Online Appendix for "Neighborhood Sanitation and Infant Mortality" by Michael Geruso and Dean Spears

A.1 Sample Sizes Needed to Experimentally Identify Infant Mortality Externalities

In footnote 1 in the introduction, we noted that the number of neighborhood clusters required to detect even economically large infant mortality effects of open defecation (OD) via a field experiment is large, both because of the plausible effect size relative to the variance in mortality and because measuring local externalities necessarily implies randomization at the level of the locality, not the individual. We also noted that it can be difficult to generate a first stage effect on latrine use via experimental interventions. In this section, we illustrate these issues.

We begin with a standard power calculation to determine the number of localities (clusters) required to detect an external effect of OD on IMR. Assume we wish to detect a minimum effect size of 3.5 infant deaths per thousand, which is 5% of mean IMR and a little larger than our OLS estimate of 2.7 to 2.9 deaths averted per 10 percentage point reduction in local open defecation. The calculation results in 8,622 clusters, based on a simple two-sided test.

With the NFHS data, we can alternatively perform a more detailed calculation for the required sample size and cluster count via Monte Carlo simulation. Unlike the standard power calculation, this method naturally incorporates any heterogeneity in infant mortality that is present across clusters. For the simulation, we again assume that the true effect of a 10 percentage point reduction in local OD is equal to 5 percent of mean infant mortality, or 3.5 deaths per thousand. To implement the Monte Carlo simulation, we iterate over the following procedure, varying the number of sample clusters (N_c) included. We use PSUs from the NFHS data described in Section 2 as our clusters.

1. Randomly select, with replacement, N_c clusters to include in the simulation.
2. Randomly assign half the included clusters to treatment and half to control.
3. Randomly identify 5 percent of infants in treated clusters and replace their infant mortality with zero, thus leaving observations for live children unchanged. This changes the mean IMR in each treatment cluster by 5 percent of the mean on average.
4. Regress infant mortality on a treatment indicator, clustering standard errors.

In practice, we vary N_c from 2,000 to 10,500 clusters in increments of 100, with 50 iterations at each value of N_c. Appendix Figure A6 plots the relationship between sample size and power delivered by the simulation. The horizontal axis shows the cluster count, and the vertical axis measures the fraction of simulations resulting in a significant treatment effect at the 5% level. The graph reveals that between 9,000 and 10,000 clusters are needed to achieve power = .80. This closely aligns with the analytical derivation of the required sample size of 8,622 clusters.

Note that these power calculations will somewhat understate the required sample size because they do not account for the fact that within a cluster, externalities can only be measured on the subset of households that were not assigned the latrine treatment. Here, we have used the size of the whole cluster to simulate the externality, whereas the correct experiment would measure the externality within only the "leave-out" households in treatment clusters.

Calculating costs requires making additional assumptions about the efficacy of a hypothetical latrine intervention, on which very little data exists. For illustration, we note that Barnard et al. (2013) provides evidence on this question by examining a small number of Indian villages where latrines were built under the central government's Total Sanitation Campaign in the late 2000s. Barnard et al.

(2013) shows that among individuals owning a latrine following the implementation of the program in their village, less than half were using the latrines.

To calculate a lower-bound estimate of the cost of an experiment that detected the mortality externalities of a latrine intervention, consider an intervention that converts non-latrine users to latrine users at a success rate of 50% by constructing a latrine and providing some information about its benefits and use at a cost of $500 USD per household.[56] With approximately 9,000 clusters and average cluster sizes of 200 households, this implies 40 interventions in each of the 4,500 treatment localities in order to generate the 10 percentage point first stage effect on latrine use. The cost of implementing the treatment alone (leaving out surveying and other costs) would equal $90 million.

A.2 Details of Non-Parametric Decomposition

As an alternative approach to statistically explaining the mortality gaps, we estimate counterfactual Hindu mortality rates after non-parametrically reweighting the sample of Hindu children to match the characteristics of Muslim children. Compared to the linear regressions in Section 2, this non-parametric approach has the advantage of more flexibly allowing correlation between open defecation and other controls.

Following DiNardo, Fortin and Lemieux (1996), we first reweight the Hindu sample according to a partition based on variables other than open defecation and report counterfactual outcomes. We then reweight according to a finer partition that interacts groupings of these variables with our sanitation variable. Here, sanitation (exposure to open defecation) is defined flexibly as an interaction between own and neighbors' latrine use. In particular, we divide both samples into 20 bins b of exposure to open defecation: 10 bands of local (PSU) open defecation interacted with household open defecation. Other variables are binned as follows: 3 survey rounds, 2 urban statuses, 8 bins of asset ownership, 3 terciles of household size, and 4 quartiles of birth order.[57] For each reweight on some combination these of characteristics, we follow three steps:

1. Within each sample $s \in \{Hindu, Muslim\}$ and each bin b, compute ω_b^s, the fraction of sample s in bin b, using survey design weights.

2. For each observation in the Hindu sample, create new counterfactual weights by multiplying the observation's survey sampling weight by the ratio $\frac{\omega_b^{Muslim}}{\omega_b^{Hindu}}$ for the bin b of which it is a member.

3. Compute a counterfactual mean Hindu mortality rate under the Muslim distribution of characteristics using these new weights.

Table A5 reports counterfactual Hindu infant mortality rates with the new weights. The first row displays the unweighted difference in means and the reweight on the marginal distribution of open defecation alone. The rest of the table explores the explanatory power of local open defecation when added sequentially after reweighting with respect to other factors. Row 1 shows that matching on open defecation alone completely accounts for, and even reverses, the direction of the gap. Sanitation non-parametrically accounting for 108 percent of the IMR gap is consistent with the fact that Hindu children come from richer families, on average, and would therefore be expected to have lower mortality. In the remaining rows, reweighting on various sets of covariates that do not include

[56] The $500 figure follows Duflo et al. (2015) who report an approximate construction cost of $440 per latrine plus annual maintenance.

[57] The requirement in any reweighting exercise to create joint distributions that include full support in both subsamples limits the number of dimensions over which we can jointly reweight in a fixed sample size. See Geruso (2012) for a fuller discussion of this limitation.

OD continues to generate a large mortality gap. Then, adding sanitation to the set of reweighting variables has a large incremental effect and explains the entire gap in most cases. The single case in which it fails to do so is the specification that includes a count of joint household assets, but does not control for the fact that Muslims live in larger households.

A.3 Problems with Survey-Reported Diarrhea

The NFHS contains information on mothers' reports of diarrhea in their children. This type of survey measure is likely to contain significant biases that may be correlated with our regressors of interest. For example, because the reporting of diarrhea depends on whether the reporting mother recognizes a loose stool as diarrhea, differences in reporting across children is correlated with the education level of their mothers. Appendix Table A8 illustrates this fact, regressing reported diarrhea on mother's education, where the omitted category is no education. The table also includes regressions where weight-for-age is the dependent variable. The table shows that reported diarrhea is only weakly correlated with education, even though children of higher educated mothers tend to show fewer measurable symptoms of the problem: Point estimates indicate that mothers with some education are weakly *more* likely to report diarrhea than those with no education (columns 1 and 2). This is despite the fact that weight moves in the predicted pattern, increasing with education. Columns 3 and 4 show that the weight of children is strongly correlated with mother's education.

We also note that in the NFHS data, the reported incidence of diarrhea fluctuates significantly across survey rounds: In our sample it is 11% in the 1992/1993 round, up to 19% in the 1998/1999 round, and then back down to 11% in the 2005/2006 round. This non-monotonicity over time stands in stark contrast to the wide evidence from elsewhere, including the Census of India, that infant mortality—which is largely accounted for by diarrheal disease (Million Death Study Collaborators, 2010)—was steadily declining in India over this time period. For these reasons, we focus our analysis on surveyor-measured weight-for-age, following the standard practice (Schmidt et al., 2011). For more detail on the problems with survey-reported diarrhea, see Schmidt et al. (2011).

A.4 Cough, Fever, and Diarrhea

In Section 5.3 we describe an exercise that examines whether fever and cough respond to neighborhood religious composition differently than diarrhea. We attempt to address differences across mothers of different socioeconomic status in the subjective reporting of symptoms by comparing relative reporting of the three types of symptoms conditional on a mother × child fixed effect. We reshape the data to "stack" three observations per child, one for each symptom: fever, cough, and diarrhea. The dependent variable is an indicator for whether the mother reported that the child was recently ill with that symptom. We regress an indicator for a positive report of the symptom on mother × child fixed effects.

$$\begin{aligned}\text{Ill recently}_{ijt} &= \alpha + \theta_{ijt} + \gamma_1 \text{cough}_{ijt} + \gamma_2 \text{diarrhea}_{ijt} \\ &\quad + \psi_1 \text{cough}_{ijt} \times \overline{M_{jt}} + \psi_2 \text{diarrhea}_{ijt} \times \overline{M_{jt}} + \epsilon_{ijt}. \end{aligned} \tag{4}$$

where α_{ijt} are mother × child FEs. Note that the main effect of $\overline{M_{jt}}$ is absorbed by α_{ijt}. The variables fever_{ijt} and $\text{fever}_{ijt} \times \overline{M_{jt}}$ are the excluded categories. In this regression, cough_{ijt} and diarrhea_{ijt} take on values of one if the observation corresponds to that symptom type, regardless of whether the mother reported the symptom as present ($\text{Ill recently}_{ijt} = 1$) or absent ($\text{Ill recently}_{ijt} = 0$). Table A12 reports the coefficients, which show that relative to fever, diarrhea is more strongly negatively associated with fraction Muslim. Cough, in contrast, is not.

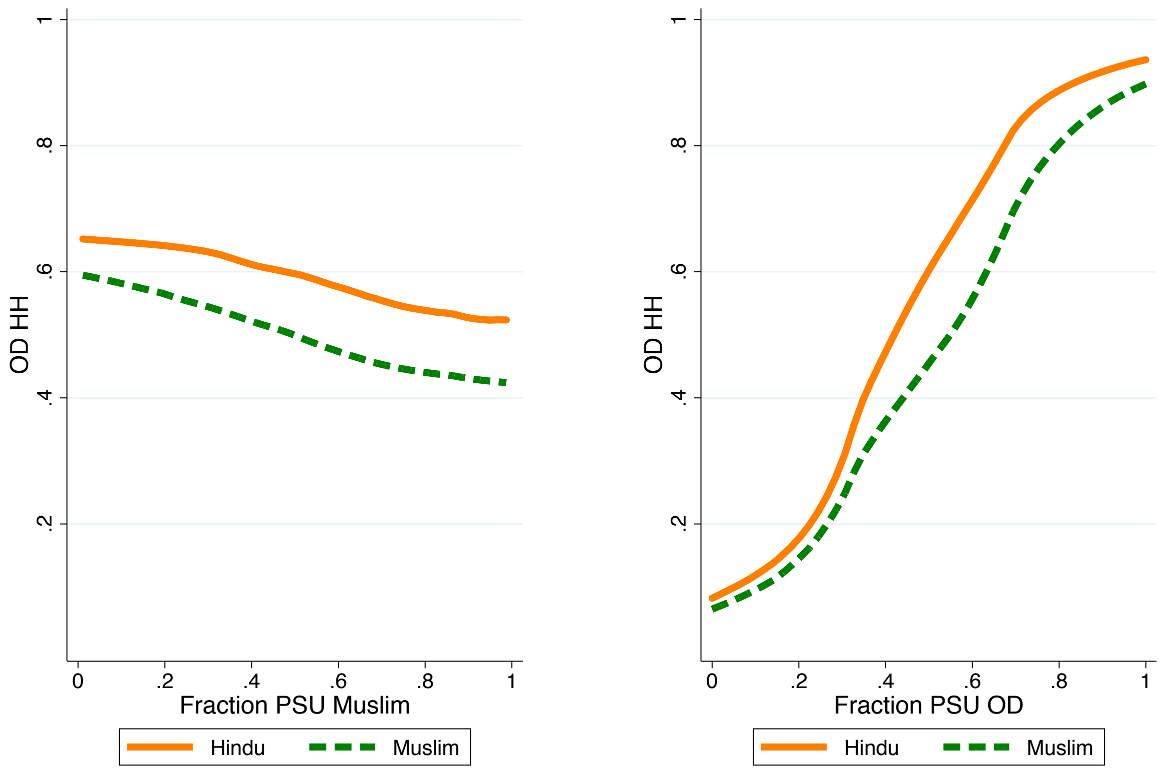
Appendix Figure A5 reports on a non-parametric version of this exercise, plotting residuals from a regression of symptom indicators on mother $\times$ child fixed effects, separately by symptom, against the religious composition of the PSU. The equation generating the residuals is:

$$\text{Ill recently}_{ijt} = \alpha_{ijt} + \gamma_1 \text{fever}_{ijt} + \gamma_2 \text{cough}_{ijt} + \gamma_3 \text{diarrhea}_{ijt} + \epsilon_{ijt}. \tag{5}$$

Figure A1: Correlation between Own and Neighbors' Open Defecation

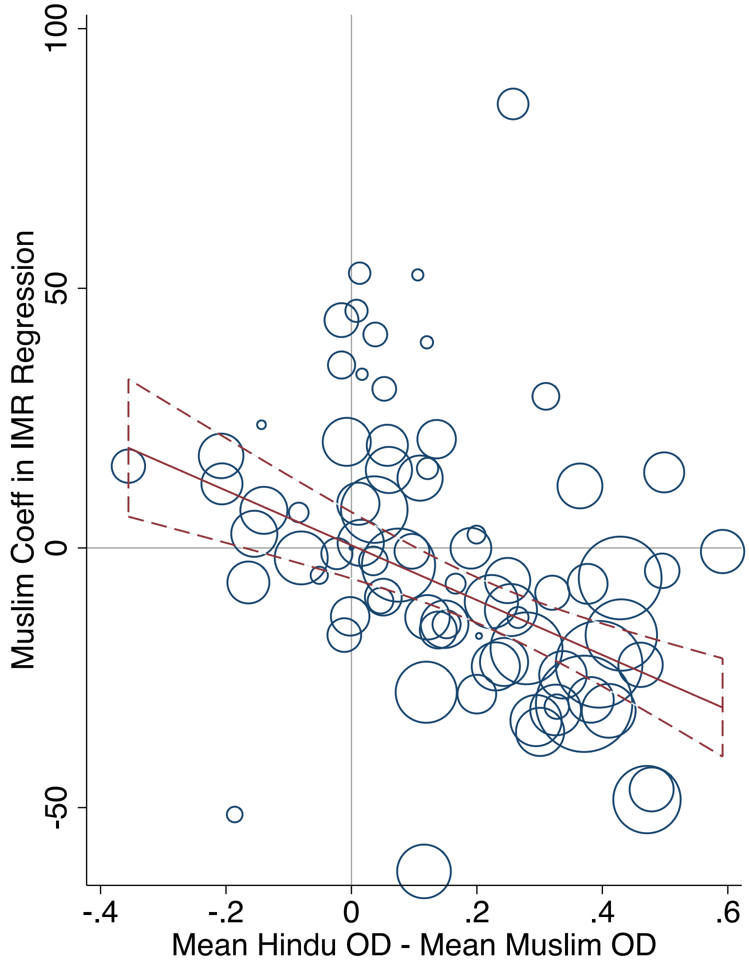
(A) Household OD vs $\overline{M_j}$

(B) Household OD vs Neighbors' OD ($\overline{OD_{ij}^{-i}}$)



Note: Figure plots local regressions of household OD on the Muslim share of the neighborhood (Panel A) and the fraction of the PSU that defecates in the open (Panel B). Neighborhoods are defined as survey PSUs. Observations are live births.

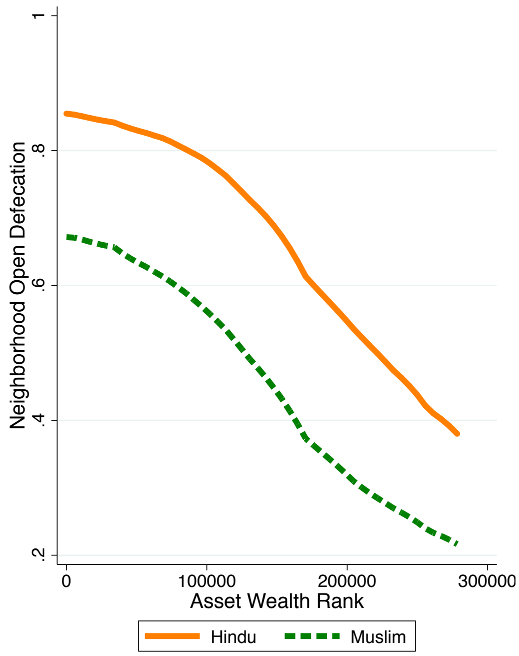
Figure A2: Hindu-Muslim IMR Gap Tracks Heterogeneity in First Stage Relationship Across States



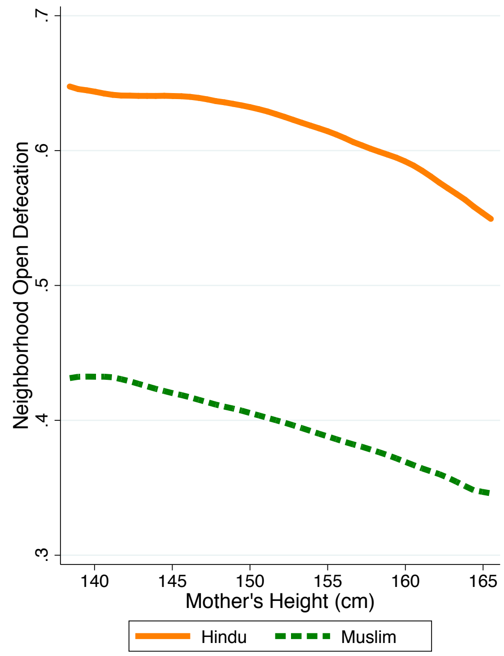
Note: Figure shows how heterogeneity in the first stage relationship between religious identity and open defecation is reflected in the reduced-form second stage relationship between religious identity and IMR. Scatter points are Indian states × survey rounds, with marker size proportional to sample size. The vertical axis measures the Muslim coefficient in an individual-level regression in which the dependent variable is IMR, estimated separately in each state × round. A linear regression is displayed in red, along with 95% confidence intervals. See Figure 6.

Figure A3: At All Levels of Parental Wealth and Health, Hindu OD Exposure is Higher

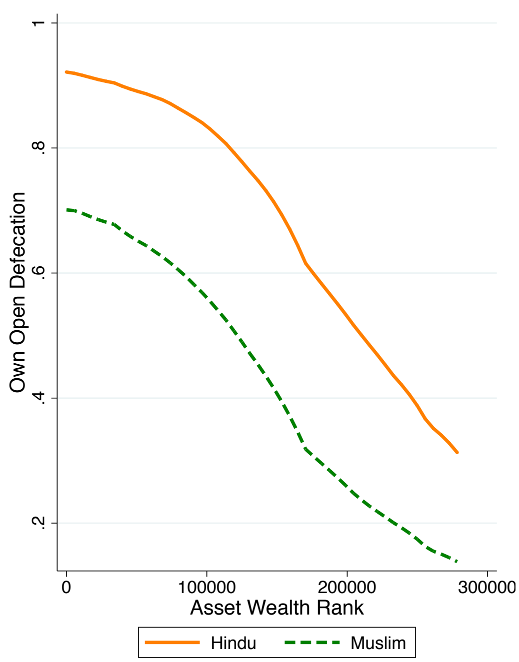
(A) PSU OD vs. Asset Wealth



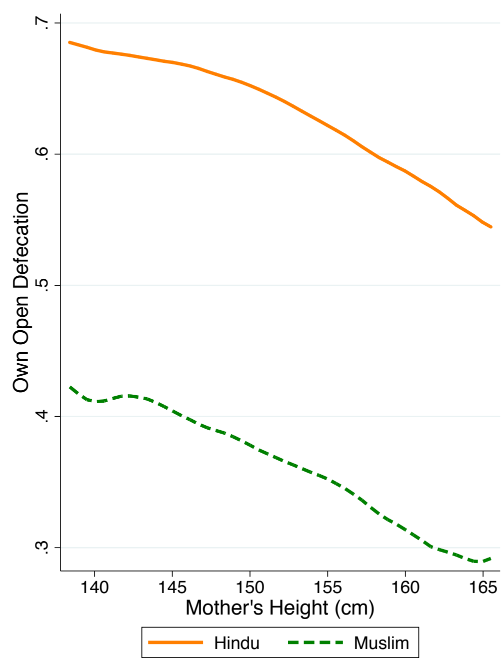
(B) PSU OD vs. Mother's Height



(C) Own OD vs. Asset Wealth



(D) Own OD vs. Mother's Height

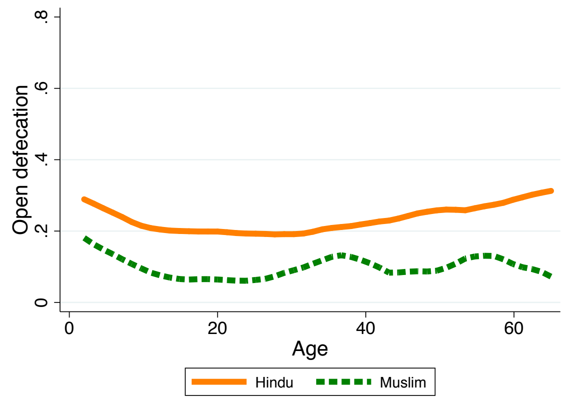


Note: Figure plots local regressions of neighborhood OD (Panels A and B) and household OD (Panels C and D) on the economic wellbeing of the household, proxied by asset wealth and mother's height. Neighborhoods are defined as survey PSUs. Observations are live births.

Figure A4: Hindu-Muslim Differences in OD: Unconditional and Conditional on Owning a Latrine

(A) By Age; All Households

(B) By Age; Households that Own Latrines

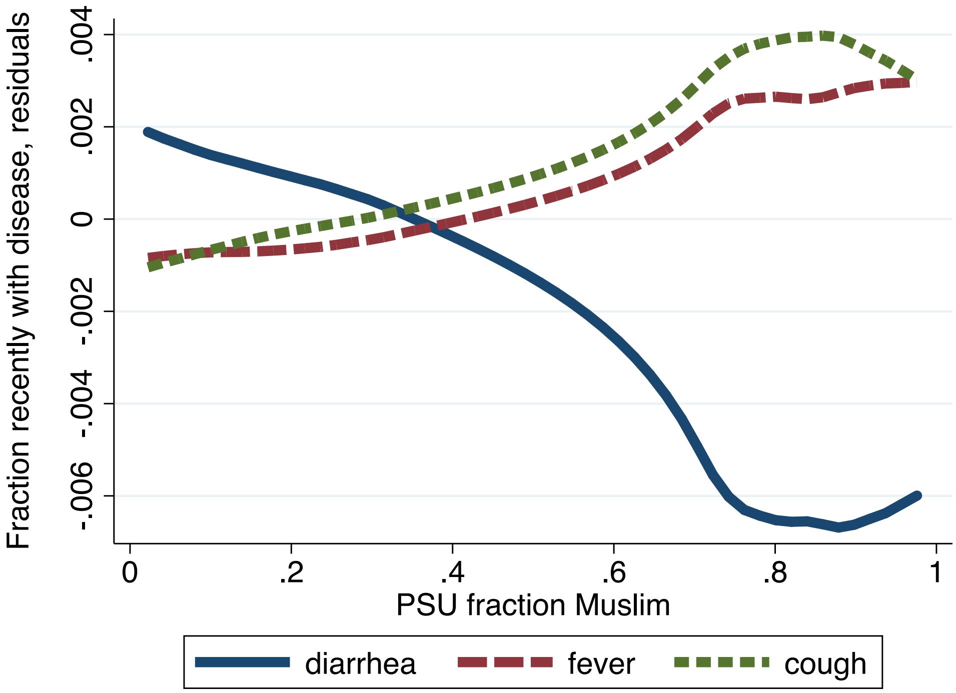


(C) By Life Satisfaction; All Households

(D) By Life Satisfaction; Households that Own Latrines

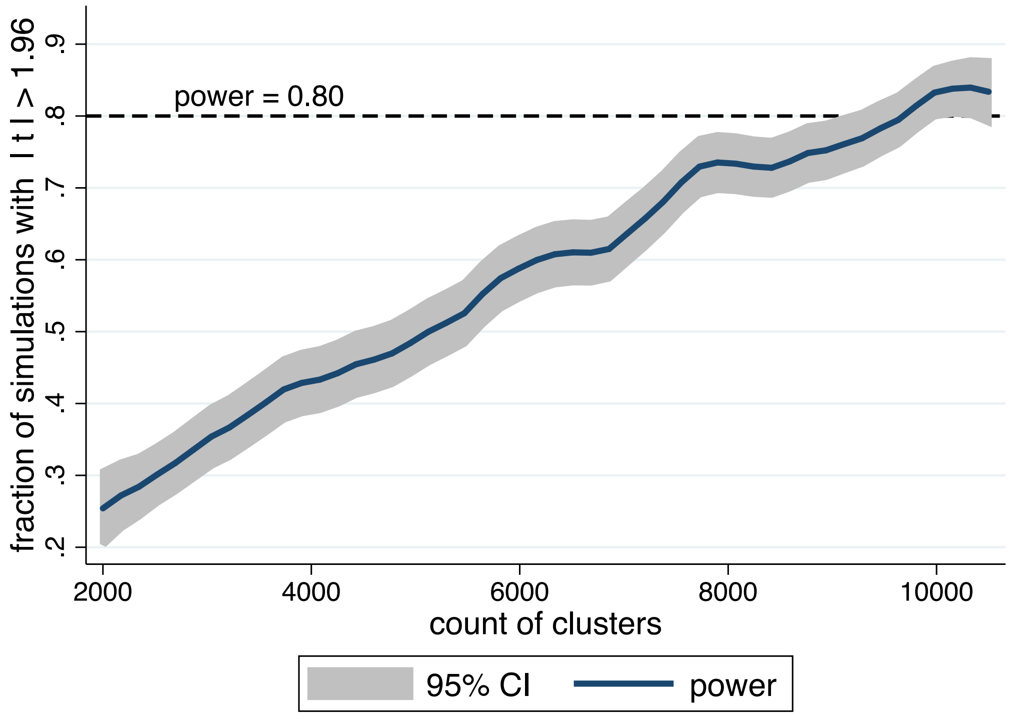
Note: Figure plots local linear regressions in which the dependent variable is person-specific open defecation. The sample in the left panels includes all household members for whom a response was recorded. The sample in the right panels includes only respondents in households that own a latrine, illustrating the preference for open defecation even when latrines are clearly available. The rows, respectively, condition on age and a life satisfaction "ladder" question (0 to 10, 10 being the most satisfied). The dataset used to construct these plots is the SQUAT survey. Observations are individuals. See Table 4 for additional data notes.

Figure A5: Symptoms by Fraction Muslim: Residuals from Mother × Child FE Regressions



Note: Figure plots local regressions of symptom residuals on $\overline{M_j}$. Residuals are generated from a stacked regression in which an observation is a child × symptom, for each of three symptoms: fever, cough, and diarrhea. An indicator for a positive report of the symptom is regressed on mother × child fixed effects and on indicators for each of the three symptom types. Residuals are plotted separately by symptom. See Appendix A.4 for additional details.

Figure A6: Experimental Sample Size Needed to Identify the Mortality Externalities of OD



Note: Figure plots statistical power against the number of clusters for a hypothetical experiment that generates infant mortality reductions equal to 5 percent of the mean infant mortality rate via a cluster-level externality. Observations are generated by sampling NFHS survey data, following a Monte Carlo procedure described in Appendix A.1. The line in the figure is a local polynomial regression of the simulation result on the cluster count.

Table A1: Correlates of Muslim Share Across PSUs

dependent varible:	assets (fraction of 7)		electricity		piped water		urban	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fraction PSU Muslim	-0.039***	-0.076***	-0.041	-0.155***	-0.091**	-0.169***	0.077*	-0.032
	(0.010)	(0.008)	(0.029)	(0.023)	(0.029)	(0.026)	(0.035)	(0.029)
HH Muslim & HH OD		X		X		X		X
mean of dep. var.	0.275	0.275	0.569	0.569	0.368	0.368	0.357	0.357
observations (live births)	104,090	104,090	104,090	104,090	104,090	104,090	104,090	104,090

dependent Varible:	mother education in years		mother literate		household size		birth order	
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Fraction PSU Muslim	-0.392*	-0.258	0.005	-0.003	0.756***	0.173	0.580***	0.255***
	(0.181)	(0.141)	(0.022)	(0.018)	(0.141)	(0.145)	(0.054)	(0.054)
HH Muslim & HH OD		X		X		X		X
mean of dep. var.	3.014	3.014	0.400	0.400	7.553	7.553	3.054	3.054
observations (live births)	104,090	104,090	104,090	104,090	104,090	104,090	104,090	104,090

dependent Varible:	father education in years		child ever vaccinated		family has healthcard		institutional delivery	
	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
Fraction PSU Muslim	-0.542***	-0.386***	-0.027	-0.006	-0.061**	-0.038	-0.011	-0.047*
	(0.079)	(0.080)	(0.021)	(0.021)	(0.023)	(0.022)	(0.025)	(0.021)
HH Muslim & HH OD		X		X		X		X
mean of dep. var.	3.313	3.313	0.790	0.790	0.568	0.568	0.357	0.357
observations (live births)	77,122	77,122	30,078	30,078	30,182	30,182	31,252	31,252

dependent Varible:	birth assistance		mother has own money		mother has healthcare say		clean cooking fuel	
	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)
Fraction PSU Muslim	-0.047	-0.089***	0.004	0.035	0.032	0.016	-0.116**	-0.147***
	(0.025)	(0.021)	(0.040)	(0.042)	(0.024)	(0.026)	(0.043)	(0.032)
HH Muslim & HH OD		X		X		X		X
mean of dep. var.	0.433	0.433	0.441	0.441	0.275	0.275	0.328	0.328
observations (live births)	31,271	31,271	27,123	27,123	26,474	26,474	27,111	27,111

Note: Table reports results from OLS regressions in which the dependent variable is a characteristic of a household, parent, or child, and the single regressor is the fraction of the PSU in which the child resides that is Muslim ($\overline{M}$). The sample is limited to mixed religion PSUs ($0 < \overline{M} < 1$). Observations are children (live births), and sample size varies across regressions because some survey questions were asked to only subsets of respondents. Standard errors are clustered at the PSU level. * $p < 0.05$, ** $p < 0.01$.

Table A2: Correlates of IMR: Signing the Potential Biases (see Table A1)

dependent variable:	Infant Mortality (IMR)			
Regressor:	assets (fraction of 7)	electricity	piped water	urban
	(1)	(2)	(3)	(4)
coefficient in IMR regression	-76.9***	-35.6***	-22.7***	-27.0***
	(3.9)	(2.1)	(2.1)	(2.1)
observations (live births)	104,090	104,090	104,090	104,090
Regressor:	mother education in years	mother literate	household size	birth order
	(5)	(6)	(7)	(8)
coefficient in IMR regression	-4.8***	-37.9***	-2.9***	4.3***
	(0.2)	(1.9)	(0.2)	(0.5)
observations (live births)	104,090	104,090	104,090	104,090
Regressor:	father education in years	child ever vaccinated	family has healthcard	institutional delivery
	(9)	(10)	(11)	(12)
coefficient in IMR regression	-2.4***	-116.7***	-57.8***	-26.5***
	(0.5)	(4.8)	(2.8)	(2.7)
observations (live births)	77,122	30,078	30,182	31,252
Regressor:	birth assistance	mother has own money	mother has healthcare say	clean cooking fuel
	(13)	(14)	(15)	(16)
coefficient in IMR regression	-29.2***	2.600	0.900	-29.4***
	(2.7)	(3.3)	(3.6)	(3.5)
observations (live births)	31,271	27,123	26,474	27,111

Note: Table reports results from OLS regressions in which the dependent variable is IMR. Each column reports a separate regression of IMR on a single regressor, which is listed in the column header. Mortality variables are scaled as described in the text to generate coefficients that indicate impacts on rates $\times$ 1000 (deaths per 1000 children). The sample is limited to mixed religion PSUs ($0 < \overline{M} < 1$) to correspond to Table A1. Observations are children (live births), and sample size varies across regressions because of the design of the DHS questionnaire, which asked some questions to only subsets of respondents. Standard errors are clustered at the PSU level. * $p < 0.05$, ** $p < 0.01$.

Table A3: Horserace Regressions: $\overline{OD_j}$, $\overline{M_j}$, and Mortality

dependent variable:	Infant Mortality (IMR)		Neonatal Mortality (NMR)	
	(1)	(2)	(3)	(4)
Muslim	-2.5	-3.6	-1.7	-1.6
	(2.1)	(2.3)	(1.7)	(1.9)
PSU fraction Muslim	4.6	-4.7	1.5	-2.8
	(2.7)	(3.0)	(2.2)	(2.5)
PSU mean OD (except own)	25.6**	9.4**	16.8**	8.0**
	(2.1)	(3.0)	(1.7)	(2.4)
own household OD	20.2**	5.9**	12.3**	4.9**
	(1.6)	(1.8)	(1.3)	(1.4)
extended controls		X		X
mean of dep. var.	72.2	72.2	46.2	46.2
observations (live births)	278,423	278,423	278,423	278,423

Note: Table reports results from OLS regressions. PSU mean OD is calculated over all households in the PSU other than the respondent household. Controls are as described in the Table 2 notes. All regressions include survey round fixed effects. Observations are children (live births). Standard errors are clustered at the PSU level. * $p < 0.05$, ** $p < 0.01$.

Table A4: Splits by Child Sex, Birth Order, and Urban/Rural

	Panel A: split by child sex					
dependent variable:	IMR					
sample restriction:	Full Sample		Boys		Girls	
	(1)	(2)	(3)	(4)	(5)	(6)
Muslim	-9.8**	-2.5	-9.0**	-1.3	-10.6**	-3.8
	(1.5)	(2.3)	(2.0)	(3.2)	(2.0)	(3.1)
own household OD		20.2**		20.4**		20.1**
		(1.7)		(2.3)		(2.4)
PSU mean OD (except own)		25.8**		22.0**		29.9**
		(2.3)		(3.0)		(3.1)
indicators for All Muslim & No Muslim		X		X		X
mean of dep. var.	72.2	72.2	73.7	73.7	70.6	70.6
observations (live births)	278,423	278,423	144,269	144,269	134,154	134,154

	Panel B: split by child birth order					
dependent variable:	IMR					
sample restriction:	Full Sample		First Birth		Second or Higher Birth	
	(1)	(2)	(3)	(4)	(5)	(6)
Muslim	-9.8**	-2.5	-6.7*	-1.4	-10.5**	-2.6
	(1.5)	(2.3)	(2.7)	(4.2)	(1.7)	(2.7)
own household OD		20.2**		22.7**		19.8**
		(1.7)		(3.0)		(2.0)
PSU mean OD (except own)		25.8**		38.4**		21.1**
		(2.3)		(3.8)		(2.7)
indicators for All Muslim & No Muslim		X		X		X
mean of dep. var.	72.2	72.2	74.4	74.4	71.4	71.4
observations (live births)	278,423	278,423	76,253	76,253	202,170	202,170

	Panel C: split by PSU location					
dependent variable:	IMR					
sample restriction:	Full Sample		Urban		Rural	
	(1)	(2)	(3)	(4)	(5)	(6)
Muslim	-9.8**	-2.5	-3.7	-4.6	-8.8**	-1.3
	(1.5)	(2.3)	(2.1)	(3.4)	(2.0)	(3.1)
own household OD		20.2**		22.4**		19.3**
		(1.7)		(3.1)		(2.1)
PSU mean OD (except own)		25.8**		19.3**		26.4**
		(2.3)		(4.8)		(3.4)
indicators for All Muslim & No Muslim		X		X		X
mean of dep. var.	72.2	72.2	52.0	52.0	80.9	80.9
observations (live births)	278,423	278,423	83,344	83,344	195,079	195,079

Note: Table reports results from OLS regressions. The dependent variable is IMR, scaled as described in the text to generate coefficients that indicate impacts on rates $\times$ 1000 (deaths per 1000 children). Columns 1 and 2 repeat the main results from Table 2 for reference. Columns 3 through 6 replicate the regressions in the subsamples defined in the column headers. All regressions include survey round fixed effects. Observations are children (live births). Standard errors are clustered at the PSU level. * $p < 0.05$, ** $p < 0.01$.

Table A5: Nonparametric Reweight: Counterfactual Hindu Mortality Under Muslim Exposure to Open Defecation

					Hindu Raw Mean:	Muslim Raw Mean:	Raw Gap to Explain:		
					73.93	63.17	10.76		
Reweighting variables					Reweight Results				
Round	Urban	Household Assets	Household Size	Birth Order	Reweight without OD	Residual Gap to Explain	Reweight with OD	Incremental Effect of OD Reweight	Percent Explained
					(1)	(2)	(3)	(4)	(5)
					73.93	10.76	62.31	11.62	108%
X					72.63	9.46	62.29	10.34	109%
X	X				70.52	7.35	61.95	8.57	117%
X	X	X			72.72	9.55	65.58	7.14	75%
X	X	X	X		69.58	6.41	61.76	7.82	122%
X	X	X	X	X	70.32	7.15	62.68	7.64	107%

Note: Table presents a nonparametric decomposition of the extent to which sanitation differences can account for infant mortality differences between Hindus and Muslims. Xs in the left of the table indicate the characteristics over which the reweight of the joint distribution is performed. Column 1 presents counterfactual mortality rates for Hindu children ($\times$1000), using the empirical Hindu distribution of exposure to OD and the Muslim distribution of other characteristics. Column 3 presents counterfactual mortality rates for Hindu children after matching the Muslim joint distribution of exposure to OD and the indicated characteristics. The distribution of open defecation is defined over 20 bins of exposure: 10 bands of local (PSU) open defecation interacted with household open defecation. Other characteristics are binned as follows: 3 survey rounds, 2 urban statuses, 8 bins of asset ownership, 3 terciles of household size, and 4 quartiles of birth order. The final row matches the distribution of characteristics across 11,520 (=20$\times$3$\times$2$\times$8$\times$3$\times$4) cells.

Table A6: Breastfeeding $\times$ $\overline{M_j}$ Interactions in High and Low IMR Neighborhoods

dependent variable:	Infant Mortality (IMR)	
sample restriction:	PSU IMR < Median	PSU IMR ≥ Median
	(1)	(2)
Muslim	23.4	-43.4
	(21.1)	(36.0)
breastfed X Muslim	-25.9	47.3
	(21.1)	(36.4)
PSU fraction Muslim	44.1	32.2
	(27.1)	(48.4)
PSU fraction Muslim X breastfed	-45.4	-59.1
	(27.0)	(48.5)
PSU OD (except own)	142.2**	137.4**
	(14.7)	(23.5)
PSU OD (except own) X breastfed	-148.8**	-172.6**
	(14.7)	(23.5)
breastfed	-28.5**	-254.0**
	(6.8)	(18.8)
extended controls	X	X
indicators for All Muslim & No Muslim	X	X
PSUs	7,288	7,288
observations (live births)	42,775	40,927

Note: Table reports results from OLS regressions. The dependent variable is IMR, scaled as described in the text to generate coefficients that indicate impacts on rates $\times$ 1000 (deaths per 1000 children). The breastfed indicator is equal to one if the infant was exclusively breastfed during the first six months of life if she survived, or until death if she died. PSU mean OD is calculated over all households in the PSU other than the respondent household. The sample is split across the columns according to PSU-level mean IMR above or below the median. Controls are as described in the Table 2 notes. All regressions include survey round fixed effects. Observations are children (live births). Standard errors are clustered at the PSU level. * $p < 0.05$, ** $p < 0.01$.

Table A7: Summary Statistics from Supplementary Dataset: The India Human Development Survey

	Hindu Subsample		Muslim Subsample	
	Mean	SD	Mean	SD
	(1)	(2)	(3)	(4)
household open defecation	0.51	0.50	0.31	0.46
local (PSU) open defecation	0.50	0.35	0.33	0.34
local (PSU) fraction Muslim	0.05	0.12	0.66	0.33
household has piped water	0.30	0.46	0.28	0.45
household is urban	0.30	0.46	0.44	0.50
ln(per capita consumption)	9.90	0.68	9.83	0.61
non-vegetarian household	0.23	0.42	0.40	0.49
meat, household kg per month conditional on any	3.15	3.65	4.14	3.92
eggs, household dozen per month	4.17	10.98	9.73	18.64
milk, household liters per month	18.64	29.27	15.41	24.16
always wash hands after defecating[a]	0.72	0.45	0.70	0.46
usually or always wash hands after defecating[a]	0.96	0.18	0.96	0.20
always purify water[a]	0.11	0.32	0.12	0.33
usually or always purify water[a]	0.20	0.40	0.21	0.41
observations	32,572		4,623	

Note: Table displays summary statistics for the supplemental dataset used in Section 5.3, the 2012 round of the India Human Development Survey (IHDS). Observations are households.

[a] The sample sizes for the wash and water variables are slightly smaller than for the rest of the table because these were observed in the female questionnaire, rather than the main household questionnaire. These sample sizes are 32,254 and 4,550 for Hindus and Muslims, respectively.

Table A8: Reliability of Self-Reported Diarrhea vs. Objective Measures of Acute Malnutrition

	dependent variable:			
	respondent reported diarrhea		weight-for-height z-score	
	(1)	(2)	(3)	(4)
Mother some education	0.008	0.013+	0.341**	0.099**
	(0.007)	(0.007)	(0.027)	(0.026)
Mother high education	-0.021**	-0.002	0.918**	0.326**
	(0.005)	(0.007)	(0.021)	(0.025)
extended controls		X		X
mean of dep. var.	0.17	0.17	-1.90	-1.90
observations (live births)	25,684	25,684	25,684	25,684

Note: Table reports results from OLS regressions. In Columns 1 and 2, the dependent variable is the respondent's report of diarrhea in the child. In Columns 3 and 4, the dependent variable is the surveyor-measured weight and height, converted to a weight-for-height z-score according to the World Health Organization child growth standard. Some education corresponds to some primary education. High education corresponds to greater than primary education. The omitted category is no education. Extended controls are as described in the Table 2 notes. All regressions control for survey round fixed effects. Observations are children (live births). Standard errors are clustered at the PSU level. * $p < 0.05$, ** $p < 0.01$.

Table A9: Robustness of First Stage Result: Splits by Subsamples

dependent variable:	PSU mean OD (except own)					
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: split by child sex					
	Full Sample		Boys		Girls	
PSU fraction Muslim	-0.121**	-0.174**	-0.119**	-0.174**	-0.124**	-0.174**
	(0.013)	(0.012)	(0.013)	(0.012)	(0.014)	(0.013)
own religion and OD	X	X	X	X	X	X
extended controls		X		X		X
observations (live births)	104,090	104,090	53,779	53,779	50,311	50,311
	Panel B: split by child birth order					
	Full Sample		First Birth		Second or Higher Birth	
PSU fraction Muslim	-0.121**	-0.174**	-0.107**	-0.161**	-0.127**	-0.178**
	(0.013)	(0.012)	(0.013)	(0.012)	(0.014)	(0.013)
own religion and OD	X	X	X	X	X	X
extended controls		X		X		X
observations (live births)	104,090	104,090	27,020	27,020	77,070	77,070
	Panel C: split by own religion					
	Full Sample		Muslims		Hindus	
PSU fraction Muslim	-0.121**	-0.174**	-0.113**	-0.179**	-0.135**	-0.166**
	(0.013)	(0.012)	(0.018)	(0.016)	(0.015)	(0.014)
own religion and OD	X	X	X	X	X	X
extended controls		X		X		X
observations (live births)	104,090	104,090	34,052	34,052	70,038	70,038
	Panel D: split by PSU location					
	Full Sample		Urban		Rural	
PSU fraction Muslim	-0.121**	-0.174**	-0.054**	-0.103**	-0.177**	-0.202**
	(0.013)	(0.012)	(0.019)	(0.017)	(0.018)	(0.016)
own religion and OD	X	X	X	X	X	X
extended controls		X		X		X
observations (live births)	104,090	104,090	37,209	37,209	66,881	66,881

Note: Table reports results from OLS regressions in which the dependent variable is the mean of neighbors' open defecation in the PSU ($\overline{OD_{ij}^{-i}}$). The regressor of interest is the fraction of the PSU that is Muslim ($\overline{M}$). Column 1 reports results from the full sample. Columns 2 and 3 and Columns 4 and 5 estimate the identical OLS regression for each of the subsamples defined in the panel headers. All regressions control for own religion and own OD. Regressions in columns 4 and 6 include the extended controls as described in the Table 2 notes. All regressions include only the mixed-religion PSU sample over which the IV is defined ($0 < \overline{M} < 1$). All regressions include survey round fixed effects. Observations are children (live births). Standard errors are clustered at the PSU level. * $p < 0.05$, ** $p < 0.01$.

Table A10: Robustness of IV Results in Table 9: Splits by Subsamples

dependent variable:	Infant Mortality (IMR)		
	(1)	(2)	(3)
	Panel A: split by child sex		
	Full Sample	Boys	Girls
PSU mean OD (except own)	61.4**	55.2*	68.4*
	(21.5)	(28.0)	(29.0)
own religion and own OD	X	X	X
extended controls	X	X	X
observations (live births)	104,090	53,779	50,311
	Panel B: split by child birth order		
	Full Sample	First Birth	Second or Higher Birth
PSU mean OD (except own)	61.4**	66.4	59.1*
	(21.5)	(40.7)	(24.0)
own religion and own OD	X	X	X
extended controls	X	X	X
observations (live births)	104,090	27,020	77,070
	Panel C: split by own religion		
	Full Sample	Muslim	Hindu
PSU mean OD (except own)	61.4**	33.5	86.9**
	(21.5)	(26.9)	(33.4)
own religion and own OD	X	X	X
extended controls	X	X	X
observations (live births)	104,090	34,052	70,038
	Panel D: split by PSU location		
	Full Sample	Urban	Rural
PSU mean OD (except own)	61.4**	66.4	66.1**
	(21.5)	(49.0)	(25.4)
own religion and own OD	X	X	X
extended controls	X	X	X
observations (live births)	104,090	37,209	66,881

Note: Table reports results from IV regressions of mortality on neighbors' open defecation in the PSU ($\overline{OD_{ij}^{-i}}$). Mortality variables are scaled as described in the text to generate coefficients that indicate impacts on rates $\times$ 1000 (deaths per 1000 children). Column 1 reports results from the full sample IV regression in column 7 of Table 9 for comparison. Columns 2 and 3 estimate the identical IV regression over each of the subsamples defined in the panel headers. All regressions include only the mixed-religion PSU sample over which the IV is defined ($0 < \overline{M} < 1$). All regressions control for survey round fixed effects, own religion, own OD and the extended controls as described in the Table 2 notes, except for the single variable on which the sample is split in each panel (sex, birth order, etc.). Observations are children (live births). Standard errors are clustered at the PSU level. * $p < 0.05$, ** $p < 0.01$.

Table A11: Robustness of IV Results: Mortality is Uncorrelated with Residing in a PSU that is Religiously Dissimilar from the Respondent Household

dependent variable:	Infant Mortality (IMR)		Neonatal Mortality (NMR)	
sample restriction:	Mixed Religion PSU		Mixed Religion PSU	
specification:	IV	IV	IV	IV
	T9 - Col 7		T9 - Col 14	
	(1)	(2)	(3)	(4)
PSU mean OD (except own)	61.4**	61.8**	44.1*	44.2*
	(21.5)	(21.6)	(17.4)	(17.5)
own household OD	-14.1	-14.1	-7.8	-7.8
	(7.9)	(7.9)	(6.4)	(6.4)
fraction of PSU religiously dissimilar		-4.7		-1.1
		(3.9)		(3.2)
extended controls	X	X	X	X
mean of dep. var.	72.2	72.2	46.2	46.2
first stage F-stat	230.7	231.1	230.7	231.1
observations (live births)	104,090	104,090	104,090	104,090

Note: Table reports results from IV regressions of mortality on neighbors' open defecation in the PSU ($\overline{OD_{ij}^{-i}}$), instrumented with $\overline{M}_j$. The sample is restricted to the mixed-religion PSU sample over which the IV is defined ($0 < \overline{M} < 1$). Columns 1 and 3 repeat results from Table 9 for comparison. Columns 2 and 4 add a control for the fraction of the respondent's neighborhood that is religiously dissimilar, which equals $\overline{M}_j$ for Hindu households and $1 - \overline{M}_j$ for Muslim households. Extended controls are as described in the Table 2 notes. All regressions control for survey round fixed effects. Observations are children (live births). Standard errors are clustered at the PSU level. * $p < 0.05$, ** $p < 0.01$.

Table A12: Diarrhea, Fever, and Cough

dependent variable:	Infant Mortality (IMR)
	(1)
cough	-0.0397**
	(0.0035)
diarrhea	-0.1275**
	(0.0063)
cough X PSU fraction Muslim	0.0001
	(0.0092)
diarrhea X PSU fraction Muslim	-0.0293
	(0.0172)
mother X child FEs	X
observations (children X symptoms)	189,735

Note: Table reports results from an OLS regression. Observations are children $\times$ symptoms, so that the sample stacks three observations per child, one for each symptom: fever, cough, and diarrhea. Mother $\times$ child fixed effects are included. The coefficients are relative to the excluded categories—fever and fever $\times$ $\overline{M_j}$. The sample consists of mixed-religion PSUs ($0 < \overline{M} < 1$). * $p < 0.05$, ** $p < 0.01$.