in the 2013–14 SQUAT survey (Bihar, Madhya Pradesh, Rajasthan, and Uttar Pradesh), which were the subject of our prior work in the *Economic & Political Weekly* (Coffey et al 2014). The SQUAT survey focused on these states because they represent over 40% of India’s rural population and because the fraction of households that did not have a toilet or latrine in each of these states

was around 80% in the 2011 Census. The NFHS-4 finds that open defecation remains very high—above 70%—in the rural areas of the above states.

Table 1 presents further details on the prevalence of open defecation in rural India. The first column shows data from the 2005–06 NFHS-3 for comparison. The other columns report our estimates of the prevalence of rural open defecation from the NFHS-4. In addition to showing results for India as a whole (column 2), we compute results for three sub-populations, presented in columns 3, 4, and 5:

Table 1: Levels of Open Defecation in Rural India

Sample Year	All States 2005–06 (1)	All States 2015–16 (2)	Squat Focus States 2015–16 (3)	Uttar Pradesh 2015–16 (4)	Bihar 2015–16 (5)
	Panel A: Where do rural households dispose of their faeces? (reported as a % of households)				
Open defecation	74.6	54.8	70.2	70.1	73.6
Pit latrine	10.9	17.9	8.7	7.5	7.7
Septic tank	13.6	25.5	20.3	21.5	17.8
Flush toilet to sewer	0.8	1.6	0.6	0.8	0.5
Panel B: Households who defecate in the open, among rural households with characteristic (%)					
Has TV	52.2	38.1	46.3	48.4	35.9
Does not have TV	84.3	73.9	82.2	80.7	81.9
Has mobile phone	32.5	51.5	67.7	68.3	71.6
Hindu	78.2	58.4	72.4	74.3	74.6
Muslim	59.5	39.1	54.5	44.3	68.5
Water on premises	52.8	33.4	41.2	51.1	62.2
Improved water access	73.6	54.5	69.5	69.9	73.4
Panel C: Count of persons who defecate in the open (millions; see note below about assumption)					
All rural households	595	500	264	110	75
Has TV	139	192	64	28	7
Does not have TV	456	307	199	81	68
Has mobile phone	24	434	236	101	68
Water on premises	47	54	11	2	2
Improved water access	491	441	241	106	74

Columns 2–5 assume a total rural population of 912 million. Column 1 assumes a total rural population of 800 million. Results in panel C assume that all members of a household have the same sanitation behaviour. All columns use DHS sampling weights.

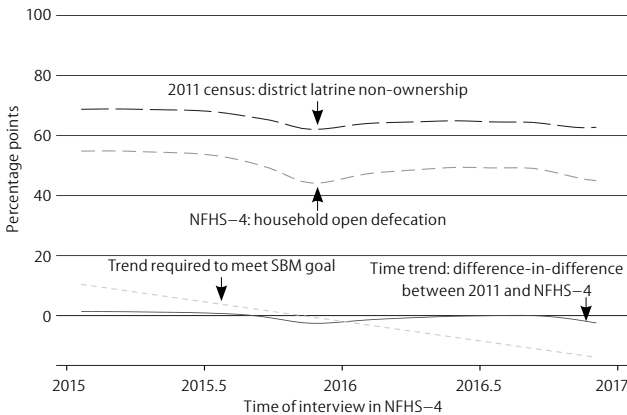
Sources: NFHS-3 and NFHS-4.

the four SQUAT focus states, Uttar Pradesh, and Bihar.

Panel A reports the percentages of rural households that defecate in the open, use a pit latrine, that use a latrine with a tank, and that use a toilet that flushes into a sewer. Comparing the 2005–06 data to the 2015–16 data, we see a decline of about 20 percentage points in household-level open defecation (from about 75% to about 55%). Most of the change appears to come from an increased use of latrines with tanks, which are more expensive than pit latrines. As we have discussed previously in the *Economic & Political Weekly*, pit latrines are a safe, affordable sanitation option that is widely used in other developing countries (Coffey et al 2017). In India, however, and especially in the SQUAT focus states, pit latrines are relatively rare. Instead, people either use an expensive latrine that is connected to a very large tank or they defecate in the open. This is because by avoiding pit latrines, rural Indians avoid the need to empty a latrine pit. Even though emptying a pit latrine is a common occurrence in other developing countries, it is problematic because people believe that only people from untouchable castes can empty a latrine pit (Coffey and Spears 2017). Although pit latrines were more common in 2015–16 than they were in 2005–06, they were less common than latrines with tanks that could be emptied mechanically or infrequently.

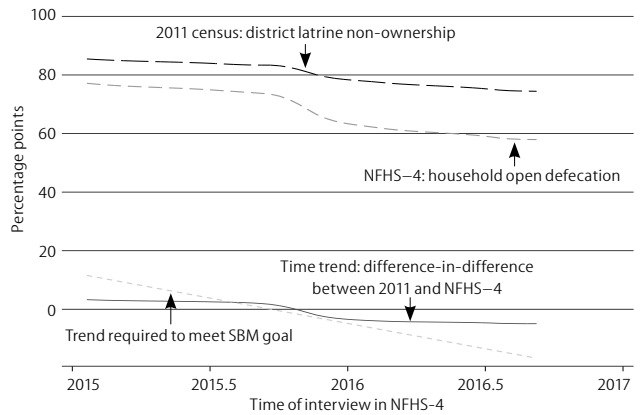
Panel B of Table 1 reports the fraction of households within various categories (for example, households that have a television) that defecate in the open. Several patterns, each suggested by prior research on open defecation in India,³ emerge from the data. First, these data provide evidence that open defecation is not driven by poverty: it is common even among households that own assets such as televisions and mobile phones. Second, open defecation in rural India is robustly correlated with religion, as originally explored by Geruso and Spears (forthcoming): Hindu households are more likely to report open defecation than Muslim households, despite the fact that Muslim households are poorer, on average. Third, open defecation in

Figure 2: 2015–16 Time Trends in Rural Open Defecation: All India



Sources: NFHS-4 and 2011 Census.

Figure 3: 2015–16 Time Trends in Rural Open Defecation: SQUAT States



Sources: NFHS-4 and 2011 Census.

India is not a result of lack of access to water: about a third of households that have water on the premises defecate in the open.

Panel c uses the NFHS-4 data to estimate the number of persons who defecate in the open in rural India. These estimates must be treated with care because, as we discussed above, the NFHS asks about household behaviour, rather than individual behaviour. Therefore, in computing the number of people who defecate in the open, we must assume that what a household reports is true for every member of that household. This assumption leads us to underestimate open defecation behaviour. Despite this, the number of people who still practise open defecation is staggering: the results in Panel c find that at least 500 million rural Indians defecated in the open in 2015–16.

Impact of SBM?

Ordinarily, researchers implicitly interpret a DHS survey as though it were representative of a country in a particular year. The NFHS-4, however, collected a large sample of approximately 6,00,000 households over a period of two years. The 23-month span of the NFHS-4 occurred within the first half of the SBM. As a result, we can compare households that were interviewed earlier in the survey with households that were interviewed later to try to learn something about SBM’s progress over the two years of the survey.

Such a strategy offers the advantage of asking the same survey question at

different points of time. However, it also offers the risk that places where the survey visited early could be different, on average, from places where the survey visited late. We will, therefore, have to interpret any apparent time trend carefully. We account for differences across places, in part, by matching each rural household in the NFHS-4 with the fraction of rural households in its district that were reported to not own any toilet or latrine in the 2011 Census.

Figures 2 and 3 compare open defecation rates among households interviewed by the NFHS-4 at different times. Figure 2 studies all of rural India, where Figure 3 studies only the four SQUAT focus states. In both of these figures, an observation is a household, and the horizontal axis is the time at which a household was interviewed. Similar methods are used for creating both figures—we focus our discussion primarily on the findings of Figure 2 for simplicity.

The dashed line labelled “NFHS-4” plots how household-level average open defecation is different among households interviewed at different times. It has a downward slope, which means that households interviewed towards the end of the survey were less likely to report open defecation than households interviewed at the beginning. One way to think about this line is to imagine what it would look like if there were a very rapid reduction in open defecation across the country over the two years during which the NFHS-4 were collected: then, we would expect the line to have a steep downward slope. Does the slope

we see reflect rapid national improvement in open defecation?

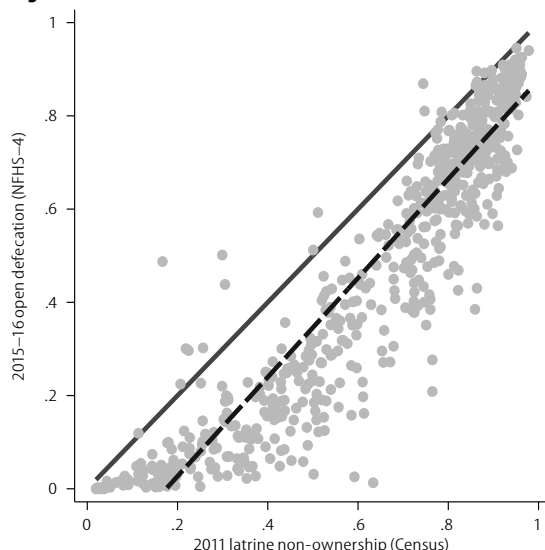
Unfortunately, we cannot interpret the slope of the NFHS-4 line as *only* reflecting change over time in average open defecation across India because the places interviewed later in the survey might have been different, on average, from the places interviewed earlier in the survey. That is exactly what the line with long dashes labelled “2011 Census” indicates. This line is computed by matching each household to the proportion of rural households in its district that did not own a latrine according to the 2011 Census. This line can be thought of as a measure of place-specific differences in sanitation. The “2011 Census” line slopes down, indicating that places with more latrine non-ownership in 2011 tended to be interviewed earlier by the NFHS-4 than places with less latrine non-ownership in 2011. So, much of the slight downward slope in open defecation in the NFHS-4 line is probably due to pre-existing differences in sanitation across places. This means that the NFHS-4 line probably *overstates* the decline in open defecation over this period.

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Figure 4: Districts in 2016 that Resemble 2011

Sources: NFHS-4 and 2011 Census.

One way of thinking about this is that the average household interviewed by the NFHS-4 in 2016 was between 3 and 4 percentage points less likely to report defecating in the open than the average household interviewed in 2015. But, the average household interviewed in 2016 lives in a district that had 2 to 3 percentage points less latrine non-ownership in the 2011 Census than the average household interviewed in 2015. So, it may be that the average decline in open defecation in rural India was at a rate of about 1–2 percentage points a year.

The line marked “time trend” at the bottom of Figure 2 is computed by subtracting each point on the “NFHS-4” line from each point on the “2011 Census” line. When estimated in this way, the time trend has a negative slope, but is not particularly large: it is about 1.8 percentage points per year. Both figures also compare the “time trend” line with a dotted line that shows how steep the negative slope would have to be to meet the SBM’s 2019 goal. The slope of the dotted line is steeply negative: the decline in open defecation from 2015 to 2016 would have needed to be 13 percentage points per year to be on pace for the SBM. Within the four SQUAT focus states, the decline in open defecation would have needed to be greater: 17 percentage points per year. The decline estimated by the “time trend” line in the SQUAT states was about 7 percentage points in these states. Although the rate

of decline of 7 percentage points per year is slower than what would be needed to meet the SBM, if this pace of decline indeed represents a change in individual-level behaviour (rather than household ownership), it would nevertheless be an important improvement.

As a double-check of this method of estimating the decline of rural open defecation, we also compute an estimate of the time trend in open defecation using linear regression. When we run a regression of household-level open defecation on the date of the NFHS-4 interview, controlling for district-level latrine non-ownership in the 2011 Census, we estimate a similar trend to what is estimated above: a linearised, annualised rate of decline in open defecation of 1.7 percentage points per year in 2015 and 2016.

Figure 4 offers a further visualisation of our finding that the patterns of open defecation in 2015–16 resemble what was true in 2011. The figure shows that district-level open defecation, computed from the NFHS-4, is highly predictable based on district-level latrine non-ownership in the 2011 Census.⁴ The fact that the line is below the 45-degree line means that open defecation decreased overall, but the correlation between past and present is 93%. Regional patterns of open defecation that were present in 2011 are similar in the NFHS-4.

Conclusions

These results from the NFHS-4 are unlikely to surprise readers familiar with the challenges posed by open defecation in rural India. Nevertheless, they are important: they are the most credible nationally-representative estimates to be released in nearly a decade. These new numbers encourage readers and policymakers to be cautious when interpreting suggestions that open defecation in rural India has changed radically in the last few years. If the average decline in rural open defecation from December 2016 to October 2019 proves

to be similar to what the NFHS-4 indicates it was from January 2015 through November 2016, then about half of all rural Indians will still be defecating in the open at the end of the SBM. Careful reflection and new approaches to encouraging latrine use are needed.

NOTES

- 1 In each country, including India, the DHS questionnaire asks, “What kind of toilet facility do members of your family usually use?”
- 2 The number of persons who defecate in the open in a given area is a useful indicator of a person’s exposure to faecal germs. If population growth is high enough, it may be the case that even though the *percentage* of households that defecate in the open is decreasing, exposure to faecal germs remains similar to what it was 10 years ago. It is difficult to quantify exposure to faecal germs in rural India because the government does not publish urban and rural population density separately.
- 3 See Coffey and Spears (2017) for a detailed account of the causes and consequences of open defecation in India.
- 4 The figure excludes two outlier districts from Jammu and Kashmir where the census data appear to be inaccurate.

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