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The Consequences of Social Inequality for the Health and Development of India's Children: The Case of Caste, Sanitation, and Child Height

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Abstract

The links among social inequality, economic inequality, and health have long been of interest to social scientists, but causal links are difficult to investigate empirically. In particular, studies examining the impact of social status on one's own health may overlook important effects of inequality on the health of populations as a whole occurring due to negative externalities of social forces. A recent literature on caste, sanitation, and child net nutrition provides an example of one social context where social inequality makes an entire population less healthy. This paper presents new observational analysis of the India Human Development Survey that provides descriptive evidence of this mechanism. We show that, on average, children in rural India are shorter if they live in villages where more people report practicing untouchability—meaning that they enforce caste hierarchies in their interactions with people from the lowest castes. This association is explained by the association between casteism and the prevalence of rural open defecation.

Keywords

Social inequality; Health; Height; India; Caste; Sanitation; Open defecation

Introduction

The relationship between socioeconomic status and health is well established: across many societies, more advantaged groups are healthier, on average. White people in the USA can expect to live over three years longer than Black Americans, for example. Throughout the world, indigenous people have large gaps in life expectancy relative to other citizens: the gap is 20 years in Australia, 20 in Nepal, and 13 in Guatemala (UN, 2010). These differences in life expectancy and health status have been documented and studied extensively in sociology and economics studies. Beyond life expectancy, gaps in levels of diverse health outcomes, such as obesity (Johnston & Lee, 2011), and inputs, such as smoking (Ho & Elo, 2013),

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Human and Animal Rights This article does not contain any studies with human participants performed by any of the authors, because the IHDS data that we received online are anonymous.

exist between racial groups. These gaps are present even in infancy: mortality rates among black infants are more than double those among white infants in the USA. Racial gaps in infant mortality have persisted even in the context of declining overall risks of infant death (Frisbie, Hummer, Powers, & Pullum, 2010). Gaps in actual and perceived safety may also contribute to health inequities, both through direct effects of violence and through indirect effects on emotional well-being (Case & Coates, 2017).

The mechanisms behind these disparities are difficult to understand, as the effects of social rank and of economic deprivation are closely linked. Social group and income are highly correlated, so reasons for disparities between rich and poor people or people of different races can encompass both explanations. Similarly, places with high inequality are often places where many people are poor, so what appears to be an effect of inequality may actually simply reflect poverty. Finally, poor health can cause poverty, and variables such as education affect health as well as socioeconomic status. The many levels of causation and feedback loops inherent in the relationships among economic standing, poverty, and social standing make it difficult to draw definitive conclusions about the causal role of social status in health outcomes (Cutler, Lleras-Muney, & Vogl 2011).

Despite these difficulties, there has been substantial effort to examine the relative contributions of poverty and inequality to observed gaps. Research on occupational rank, social status, and health has sought to establish a substantial role of *relative* social standing or economic status. One classic example of the difficulty is the Whitehall Studies of British civil servants. Participants with lower status jobs had higher mortality rates, higher obesity rates, and less healthy behaviors, a fact which has been interpreted as evidence of an effect of status on health (Marmot, Rose, Shipley, & Hamilton 1978; Marmot et al., 1991). Yet, when Case and Paxson (2011) re-analyzed the Whitehall data with attention to effects over the life course, they found evidence that these correlations in important part reflect an effect of health—especially early-life health—on economic outcomes.

The mechanisms that these studies examine are *direct* in that they constitute an impact of individual-level characteristics on a person's health outcomes. But what if social inequality affects the health outcomes of *all* members of society? If so, such a finding about *social* inequality may escape the common threat that apparent evidence of *economic* inequality may simply reflect poverty (Coffey & Spears, 2017). In economics, cases where one person's decisions affect another person's outcomes are called externalities. One classic example of a negative externality is pollution, where a firm's production decisions create a byproduct that harms people living nearby. Externalities can also stem from individual decisions, such as the decision to vaccinate one's children, which protects not only that child, but also other children interacting with him or her. Vaccination is an example of a positive externality. A recent literature in development economics finds that in certain contexts, the social mechanisms that perpetuate and result from inequalities among groups can also cause health behaviors harmful to everyone, rather than just the disadvantaged group.

This paper introduces the reader to this literature, particularly in the context of India, where health outcomes, compared with other developing countries, are worse than would

be predicted based on average income. Children in India are shorter and more likely to die at the beginning of life than children in other countries with similar levels of economic development. Because one in five births this year will be in India, understanding early-life health in India is important for everyone concerned with the global distribution of human well-being in our times.

Several recent studies have attempted to explain India's disadvantages in early-life health, finding that various dimensions of India's hierarchical social systems offer potential explanations for its relatively poor health outcomes. For example, in India, women are at their lowest social position within the household at the same time that they are most likely to have children. This low social status is associated with restricted food intake and heavy manual labor. Coffey (2015) uses data from 2005 to find that 42.2 percent of women are underweight prior to becoming pregnant; this is a much higher level of pre-pregnancy underweight than in Sub-Saharan Africa, a region which is poorer. Because underweight mothers often give birth to low-birth weight babies, this research suggests that not only does the low social status ascribed to young women in India affect the health of that group, but also it also affects the birth outcomes of their children. This is of particular importance given the recent research linking child health with adult outcomes such as wages and educational attainment.

In this paper, we examine the effects of another source of social inequality in India on health outcomes: the caste system. We present new observational evidence on the role of casteism in the stunted growth of Indian children. The empirical exercise is based on a novel question asked in the India Human Development Survey (IHDS) in 2012, which asks whether respondents' households practice untouchability, that is, whether they enforce the caste hierarchy in their interactions with people from the lowest castes (Thorat & Joshi, 2015). Substantial proportions of respondents answered in the affirmative, but there is large variation across regions and villages in the share of respondents who report that someone in their household practices untouchability. We examine the relationship between local casteism and child height, finding that children in households that practice untouchability are *taller*, on average,[1] than children in households that do not practice untouchability, but that children living in villages with a larger share of residents practicing untouchability are *shorter*, on average.

The latter association is explained in large part by a third variable: open defecation. Our analysis provides evidence of an effect of local open defecation externalities on child height that derives from variation in the practice of untouchability in India. This exercise builds upon previous work by Coffey and Spears (2017), who explore the relationships between the norms of ritual purity and pollution that enforce caste boundaries and the practice of open defecation, as well as Spears and Thorat (2017), who show empirically that local levels of casteism predict open defecation behavior, even controlling for possible confounding

[1]This positive relationship between household untouchability and height becomes small and insignificant with the inclusion of household-level socioeconomic and demographic controls, which suggests that this relationship can be explained by the fact that households that untouchability are more advantaged, on average; our focus is on *local* untouchability.

variables. Finally, we discuss how this case sheds light on the overall relationship between social inequality and health outcomes.

Open Defecation, Health, and Height in India

This paper examines the link between the caste system, sanitation behavior, and population health in India. Sanitation in India is poor: about 55 percent of rural households defecate in the open (Coffey & Spears, 2018), and declines in open defecation have happened much more slowly in rural India than in the neighboring countries of Nepal and Bangladesh (Ghosh, Gupta, & Spears 2014). Furthermore, 55% is likely an underestimate of the true proportion of *people* who defecate in the open: the data come from the 2015–2016 National Family Health Survey, which asks about sanitation at the *household* level. Coffey et al. (2014) find that in many households with latrines, some members use the latrine, while others defecate in the open. Therefore, estimates of open defecation derived from household-level data will miss individuals who practice open defecation living in households in which others use a latrine. As in the case of maternal malnutrition, India is an outlier in sanitation: many countries that are much poorer than India have lower rates of open defecation. In fact, according to the World Health Organization and the United Nations Children's Fund Joint Monitoring Report (2017), rural Indian open defecation accounts for over half of the world's open defecation.

A large literature links the practice of open defecation to a plethora of health threats, especially for children. Unsafe disposal of feces spreads disease, and the consequences are not limited to those who practice open defecation themselves. Open defecation creates an infectious disease environment that threatens to harm the health and net nutrition of children during the critical early-life years. Previous research has tied local open defecation rates to infant mortality rates. Leveraging the fact that Hindus in India are more likely to defecate in the open than Muslims in India, Geruso and Spears (2018) show that infant mortality rates are higher in villages with a larger fraction of Hindus (relative to Muslims), but that a household's own religion does not predict infant mortality, once neighborhood open defecation rates are accounted for. The overall Muslim survival advantage is striking because it exists despite the fact that on average, Muslims are disadvantaged in India relative to Hindus.

Children past infancy remain vulnerable during the critical early years in which their bodies and brains are developing: there are several potential pathways through which exposure to fecal germs can harm the health and proper growth of children. Most obviously, feces harbor germs that contribute to diarrheal episodes. Diarrhea itself can be dangerous, but even if it is only a temporary problem, it prevents the body from absorbing nutrition from food. Recent research has also suggested that long-term exposure to contaminated food and water may contribute to a condition called environmental enteric dysfunction, an illness that causes chronic intestinal inflammation. The inflammation over time causes a flattening in the folds of the intestine and prevents the proper absorption of food, which in turn has been hypothesized to stunt growth and cause other health problems (Humphrey, 2009). Feces also harbor parasites such as hookworms, which grow in children's intestines and siphon nutritional resources from the child, stunting growth.

These consequences for health carry far into the future; failure to grow to one's full height potential is correlated with failure to grow to one's full cognitive potential (Case & Paxson, 2008). This has consequences for economic outcomes such as educational attainment and earnings (Lawson & Spears, 2016). Given the correlations among height, overall health status, and cognitive ability, average population-level height is an important outcome to understand.

Open Defecation and the Caste System

This section briefly summarizes Coffey and Spears' (2017) recent book on the contribution of India's social systems to its unique open defecation problem. The caste system, historically and today, divides Indian society into many subgroups, called *jatis*. One's occupation, marriage prospects, and level of education are often related to one's caste, which is determined at birth. The caste system is particularly associated with Hinduism in India, although it is found among other religious groups as well.

The caste system is maintained and enforced in part through norms surrounding purity and pollution. The ideas of *ritual* purity and pollution are distinct from *physical* cleanliness and dirtiness. Under the norms of purity and pollution, both objects and people can be considered polluted and polluting to others or pure and purifying to others, irrespective of physical dirtiness. For example, cow dung and urine are considered purifying, while newborn babies and postpartum mothers are considered temporarily polluting.

The logic of purity and pollution reinforces the hierarchies of the caste system. People from the lowest-ranking castes are considered "untouchable" to other members of society. Higher-caste individuals have traditionally avoided physical contact with people from untouchable castes and refused to share food and water with them in order to avoid becoming polluted by them. People from untouchable castes are expected to do the dirtiest jobs, including disposing of animal carcasses, cleaning human feces, and de-blocking sewers and drains.

Initial improvements in sanitation—away from open defecation—have been achieved elsewhere in the developing world not through the installment of flush toilets but through the use of pit latrines, which are less expensive and simpler to install than sewers. These latrines, however, have pits that must eventually be emptied by hand, a job that, in India, is considered exceptionally polluting and thus only fit to be undertaken by people from untouchable castes. In recent years, people from these disadvantaged castes have protested the social injustices that they face in part by refusing to perform these types of jobs.

One consequence of these slow but ongoing social changes is that high-caste households considering whether or not to install a pit latrine are concerned that it will be difficult or expensive to find someone who is willing to empty the pit. As a result, many households forego the use of latrines altogether—even when the government distributes them for free.

In these ways, the forces of social inequality in India have prevented the progress toward improved sanitation that has been achieved elsewhere in the developing world, including in much poorer places. Neighboring Bangladesh, for example, is poorer than India, on average, but has a culturally and religiously distinct society, which contributes to the fact that the use

of inexpensive latrines is widespread and open defecation has essentially been eliminated there.

In this paper, we use quantitative data inspired by this qualitative evidence. The data are introduced in detail in the next section. A key variable in our analysis is the fraction of households in a village who report practicing untouchability—meaning, who report enforcing the rules of casteism. We use this variable as a proxy for the local importance of Hinduism-related casteism, purity, and pollution. Figure 1 shows that it is highly predictive of local open defecation. Therefore, *our hypothesis is that local Hinduism-related social inequality, as proxied by reported practice of untouchability, causes children to be exposed to more open defecation, on average, which translates into reduced child height-for-age, a key marker of early-life health*. The next section details the data, variables, and empirical methods by which we investigate this hypothesis.

Data and Methods

Building upon Coffey and Spears (2017), we pursue a novel empirical quantification of the impact of casteism on child health in India through the mechanism of open defecation. Because open defecation creates a disease environment that impacts entire localities, casteism could create substantial negative externalities through this pathway. We use the 2012 India Human Development Survey (IHDS), which measured children's heights and asked about sanitation and casteism in a nationally representative sample of about 40,000 households. The IHDS is a panel survey implemented by the University of Maryland and the National Council of Applied Economic Research.

Dependent variable The dependent variable in our analysis is a child's height-for-age *z*-score. We use the 2006 World Health Organization's child growth reference standards for healthy children to compute height-for-age *z*-scores.[2] The *z*-score can be interpreted as the number of standard deviations away from the age-specific mean that a child's height falls.[3]

Although the IHDS measured the height of some children over the age of 5, we restrict our sample to children under age 5 for comparability to studies using data from the Demographic and Health Surveys (DHS). We also follow the DHS recommendation of restricting the analysis to children with recorded height-for-age *z*-scores between −6 and 6. We highlight that the measurement of height in the IHDS is not as high quality as in the DHS: for Indian children in a similar time period, the variance of height in the IHDS is larger, and age-in-months is not available for all children. The calculation of height-for-age z-score using WHO standards requires age-in-months. As a result, we approximate age-in-months as the midpoint based on age-in-years (so, a one-year old would be coded as 18 months); this will introduce significant measurement error into the dependent variable.[4] Therefore, we do not interpret any result in this section as a quantitatively precise estimate

[2]The calculation consists of simply subtracting the mean height for the age group from the child's height and dividing the difference by the age-specific standard deviation.
[3]In the IHDS, some children are measured lying down, while others are measured standing (according to their age); we control for the position in which they were measured in all analyses.
[4]The results are robust to using log height (in cm) as the outcome variable rather than height-for-age z-score.

of India's true average effect of neighborhood open defection; rather, this section provides supporting evidence that suggests that such an effect exists and is large.

Explanatory variables For the main explanatory variable of interest, we take advantage of new questions introduced in the 2012 wave of the IHDS. The survey sought to elicit attitudes regarding members of lower castes through a set of two questions. The first question was: "In your household do some members practice untouchability?" If the respondent answered in the negative, they were then asked "Would there be a problem if someone who is scheduled caste were to enter your kitchen or share utensils?" The enforcement of untouchability unfortunately remains common: about a quarter of households in rural India responded in the affirmative to the first question and 31 percent answered yes to the first or second question (Spears & Thorat, 2017). We follow Spears and Thorat in defining the variable of interest as an indicator for whether the respondent said yes to *either* question (see Fig. 1 above).

The IHDS asks whether the household owns a toilet; the question also asks respondents specifically what type of latrine/toilet they own. The last option is "No facility belonging to household (or open fields)." Spears and Thorat (2017) use this answer as an indication of open defecation, and we follow that use. It is important to note, however, that Coffey et al. (2014) find that a substantial fraction of people living in households that own latrines do not use them, so this variable is likely to yield an undercount of actual open defecation. The two independent variables of interest (casteism and open defecation) are constructed as averages of the responses given by households living in the child's primary sampling units (PSU). These local averages estimate the fraction of a child's *neighbors* who practice open defecation and who practice untouchability; the child's own household is excluded from the local averages is both cases. PSUs in the IHDS are villages or urban blocks (IHDS, 2011).

To test alternative mechanisms for the relationship between child height and PSU-level untouchability, we also include controls for levels of conflict in the village using two measures. The first gives a PSU-level average of respondent's opinion of the level of conflict in the village, on a scale from 1 to 3 (where 3 is the least conflict). The second gives a PSU-level average of whether respondents report that their community bonds together to solve local problem, as opposed to each family solving their problems individually.

Table 1 reports summary statistics for the full sample of children and for subsamples of children exposed to different levels of local untouchability. Many important covariates, such as household consumption per capita, maternal education, markers for women's status (men eat first as opposed to household eating together or women eating first, a count of decisions that the mother reports having a say over out of eight total types of decisions), whether the household is urban, whether the household owns land, and number of children, are non-monotonically related to the prevalence of untouchability among a child's neighbors.

Empirical Strategy

Our observational empirical strategy builds upon Spears and Thorat (2017), who relate local levels of casteism to local open defecation. We use the same variable for casteism

as they use as their independent variable—namely, the fraction of households in a survey cluster or primary sampling unit (PSU) who report practicing untouchability—to examine the links between casteism, open defecation, and child height. Spears and Thorat show that there is substantial variation in local practices of both open defecation and casteism across India. They then demonstrate that these two practices are correlated, with households that admit to enforcing untouchability being more likely to defecate in the open themselves and areas where more people practice untouchability having a larger fraction of people who practice open defecation. Although their estimates are not intended to uncover a causal effect of casteism on open defecation, they rule out several alternative explanations, such as associations between practicing untouchability and broader economic disadvantage as well as associations between the practice of untouchability and incorrect health beliefs. Their econometric analysis shows that this relationship is robust to a wide range of regression controls. Therefore, this study will use local practices of untouchability as measured by the 2012 IHDS question as a source of variation in open defecation to examine the consequences for population health. We build on Spears and Thorat, who do not study health or height, by taking the relationship that they document as the first stage for the full chain that we investigate in this paper.

This paper empirically investigates the link between casteism, open defecation, and height. We show that, although children living in *households* that report practicing untouchability are slightly taller than other Indian children, on average, children living in localities where more neighbors practice untouchability are shorter on average, whether or not a wide set of household socioeconomic observables are accounted for. The main analysis investigates the relationship between PSU untouchability, open defecation, and individual-level child height using reduced-form OLS regressions. Specifically, we investigate these relationships by first estimating equations of the following form:

$$\text{HFA}_{ihv} = \beta_1 \text{practice untouchability}_{hv} + \beta_2 \overline{\text{practice untouchability}_{v}^{-i}} + \beta_3 \overline{\text{open defecation}_{v}^{-i}} + X_{ihv} + \epsilon_{ihv}, \quad (1)$$

where i indexes individual children, h indexes households, and v indexes PSU's (villages). $\text{practice untouchability}_{vs}^{-i}$ and $\text{open defecation}_{vs}^{-i}$ are PSU averages of the indicators of household-level untouchability and open defecation, respectively, calculated *without* household h. X_{iV} is a vector of child and household-level controls. This includes vectors of fully interacted age and sex controls, log consumption per capita of the household, whether the child was measured lying down or standing, whether the household owns land, indicator variables for the number of children in the house, and indicators for caste and religion categories. The standard errors are clustered at the level of the PSUs.

We examine the relationship between our independent variables of interest and height by building up to Eq. 1 in stages. We first examine the relationship between a household's practice of untouchability and the height of children living in the household. We then successively add other independent variables, examining how the effect of village-level untouchability impacts height relative to own household untouchability, and finally

examining whether measures of village-level open defecation mediate the relationship between village-level casteism and height outcomes.

This analysis shows that children living in localities where more neighbors report practicing untouchability are shorter, on average, but not after accounting for differences in exposure to open defecation. The quantitative, descriptive results from this exercise are consistent with open defecation having a large effect of child height in India, but we make no claim that these estimates reflect quasi-randomized causal effects.

Results

Table 2 shows the results of regressions examining the relationship between measures of untouchability at the household and PSU levels and child height-for-age. Column 1 shows the association between own household untouchability and height-for-age, with the full set of age-by-sex and measuring position controls. The relationship is small and statistically insignificant. Column 2 adds PSU-level untouchability to the regression and shows that children living among more neighbors who practice untouchability are shorter, on average, but those whose own households practice untouchability are taller. Column 3 adds a vector of controls for other predictors of child height, and the negative relationship between PSU untouchability and height remains. Note that controlling for PSU conflict and PSU bonding together could plausibly be over-controlling, because these could reflect common variation with untouchability; we nevertheless include column 3 for a more complete investigation of robustness. The positive relationship between own household untouchability and height shrinks with the inclusion of household observable characteristics, suggesting that this effect may be compositional rather than causal. Overall, these results demonstrate that the association between child height and untouchability are driven by *neighbors'* practice of untouchability, not the child's own household. This suggests that the negative overall relationship between the practice of untouchability and height partially reflects an *externality* of that practice on other households in the neighborhood.

Table 3 builds on Table 2 by investigating open defecation as a mediator of the relationships displayed in Table 2. The table presents three pairs of OLS results, each pair with and without a control for PSU-level open defecation included among the independent variables. All regressions control for age (in years) interacted with sex and whether the height measurement was taken standing or lying down. The first pair of estimates shows the results of a regression of height on PSU untouchability with and without the control for PSU-level open defecation. The second pair adds a control for urban status of the PSU and other PSU-level characteristics, and the third adds household-level controls for other predictors of child height.

The pairing exercise is useful because it helps us verify that open defecation is a major mechanism behind the relationship between untouchability and child height. There are various reasons why local casteism might predict child height (such as availability of public goods, or consequences of mothers' stress); by reporting each regression with and without the open defecation control, we demonstrate that the association between the PSU-level untouchability variable and open defecation explains a major portion of

the negative relationship between untouchability and height. The evidence from Table 2 suggested that the effects of untouchability on height occurred through an effect on the neighbors of households that practice untouchability, rather than through an association with own household discriminatory behavior. This evidence strengthens that argument by testing several alternative hypotheses.

In columns 3 and 4, we add in controls for several other PSU-level characteristics: urban status and controls for the level of conflict in the PSU. These controls account for PSU-level characteristics that may be correlated with both practices of untouchability and open defecation behaviors. For instance, it may be the case that untouchability is correlated with an overall lack of social cooperation or capital in the village, which could also be correlated with open defecation behavior. However, the overall pattern from columns 1 and 2 holds with these additional controls. Finally, in columns 5 and 6, we control for several socioeconomic and other variables of the child's household, including maternal education and women's status, which may be correlated with practices of untouchability and with child height.[5] Although the negative relationship between untouchability and height is statistically insignificant in the specification without the open defecation control, accounting for open defecation dramatically decreases the magnitude of the relationship. The controls verify that this pattern of results is not merely due to differences between rural and urban India, nor to the socioeconomic status of the child's household, nor to the child's family's caste or religion category.

These results are a useful addition to the literature on the effects of open defecation on child height because household-level omitted variables are implausible: children in India who live in households that report practicing untouchability are *taller* on average, than children who live in households who do not. Therefore, the fact that children living among more local neighbors who report practicing untouchability are *shorter* on average, suggests a mechanism rooted in externalities and context effects.

The confidence intervals in this analysis are wide, and these quantifications should not be taken as more than qualitatively indicative of the importance of open defecation for child height. However, in each case the null hypothesis of no association between sanitation and child height can be rejected, and in each case the confidence interval includes the effect sizes large enough to explain 100% of the height gap between children in India and sub-Saharan Africa, as quantified by Spears (2018). This is true with or without a wide set of controls.

Discussion and Conclusion

This paper has illustrated a link among social hierarchies, health behaviors, and health outcomes in India. In this case, the norms dividing people from untouchable castes from non-untouchables create health hazards that harm *everyone*, not just the socially and economically disadvantaged. Ideas about ritual purity and pollution have prevented

[5]In results not shown here but available upon request, we exclude Dalit respondents from the computation of each PSU's fraction of households reporting untouchability. We include this as a robustness check because a small, but positive number of respondents from untouchable castes report that they practice untouchability, which is difficult to interpret. The regression results are qualitatively unchanged, although this necessarily drops from the sample children living in segregated, all-untouchable caste PSUs.

progress toward improved sanitation in India, which would save lives and help people have healthy childhoods and reach their full economic potential. Open defecation in rural India contributes to an infectious disease environment that plagues Indian children with diarrhea, parasites, and other health problems. We find an association between PSU shares of people practicing untouchability and child height. This is despite the fact that, controlling for PSU untouchability, own household untouchability predicts improvements in child height. This suggests that the mechanism at play is a consequence of casteism that affects an entire neighborhood, rather than just the household practicing untouchability. We show that a major mechanism is open defecation: once PSU-level open defecation is controlled for, PSU untouchability no longer predicts child height.

Despite our results, important uncertainties and limitations remain. One limit is that, although the IHDS is a large survey, our statistical power is limited by the fact that not all households have children, and that we are studying village-level variation and must therefore cluster standard errors. The most notable limit is that this is an observational study of existing variation. The advantage is that we are able to study the full range of exposure to open defecation and casteism that exists throughout rural India. However, we do not have the benefits for causal inference of a randomized controlled trial. As a result, we cannot fully rule out all possible confounding factors that may have influenced our results.

A large literature in economics has debated whether *economic* inequality causes poor health, or whether the apparent correlation reflects omitted variables and spurious factors (Case & Paxson, 2011; Deaton, 2013). Our analysis differs from this debate because we study a case of *social* inequality: we show novel evidence of a case where social inequality leads to worse health outcomes throughout society. Previous literature in psychology, sociology, and economics has suggested that social inequality may have a substantial impact on health through mechanisms such as feelings of relative deprivation and restricted access to health care. However, these mechanisms are difficult to disentangle from the direct impact of absolute poverty on health as well as from third variables associated with both relative deprivation and health. The results of this paper suggest that—without necessarily offering evidence for or against channels of causation between one's *own* rank and one's own health—in certain important contexts, social inequality can create health *externalities* that affect whole populations, rather than only the marginalized themselves.

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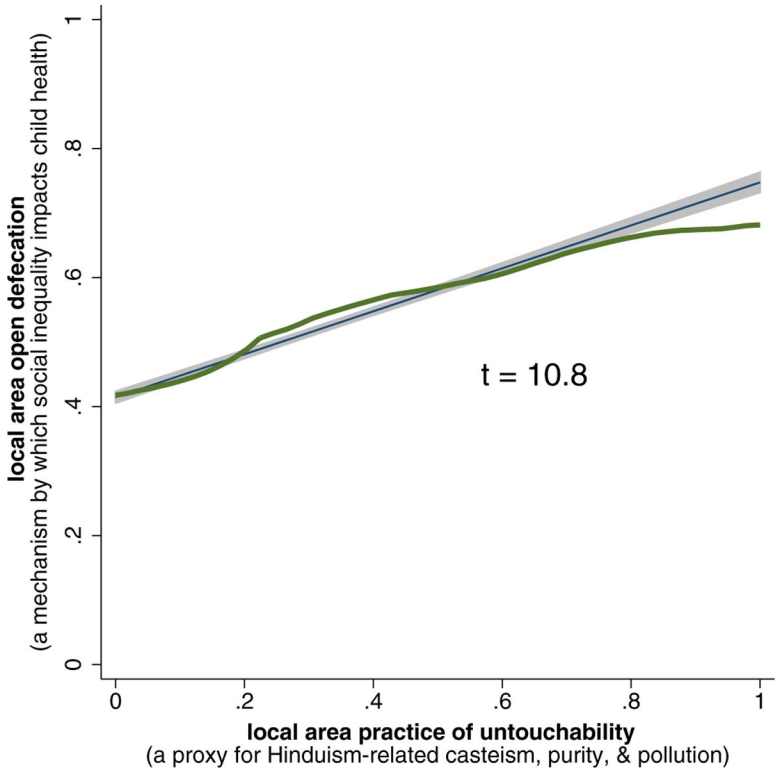

Fig. 1.

A proxy of Hinduism-related casteism, purity, and pollution practices predicts local-area exposure to open defecation among children. *Note*: Child-level sample of $n = 1\ 2922$ children, matching child-level height analysis from the IHDS. The horizontal axis displays the PSU average of our measure of untouchability, and the horizontal axis displays the PSU average of open defecation

Table 1

Summary statistics from IHDS analysis

	Full sample	No untouchability	Intermediate	All untouchability
Height-for-age *z*-score	−2.21	−1.98	−2.26	−2.52
PSU open defecation	0.52	0.35	0.56	0.65
PSU untouchability	0.33	0	0.39	1
PSU conflict	2.44	2.62	2.40	2.44
PSU band together	0.74	0.74	0.74	0.74
Urban	0.28	0.43	0.25	0.19
ln(cons. per capita)	9.62	9.71	9.60	9.57
HH farm land	0.48	0.31	0.52	0.53
Is only child	0.18	0.24	0.16	0.15
HH number of children	2.82	2.48	2.90	2.91
Hindu	0.80	0.64	0.83	0.84
Muslim	0.15	0.24	0.13	0.14
Dalit	0.25	0.27	0.25	0.06
Men eat first	0.32	0.17	0.35	0.38
Resp. has say	6.24	6.32	6.22	6.67
Mom has no education	0.35	0.22	0.37	0.48
Mom has less than secondary education	0.51	0.59	0.49	0.40
Mom has secondary education or more	0.15	0.19	0.14	0.12

Child-level sample of $n = 12{,}922$ children, matching child-level height analysis from the IHDS. No untouchability and all untouchability are subsamples for which PSU untouchability equals 0 and 1, respectively, with intermediate the remaining observations. The no untouchability, intermediate, and all untouchability subsamples account for 19.18 percent, 79.47 percent, and 1.35 percent of the full sample, respectively

Table 2

IHDS results are driven by local untouchability context, not own household's practice of untouchability

	(1)	(2)	(3)
Dependent variable:	Height-for-age z-score		
Own HH untouchability	−0.0144 (0.049)	0.148 ** (0.057)	0.108 + (0.060)
PSU untouchability		−0.445 *** (0.105)	−0.184 + (0.108)
PSU conflict			0.039 (0.056)
PSU bond together			0.066 (0.092)
ln(cons. per capita)			0.154 *** (0.045)
Urban			0.168 ** (0.0575)
HH has farm land			0.0185 (0.0471)
Men eat first			
Resp. has say			
3 maternal education groups			
Number of children			✓
7 social groups			✓
Age, sex, position	✓	✓	✓
n	11,094	11,094	10,226

Child-level sample, matching child-level height analysis from IHDS

***, **, *, and +denote statistical significance at the 0.001, 0.01, 0.05, and 0.1 levels. Standard errors are in parentheses

Table 3

Evidence from the association between child height and the practice of untouchability, IHDS

	(i)	(2)	(3)	(4)	(5)	(6)
PSU untouch.	−0.296*** (0.089)	−0.118 (0.086)	−0.169+ (0.091)	−0.068 (0.090)	−0.083 (0.092)	−0.048 (0.092)
PSU OD		−0.545*** (0.047)		−0.498*** (0.052)		−0.286*** (0.056)
Urban			0.348*** (0.053)	0.131* (0.059)	0.169** (0.058)	0.091 (0.061)
PSU conflict			0.086 (0.058)	0.088 (0.059)	0.038 (0.056)	0.047 (0.056)
PSU band together			0.106 (0.094)	0.073 (0.092)	0.065 (0.092)	0.045 (0.092)
In (cons.) per capita					0.155*** (0.045)	0.109* (0.045)
HH farm land					0.021 (0.047)	0.027 (0.047)
Maternal						
Education						
Men eat first						
Resp. has say						
Number of children					✓	✓
7 social groups					✓	✓
Age, sex, position	✓	✓	✓	✓	✓	✓
N	11,094	11,094	11,094	11,094	10,226	10,226

Child-level sample from the India Human Development Survey 2012; children under 5 years old with height-for-age between −6 and 6. The dependent variable is height-for-age z-score. PSU open defecation is the fraction of interviewed households in the child's survey PSU that report defecating in the open, while "PSU untouch." is the fraction of households that report practicing untouchability. See the Data and Methods section for further details

***, **, *, and + denote statistical significance at the 0.001, 0.01, 0.05, and 0.1 levels. Standard errors are in parentheses