Wealth, hierarchy, and child height in Indian social groups

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Abstract

An active recent literature debates whether social hierarchy and inequality have negative health consequences, and if so for whom. This paper describes a case where social rank matters, and in particular *being outranked* matters. We study average child height in four population groups in India: three ranked categories within the Indian caste system as well as Scheduled Tribes. Membership in these groups has been formalized by the Indian government in order to target services and affirmative action to groups that have experienced different social and economic disadvantages. We show that the height gap between Scheduled Tribe children and children from general caste, or historically dominant groups, be entirely accounted for by economic wealth. However, even after accounting for economic differences, an important height shortfall remains for Scheduled Caste and Other Backward Class children. Local social rank can fully explain the remaining height gap for these lower caste children. At the same level of economic wealth, children from the lower castes are no shorter, on average, than general caste children if they are not locally outranked by higher caste households living in the same local area. We extend our analysis to consider sanitation behavior as a mechanism through which being locally outranked may lead to height gaps between children of the general castes and the lower castes.

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1 Introduction

Low social rank is correlated with poor health and human capital outcomes in a range of societies (Lynch and Kaplan, 2000). Large literatures in economic demography and epidemiology consider whether apparent effects of low social status can be explained by associated economic deprivation, and in what cases low social rank may have a direct effect (Deaton, 2003; Eibner and Evans, 2005; Miller and Paxson, 2003; Colen et al., 2006; Kondo et al., 2008). We consider these questions in the context of caste and child height in India. India is an important context in which to study social disparities in health because of the extreme social hierarchy of the Indian caste system. It is an important context in which to study child height because of the puzzlingly poor nutritional outcomes in Indian children relative to their level of wealth.

We consider height differences between general caste children and children belonging to three population groups that receive affirmative action and special consideration for government services: Scheduled Castes (SCs), Scheduled Tribes (STs), and Other Backwards Classes (OBCs). Scheduled Castes and Other Backward Classes derive their status as protected groups due to historical discrimination related to being low caste. STs are sometimes referred to as "India's original inhabitants," and derive their protected group status from their economic and geographic marginalization. STs and SCs are notably more marginalized and deprived than OBCs and members of non-protected groups, known as "general castes."

We first show that child height gaps between between SC children and general caste children, and between ST and general caste children are approximately equal. However, ST children come from poorer households, on average, which live in different environments; ST communities are often isolated from people of other social groups, and less integrated into caste hierarchies. We find that the height gap between general caste and ST children can be entirely accounted for by observed measures of economic wealth. In contrast, even after accounting for economic differences, a large and important height shortfall remains for low

caste children.

To assess whether being socially outranked could account for the remaining height gap for low caste children, we construct a measure of local social rank: the fraction of households in a local area that have higher caste rank than a child's household. We find that local social rank can fully explain the remaining height gap for low caste children. This finding is a main contribution of our paper: at the same level of economic wealth, children from the lowest castes are no shorter, on average, than general caste children, if they are not locally outranked by higher caste households living in the same local area.

In an extending analysis, we consider health externalities from poor sanitation as a partial explanation for this result. Open defecation without using a toilet or latrine is common in India and is an important factor contributing to child stunting (Spears, 2013). Caste and defecation behavior are traditionally linked; in some villages open defecation is more likely to occur near the homes of low caste households. We use recent survey data collected by Coffey et al. (2014) to show that low caste rural survey respondents are more likely to report other people defecating in the open near their homes than are general caste respondents. In the national data on child height, we find that village open defecation externalities are more steeply associated with a height penalty for low caste children than for hight caste children.

A further methodological contribution of the paper is to highlight differences in the household properties reflected in SC or ST group membership, even if their levels of deprivation–in this case as measured by nutritional outcomes–are similar. Some empirical papers in development economics or economic demography control for social group using a combined "SC or ST" indicator, rather than separating these categories. Findings from this paper suggest that researchers should use caution when combining these disparate population groups.

First, in section 2, we describe our data and further describe the population groups we study and the social and economic hierarchies that group membership represents. In section 3.1, we document the apparent similarity of the SC and ST height deficits relative to general caste children. Next, in section 3.2, we show that economic differences can explain the ST

height gap but not the SC and OBC height gaps. Then, in section 3.3 we show that adding a measure of the extent to which low-caste children's families are socially outranked in their local geographic areas can fully account for the remaining SC and OBC height gaps. We verify that two other important dimensions of social status in India – gender and birth order – are not spuriously responsible for our results, and that our finding replicates within these categories. Finally, section 4 whether local sanitation behavior could be one mechanism through which being locally socially outranked could lead to height deficits between general caste and lower caste children with the same level of material wealth.

2 Data and population groups

We use the most recent Demographic and Health Survey (DHS) for India, the 2005 National Family Health Survey 3. The DHS is a nationally representative two-stage random sample survey; throughout the paper, we use recommended sampling weights. In addition to asking a wide range of demographic and health questions of children's mothers, the DHS measures the height and weight of children under 5 years old. Throughout this paper, we scale child height according to the 2006 WHO international reference population, and exclude children more than 6 standard deviations from the reference population, as the WHO recommends. This scaling transforms measured child height into height-for-age z-scores, or differences from the average height of children of the same age-in-months and sex of a healthy reference population.[1]

Although the average child in India is about two standard deviations shorter than the healthy reference population, this average masks important differences among social groups. We follow the division of Indian children into four population groups which are established by government policy, and recorded in the DHS: SC, ST, OBC, and general.[2] Scheduled

[1] Extensive field verification has documented that these WHO norms are appropriate for Indian children, and that children raised in affluent Delhi grow, on average, to the international norms (Bhandari et al., 2002).

[2] We classify households exactly as they report themselves to the DHS surveyor. In particular, we include

Caste (SC) children, also called *dalits* or *harijans* and historically known as "untouchables," belong to the lowest-ranked castes in the caste system. Scheduled Tribe (ST) children, also known as "tribal" or *adivasi*, belong to one of a large number of groups formally classified as indigenous by Indian legislation.[3] Both of these groups are widely considered have experienced severe social, economic, and political disadvantage and exclusion historically, which continues in various forms today. A third group, Other Backwards Classes (OBC), is an additional disadvantaged classification of castes; like SCs and STs they are targeted by certain government affirmative action policies, but were recognized in government policy later than SCs and STs and are generally considered to be less disadvantaged, on average, than SCs. We refer to children who do not fall into any of these three caste or tribal population groups as "general," a residual group which includes children of moderate or high caste rank.

Summary statistics in Table 1 include the distribution of children in our sample in to these three population groups. Of the children we study, 21.2 percent are SC and 9.7 percent are ST, the most disadvantaged groups, as measured by child height. 41.9 percent of children are OBC, and the remaining 27.2 percent are general.

3 Explaining the SC and ST height gaps

Children in different population groups grow to different heights, on average. Figure 1 plots average child height-for-age z-scores at each month of age for children under five years old. The figure presents a pattern commonly seen in developing countries: height-for-age is falling in the first two years of life, after which it is approximately flat, as any damage due to early life health and nutrition becomes difficult to reverse.

Figure 1 also shows a social gradient in height: general caste children are taller at all ages than OBC children, who are taller than SC and ST children. Moreover, the age patterns of height are very similar for SC and ST children: the curves cross several times. Although the

non-Hindus: many households report a caste rank and report a religion other than Hinduism.

[3]The term "Scheduled" refers to the enumeration of eligible castes and tribes in government schedules.

focus on this paper is the relationship between child height and social group membership, we note that group membership is not the only constraint on child growth: even general children are importantly shorter than the healthy international reference population.

The central question of this paper is whether and how differences in observable characteristics can account for the differences in average height documented in figure 1. ST and SC households are not only socially disadvantaged, they are also poorer on average than general children, and in some cases live in different places. Following decomposition research in the tradition of Blinder (1973) and Oaxaca (1973), we first ask how much of the difference in child height across population groups can be accounted for by observable differences in material wealth; the remaining difference could potentially be the results of direct effects of social exclusion, which is the focus of the rest of the paper.

3.1 The apparent similarity of the SC and ST height gaps

Table 2 quantifies the height gap among population groups by regressing child height-for-age on three indicator variables for population group membership, with general caste children as the omitted category. OBC children are shorter than general children, on average, and SC and ST children are shorter still.

The SC and ST height deficits, relative to general caste children, are strikingly quantitatively similar. This similarity in the average level of deprivation may explain the common practice among empirical researchers of including as a regression covariate a single, combined indicator variable for SC *or* ST group membership. Column 2 replaces the SC and ST indicators with such a single combined indicator; columns 3 and 4 show that, after the inclusion of such a combined indicator, neither an SC or an ST separate indicator statistically significantly improves the fit of the model. However, we will find that SC and ST group membership reflect very different mechanisms to produce child stunting.

3.2 Which gaps can wealth differences explain?: Oaxaca-Blinder decomposition

Decomposition analysis estimates the fraction of an outcome difference between two groups that can be explained by a difference in observable inputs. The explanatory power of an input depends both on the size of its average effect and on the difference in its availability between groups. So, for example, for difference in education to explain differences in between blacks and whites in the U.S., it must be the case both that education matters for life expectancy and that education is different, on average, between whites and black.

Economic wealth predicts child height in India: children from richer households are taller, on average. If members of one population group are poorer than members of another on average, then this economic gradient would therefore predict that the poorer group is also shorter on average and all else equal. Table 3 shows that ST, SC, and OBC children all come from households that are asset-poorer, on average, than general caste children.[4] For all six assets, ST children's households are less likely to own the asset than SC children's households, and SC children's households are less likely to own the asset than OBC households. The fact that ST children are poorer than SC children suggests that wealth will be able to explain more of the ST-general gap than of the SC-general gap.

One aspect of the different material environment to which ST children are exposed is the fact that ST households are more likely than members of other population groups to live in their own separate villages, rather than in villages with households of other groups. Figure 2 plots this difference. Observations in the figure are the children we study, and the horizontal axis is the fraction of households in a child's local Primary Sampling Unit (PSU),[5] which is the area from which the DHS selects households, who share its population group.[6] Thus, a child whose value of the plotted variable is 1 lives in a villages where all households are of

[4]Demographic and Health Surveys do not collect consumption or income data, but do ask about household ownership of several assets.

[5]PSUs are villages in rural areas, and a few blocks in urban areas.

[6]We compute this variable from household-level DHS data.

the same population group as she is, and a child at 0.5 lives in a village where half of the households are in the same population group as she is.

The figure plots cumulative distributions by the four population groups. Many ST children are found massed at 1 – that is, in ST-only localities. The ST distribution stochastically dominates the other distributions. SC children, in contrast, are generally found in local areas where the majority of households are not SC. Thus, figure 2 provides initial evidence that ST children tend to live in a different environment than children of other groups, while SC children are likely to share a physical environment with children from higher-ranking caste groups.

3.2.1 Empirical strategy

The rest of this section uses decomposition methods from labor economics to ask how much of the height gaps between general caste children and children who are SC, ST, or OBC can be explained by other observed measures of asset wealth and socioeconomic status (Fortin et al., 2011). We conduct three Blinder-Oaxaca decompositions, one for each of the three disadvantaged population groups, considering separately the average gap between each group and general caste children. We follow the recommendation of Jann (2008) to equally weight the effect estimates with both samples (for example, in a decomposition of the general-ST gap the "effect" of having electricity is computed as the average of the effect among general children and among STs).

As our explanatory variables in the decomposition, we use standard indicators of asset wealth and economic status that are observed in DHS data. In particular, we include indicators for ownership of seven assets: electricity, radio, TV, refrigerator, bicycle, motorcycle, car, and telephone. We further include an indicator for the households type of flooring material and type of sanitation facility (including for open defecation without using a toilet or latrine), and an indicator for literacy of the child's mother. We plot point estimates and 95% confidence intervals for the unexplained child height-for-age gap before and after accounting

for these indicators of economic wealth.

3.2.2 Results

Figure 3 plots results of the decomposition analysis for each group. Although the SC and ST gaps are very similar in magnitude, these results show that they have different explanations. These indicators of asset wealth completely account for the ST-general height gap, such that the remaining unexplained difference is not statistically significantly distinguishable from zero. Low caste children – who are more likely than ST children to share a local environment with higher-caste children, but have lower social rank – continue to be shorter than general caste children, on average, even after accounting for many dimensions of economic wealth. These decomposition results suggest that controlling for SC or ST indicators may control for very different properties of households.

3.3 Social rank and consequences of caste

If material poverty cannot fully account for the height deficit of low-caste children, can their low social rank? Although SC children are relatively socially low-ranking throughout India, different SC children may have a different experience of caste rank depending on the extent to which they are out-ranked *locally*. Where SC children live mainly or entirely among other SC households, low rank may have less of an impact on their lives than other SC children who live near higher ranking children. In other words, if social rank must be enacted to have its effect, then low ranking household may require exposure to high ranking households for being outranked to have its ill effects.

To test whether the consequences of being outranked can explain the remaining height deficit of low caste children, this section constructs a measure of local rank: the fraction of households in a child's local area of higher caste rank. We show that local rank can account for the remaining SC gap. At the same level of material wealth, SC children who are not *locally* outranked by households of higher caste are not shorter than general caste children,

on average.

3.3.1 Empirical strategy

The principal empirical strategy of this section is the construction of a child-level variable *local caste rank*. This variable is an estimate, computed from the DHS, of the fraction of households in a child's local area – operationalized as survey PSU – of higher caste rank. Therefore, lower numbers reflect higher local social rank. Because ST households tend to live in separate villages and are in some cases less integrated into the Indian caste system, we omit ST children and households from this analysis.

For general caste children, this measure is zero by construction for all children. For SC children, *local caste rank* is the fraction of the PSU that is OBC or general; thus

$$local\ caste\ rank_{SC} = \frac{OBC\ households + general\ households}{SC\ households + OBC\ households + general\ households}. \quad (1)$$

For OBC children, *local caste rank* is the fraction of the PSU that is general caste; thus

$$local\ caste\ rank_{OBC} = \frac{general\ households}{SC\ households + OBC\ households + general\ households}. \quad (2)$$

There is wide dispersion in local caste rank. Figure 4 plots the empirical cumulative distribution of local caste rank, separately for OBC and SC children. SC children are distributed from 0, where no local households are OBC or general, to nearly 1, where every other household is of higher rank. OBC children are unsurprisingly less intensively locally outranked – and about one-third of OBC children are at 0 and not locally outranked at all – but are also distributed from 0 to nearly 1.

3.3.2 Results

Can being locally outranked account for height differences that assets and wealth cannot? Table 4 reports regression results that first replicate the decomposition results and then

shows that local rank can explain the remaining height shortfall of low caste children.

Height-for-age is the dependent variable in all regressions, and Panel A begins with children from all four population groups. Column 1 reprints the puzzle to be explained from Table 2: SC and ST children have a similar height deficit versus general caste children, while OBC children face a smaller deficit. Column 2 replicates the decomposition results in Figure 3 with a different function form: column 2 adds to the regression a fixed effect for every combination of assets and economic variables used in the decomposition. Thus, for example, one fixed effect is for having electricity, a radio, and a bicycle but nothing else and defecating in the open.

After these non-parametric wealth controls, the ST gap is essentially eliminated, but considerable SC and OBC gaps remain. The 0.161 standard deviation remaining SC shortfall is large and of economic importance. As illustration, it is larger than the India-Africa child height gap which has received much recent attention from economists and is estimated by both Pande and Jayachandran (2013) and Spears (2013) to be about 0.14 standard deviations.

To continue with caste rank as an explanation for the remaining gap, column 3 completes the asset fixed effects specification of column 2 but omits ST children; local caste rank is not defined for ST children, so column 3 verifies that omitting ST children does not importantly change results for SC and OBC children. Finally, column 4 non-parametrically controls for local caste rank. Column 4 adds to column 3 a set of 10 indicator variables, one for rank from each band $0.0 - 0.1, 0.1 - 0.2, \ldots, 0.9 - 1.0$. Local caste rank completely accounts for the remaining height gap, such that the coefficients on SC and OBC become positive and not statistically significantly different from zero. This means that, at the same level of asset wealth, low caste children who are not *locally* outranked are not shorter, on average, than general caste children.

Panel B replicates the analysis of Panel A excluding OBC children. This is an important robustness check because the caste rank of OBC households varies throughout India; in some

places, some OBCs are not very low ranking. The results are unchanged in this different sample.

3.3.3 Effects of local rank within demographic categories

Table 5 conducts two robustness checks to verify that other important dimensions of Indian social heterogeneity – sex and birth order – are not spuriously responsible for our result. Girls in India are well known to face a wide range of health input disadvantages (*e.g.* Kishore and Spears, 2014).

None of these changes to the sample change the results. In all four sub-samples, important low-caste height gaps remain after accounting for differences in asset wealth. Similarly, in all four sub-samples, these gaps are eliminated by further controls for local caste rank. Within every category, low caste children who are not locally outranked are about as tall as general caste children of the same economic wealth.

4 Extension: Are sanitation externalities a mechanism?

Most people in India defecate in the open, without using a toilet or latrine. Open defecation releases fecal germs into the environment, where they can cause disease in nearby children. Various biological pathways could link exposure to poor sanitation to child height, including diarrhea (Checkley et al., 2008), parasitic infection, and inflammatory intestinal reactions to a large quantity of fecal pathogens (Humphrey, 2009; Lin et al., 2013). Spears (2013) has recently documented quantitatively large effects of open defecation on child height throughout the developing world and in India.

Sanitation in India has long historical links with the caste system which continue to show effects in the present day (Lamba and Spears, 2013). "Manual scavenging," or the manual removal of human feces from a place of defecation, is a job traditionally performed by – and closely associated with – members of Scheduled Castes (Black and Fawcett, 2008). Literature

on caste in India has pointed out that shared open defecation sites in villages are more often located nearer to the homes of low caste residents than high caste residents (Valmiki, 2003). In section 4.3, we present evidence from a new survey that supports this observation. If open defecation, and the germs it spreads, are indeed relatively concentrated near low caste children in villages with both lower and higher castes, then sanitation externalities could be one mechanism linking local caste rank to child height.

4.1 Empirical strategy

In this section, we construct a measure of the *local open defecation* externalities to which a child is exposed: the fraction of households in the child's village (survey PSU) which defecate in the open, rather than use a toilet or latrine. Spears (2013) and Kov et al. (2013) have recently shown this variable to be robustly predictive of child height in DHS data. For this analysis, we concentrate only on the rural sub-sample of children in the DHS: 90% of open defecation in India is in *rural* India, and rural PSUs are a better measure of the local disease environment to which a child is exposed than urban PSUs because rural PSUs are villages.[7]

We estimate interacted regressions of the following form:

$$\begin{aligned} \textit{height-for-age}_{iv} = \; & \beta_1^a SC_{iv} \times \textit{local open defecation}_v + \beta_1^b SC_{iv} + \\ & \beta_2^a OBC_{iv} \times \textit{local open defecation}_v + \beta_2^b OBC_{iv} + \\ & \beta_3^a ST_{iv} \times \textit{local open defecation}_v + \beta_3^b ST_{iv} + \\ & \beta_4 \textit{local open defecation}_v + \beta_5 \textit{household open defecation }_i t + \\ & \alpha + X_{iv}\theta + \varepsilon_{iv}, \end{aligned} \tag{3}$$

where i indexes individual children and v indexes villages. SC, OBC, and ST are indicators for population group membership, household open defecation is an indicator that the child's household defecates in the open, and X is a vector of controls.

[7]Because urban PSUs are urban blocks or sets of blocks, a child living near the boundary of the block may have a disease environment heavily influenced by neighboring blocks.

The coefficients of interest are β_2^a and especially β_1^a. Evidence that these coefficients are negative would suggest that sanitation externalities are more negatively associated with child health for low caste children than for other children. Regression controls are added in stages to demonstrate robustness of the result to respecifications, and that it is unlikely to be driven by omitted variable bias.

4.2 Results

Table 6 presents results: local open defecation externalities are more negatively associated with child height for low caste children. There is no similar statistically significant interaction for ST children, which is consistent with the main results of this paper: ST children tend to live in separate environments, and their height deficit, unlike that of SC children, is not due to low rank. The evidence of the table suggests that differential exposure to other villagers' negative disease externalities could be one mechanism linking local rank to child height.

Columns 2 through 5 provide evidence that this result does not spuriously reflect omitted variable bias: the interactive effect only becomes stronger as controls and eventually state fixed effects are added. Column 6 adds interactions with own-household open defecation, to clarify the critical role of the externality. Column 7 adds Muslim children to the regression and a Muslim interaction. These are omitted from the main results in light of Geruso and Spears's (2014) documentation that open defecation rates (and broader sanitation beliefs and behaviors) are systematically different among the Muslim minority of India, with important health implications. However, including these children in the analysis produces essentially consistent results.

4.3 Survey evidence on sanitation and caste

The results in this section only clarify a mechanism linking local caste rank to child height if low caste children are indeed more likely to be exposed to open defecation. Traditional

sources of survey data about sanitation behavior, including the DHS, cannot help answer this question because they only record whether households defecate in the open, not where. Coffey et al. (2014) describe a new household survey, conducted from fall 2013 to spring 2014, designed to learn about sanitation behavior in five states of rural north India. 3,000 households were interviewed about latrine use, open defecation, and perceptions of sanitation in their village and its consequences. For more information about the design and implementation of the survey, please see Coffey et al. (2014).

The survey recorded respondents' caste categories and asked each respondent whether he or she had ever seen a person from another household defecating in the open near the respondent's own house. Table 7 reports results of a regression of an indicator variable for reporting having seen another person defecating in the open near the respondent's home on indicators for SC and OBC population groups, with general and high castes as the omitted category.[8] SC respondents are statistically significantly more likely to report others' open defecation near their homes.[9] Column 2 controls for the fraction of a village defecating in the open – to verify that the result is not a mechanical effect of the fact that there is more open defecation everywhere in villages where SC respondents are more likely to live – and for other demographic properties of the respondent. Although this survey question can only suggest a relationship between the caste composition of a village and patterns of exposure to disease from open defecation, the results are consistent with sanitation externalities as a mechanisms of a health effect of being outranked.

5 Conclusion

An active recent literature debates whether hierarchy and inequality have negative health consequences, and if so, for whom? This paper describes a case where social rank matters,

[8]Following the evidence above that ST children tend to live in separate villages and the strategy of section 3.3, ST respondents are omitted from this analysis.

[9]This may be an underestimate of the true difference if SC respondents were reluctant to criticize higher-caste neighbors, or if an affirmative answer would be embarrassing.

and in particular being locally outranked matters. Low caste children are shorter than their poverty would predict precisely in the cases where they are locally outranked. We present results that suggest that externalities from sanitation behavior are one mechanism through which being locally outranked can be detrimental for the physical growth of lower caste children.

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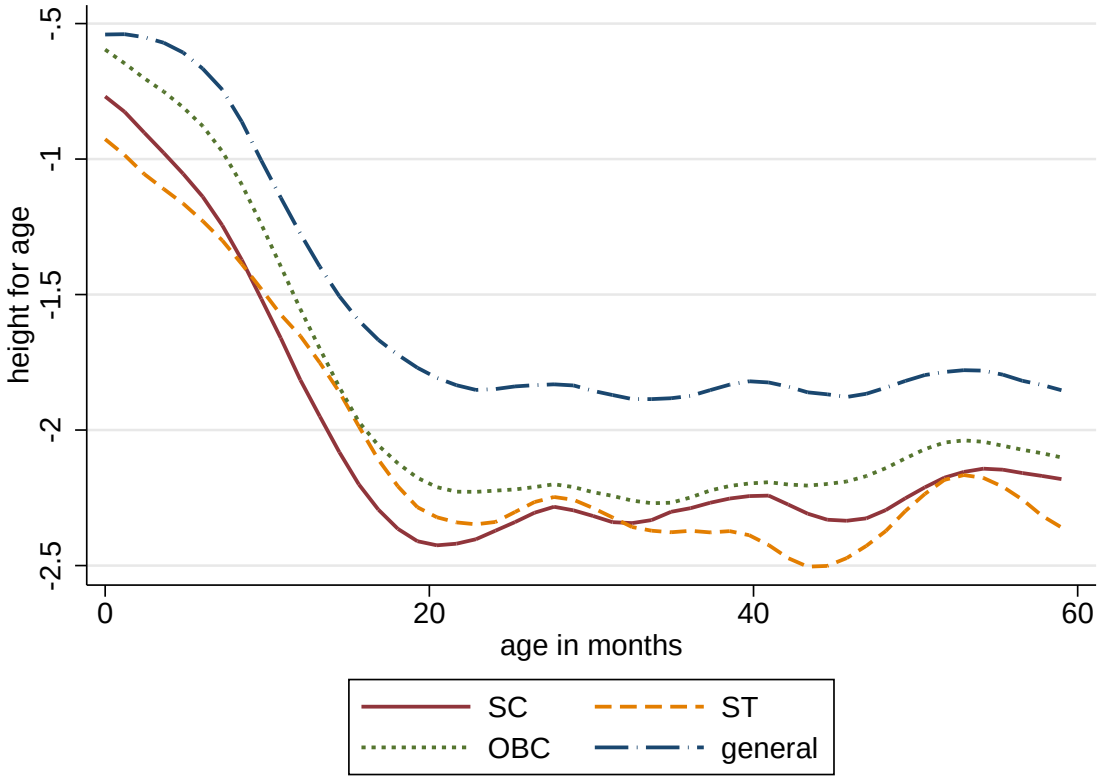

Figure 1: Height-for-age z-scores, by age and population group

Estimated curves are kernel weighted local regressions.

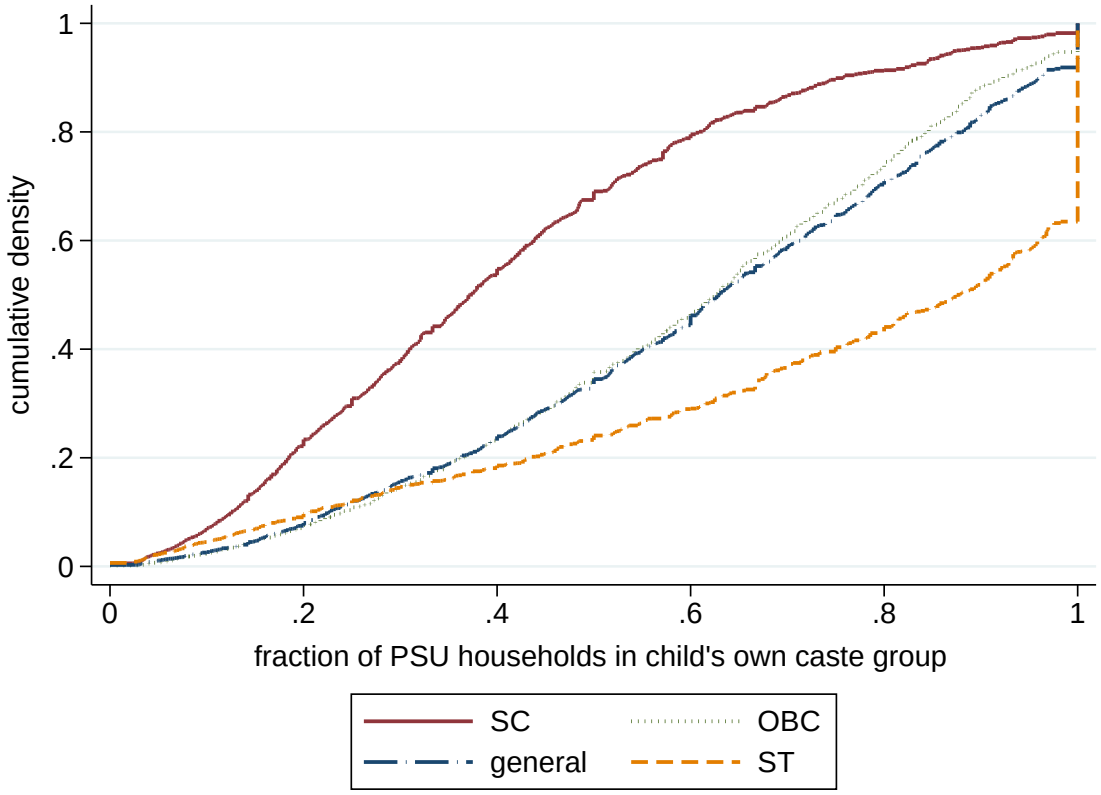

Figure 2: Cumulative distribution of fraction of PSU households in child's caste group

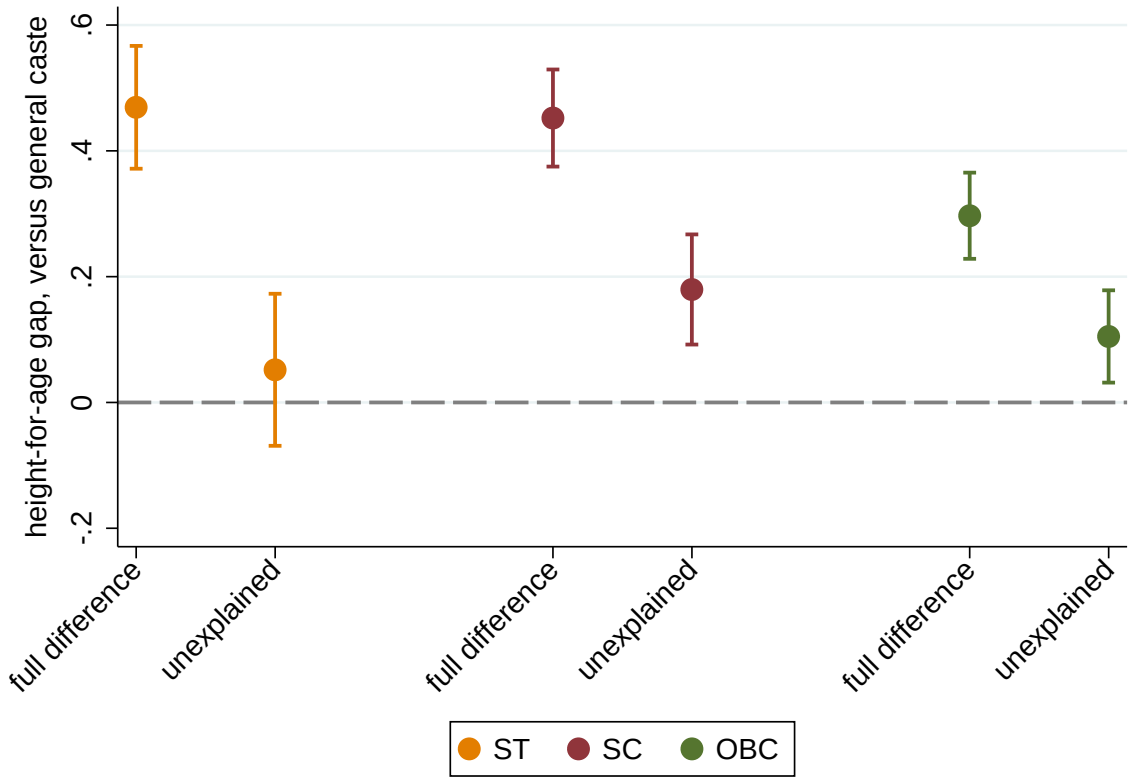

Figure 3: Oaxaca-Blinder decomposition of height gap explained by wealth.

Each confidence interval is the explained or unexplained average height-for-age difference in a binary comparison of one population group with general caste children. The "unexplained" gap is after Oaxaca-Blinder accounting for a set of observed asset wealth variables; for a complete list see the text.

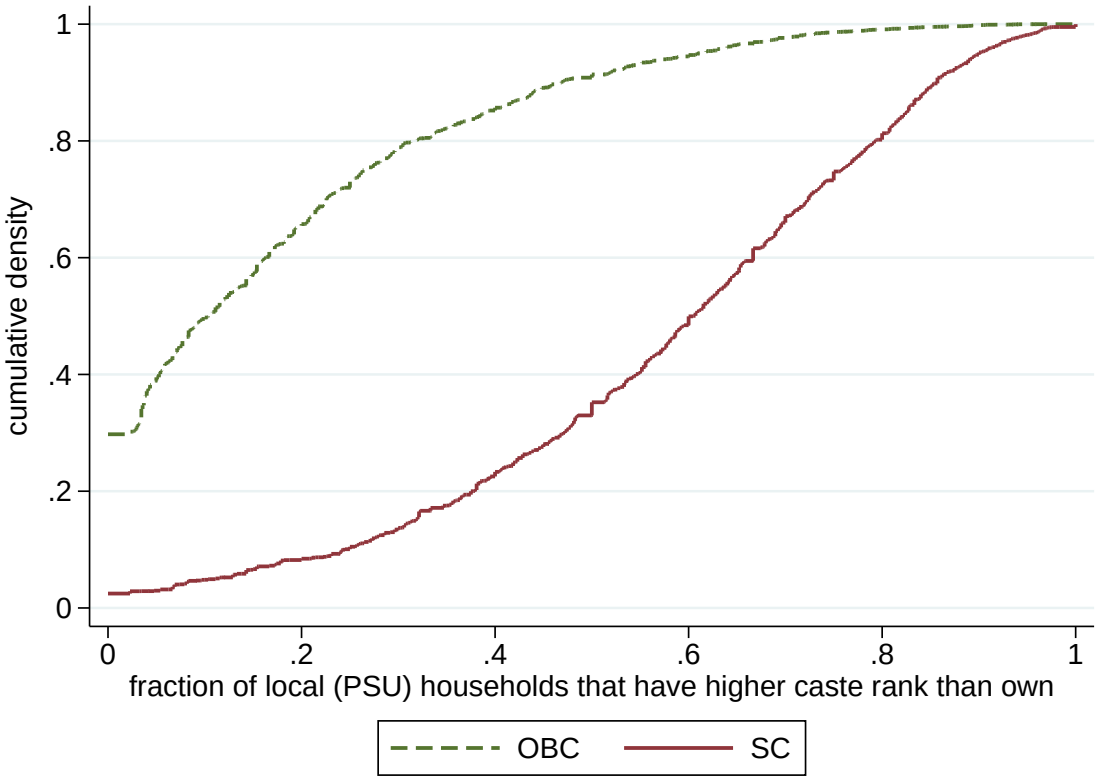

Figure 4: Cumulative distribution of fraction of PSU households of higher caste group rank than the child's own household

Table 1: Summary statistics: NFHS-3

	mean	standard deviation
height for age	-1.872	1.657
scheduled caste (SC)	0.212	0.409
scheduled tribe (ST)	0.097	0.296
other backward caste (OBC)	0.419	0.493
general caste	0.272	0.445
caste entropy measure	0.738	0.327
caste concentration measure	0.563	0.193
fraction of child's PSU that is SC	0.206	0.205
fraction of child's PSU that is ST	0.093	0.220
fraction of child's PSU that is OBC	0.420	0.297
fraction of child's PSU that is general	0.280	0.280
wealth entropy measure	1.111	0.330
wealth concentration measure	0.396	0.162
fraction of a child's PSU in 1st wealth quintile	0.256	0.254
fraction of a child's PSU in 2nd wealth quintile	0.225	0.154
fraction of a child's PSU in 3rd wealth quintile	0.198	0.141
fraction of a child's PSU in 4th wealth quintile	0.177	0.163
fraction of a child's PSU in 5th wealth quintile	0.144	0.231
n (children under 5)	39,527	

Observations are children under 5 in the NFHS-3; because averages are representative of children, they may differ from published India-wide summary statistics.

Table 2: The apparent similarity of the SC and ST height deficits

	(1)	(2)	(3)	(4)
	height-for-age z-score			
SC or ST		-0.458***	-0.469***	-0.452***
		(0.0358)	(0.0498)	(0.0394)
SC	-0.452***		0.0171	
	(0.0394)		(0.0512)	
ST	-0.469***			-0.0171
	(0.0498)			(0.0512)
OBC	-0.297***	-0.297***	-0.297***	-0.297***
	(0.0350)	(0.0350)	(0.0350)	(0.0350)
n (children under 5)	39,527	39,527	39,527	39,527

Two-sided p-values: † $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, ***$p < 0.001$. Standard errors clustered by survey Primary Sampling Unit (PSU) in parentheses. In the sample key, G = general caste, OBC = Other Backwards Class, SC = Scheduled Caste, ST = Scheduled Tribe.

Table 3: Asset ownership by population group

	(1)	(2)	(3)	(4)	(5)	(6)
	electricity	radio	TV	fridge	bicycle	motorcycle
ST	-0.220***	-0.159***	-0.306***	-0.181***	-0.0878***	-0.173***
	(0.0255)	(0.0131)	(0.0175)	(0.00967)	(0.0186)	(0.0110)
SC	-0.147***	-0.120***	-0.166***	-0.159***	0.000350	-0.161***
	(0.0201)	(0.0124)	(0.0163)	(0.00935)	(0.0146)	(0.0101)
OBC	-0.109***	-0.0742***	-0.131***	-0.128***	0.0272*	-0.0919***
	(0.0194)	(0.0109)	(0.0157)	(0.00926)	(0.0123)	(0.0103)
n (children under 5)	39,527	39,527	39,527	39,527	39,527	39,527

Each column presents a regression, with general caste children as the omitted category. Two-sided p-values: † $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, ***$p < 0.001$. Standard errors clustered by survey Primary Sampling Unit (PSU) in parentheses. OBC = Other Backwards Class, SC = Scheduled Caste, ST = Scheduled Tribe.

Table 4: Wealth explains ST height gap; social rank explains SC height gap

	(1)	(2)	(3)	(4)
Panel A: ST, SC, OBC, and general children				
ST	-0.469***	-0.0823		
	(0.0498)	(0.0539)		
SC	-0.452***	-0.161***	-0.166***	0.0234
	(0.0394)	(0.0415)	(0.0417)	(0.0758)
OBC	-0.297***	-0.107**	-0.115**	0.0205
	(0.0350)	(0.0359)	(0.0363)	(0.0561)
asset wealth		✓	✓	✓
local caste rank				✓
sample:	ST SC OBC G	ST SC OBC G	SC OBC G	SC OBC G
n (children under 5)	39,527	39,527	32,972	32,972
Panel B: Robustness check excluding OBC children				
ST	-0.469***	-0.0824		
	(0.0498)	(0.0582)		
SC	-0.452***	-0.168***	-0.180***	0.082
	(0.0394)	(0.0439)	(0.0447)	(0.250)
asset wealth		✓	✓	✓
local caste rank				✓
sample:	ST SC G	ST SC G	SC G	SC G
n (children under 5)	26,031	26,031	19,481	19,481

Dependent variable is child height-for-age z-score. Two-sided p-values: † $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, ***$p < 0.001$. Standard errors clustered by survey Primary Sampling Unit (PSU) in parentheses. OBC = Other Backwards Class, SC = Scheduled Caste, ST = Scheduled Tribe. "Local caste rank" is ten indicator variables for 0.1-width bins of the fraction of the PSU of higher caste rank. "Asset wealth" is a set of indicators for each combination of DHS asset ownership.

Table 5: Explanatory power of caste rank is similar within sexes, birth orders

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	full sample		boys only		girls only		first borns		second+ borns	
SC	-0.166***	0.0234	-0.191***	-0.0198	-0.135*	0.0880	-0.123†	0.0437	-0.180***	0.0382
	(0.0417)	(0.0758)	(0.0558)	(0.0984)	(0.0587)	(0.111)	(0.0708)	(0.121)	(0.0504)	(0.0910)
OBC	-0.115**	0.0205	-0.119*	0.00108	-0.0917†	0.0582	-0.0355	0.0832	-0.132**	0.0111
	(0.0363)	(0.0561)	(0.0494)	(0.0713)	(0.0530)	(0.0814)	(0.0610)	(0.0873)	(0.0445)	(0.0661)
asset wealth	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
local rank		✓		✓		✓		✓		✓
n	32,972	32,972	17,248	17,248	15,724	15,724	10,802	10,802	22,170	22,170

Dependent variable is child height-for-age. Two-sided p-values: † $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, ***$p < 0.001$. Standard errors clustered by survey Primary Sampling Unit (PSU) in parentheses.

Table 6: Open defecation externalities are worse for low-caste children's height

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	dependent variable: height-for-age z-score, rural children under 5 years old						
SC × local open defecation	-0.281†	-0.269†	-0.278†	-0.303*	-0.333*	-0.435*	-0.215†
	(0.155)	(0.149)	(0.144)	(0.137)	(0.139)	(0.169)	(0.126)
OBC × local open defecation	-0.312*	-0.344*	-0.279†	-0.275*	-0.302*	-0.362*	-0.168
	(0.153)	(0.148)	(0.142)	(0.132)	(0.131)	(0.154)	(0.110)
ST × local open defecation	-0.152	-0.156	-0.153	-0.186	-0.184	-0.216	-0.158
	(0.206)	(0.199)	(0.194)	(0.188)	(0.183)	(0.230)	(0.152)
Scheduled Caste	-0.234*	-0.216†	-0.138	-0.00803	-0.0145	-0.0346	-0.0745
	(0.118)	(0.114)	(0.111)	(0.104)	(0.105)	(0.106)	(0.0931)
Other Backwards Caste	-0.00734	0.0334	0.0178	0.0705	0.0673	0.0696	-0.0181
	(0.123)	(0.118)	(0.112)	(0.102)	(0.100)	(0.100)	(0.0828)
Scheduled Tribe	-0.253	-0.215	-0.132	-0.0332	-0.123	-0.117	-0.111
	(0.169)	(0.161)	(0.158)	(0.153)	(0.147)	(0.149)	(0.119)
local (PSU) open defecation	-0.133	-0.128	-0.176†	-0.153	-0.0322	0.0207	-0.121
	(0.113)	(0.111)	(0.106)	(0.101)	(0.116)	(0.128)	(0.0991)
household open defecation	-0.368***	-0.360***	-0.209***	-0.180***	-0.155**	-0.210**	-0.132**
	(0.0474)	(0.0459)	(0.0486)	(0.0474)	(0.0483)	(0.0786)	(0.0414)
SC × household open defecation						0.125	
						(0.118)	
OBC × household open defecation						0.0634	
						(0.0972)	
ST × household open defecation						0.0318	
						(0.170)	
Muslim							-0.233*
							(0.101)
Muslim × local open defecation							-0.0346
							(0.134)
birth demography		✓	✓	✓	✓	✓	✓
asset wealth			✓	✓	✓	✓	✓
mother controls				✓	✓	✓	✓
state fixed effects					✓	✓	✓
religion indicators							✓
sample:	Hindu	Hindu	Hindu	Hindu	Hindu	Hindu	all religions
n (rural children)	18,252	18,252	18,252	18,179	18,179	18,179	24,734

Two-sided p-values: † $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, ***$p < 0.001$. Standard errors clustered by survey Primary Sampling Unit (PSU) in parentheses. Open defecation is the fraction of the households in the child's PSU that defecate in the open. Sample includes rural children only.

Table 7: SC villagers are more likely to see others defecate in the open near their home

	(1)	(2)
dependent variable:	has seen OD near home	
SC household	0.0588*	0.0412†
	(0.0229)	(0.0235)
OBC household	0.0123	-0.00384
	(0.0180)	(0.0182)
village OD		0.284**
		(0.0332)
respondent ODs		-0.0222
		(0.0197)
respondent is female		0.00261
		(0.0161)
respondent's age		0.000780
		(0.000612)
n (rural households)	2,947	2,914

Two-sided p-values: † $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, ***$p < 0.001$. OD = open defecation; village OD is the fraction 0-1 of households in the village that defecate in the open. Data are from the SQUAT survey, see Coffey, *et al.* (2014); all observations are in rural north India.