Ethnic Disparities in Food Consumption and Household Nutrition Outcomes in India

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1 Introduction

The persisting challenge of undernutrition remains a major hindrance in achieving MDGs, both directly related to nutrition and hunger as well as other population health outcomes. In India, the burden of undernutrition is found to be disproportionately high in pockets of vulnerability; sharp inequalities across regions/districts, social groups and income classes characterise the undernutrition phenomenon. This paper is concerned with explaining social group-based disparities in household-level nutrition outcomes in India, by considering inequality in the nutrition outcomes between tribal and non-tribal households. We develop indicators of nutritional outcomes at the household-level and estimate undernutrition 'headcount' rates among tribal communities across Indian states having a sizeable population of these groups; we also calculate indicators of the 'severity' of aggregate undernutrition, or nutritional failure, and compare group-based decompositions between tribals and non-tribal households to identify the sources of such social group-based inequality in nutritional outcomes. Our results indicate significant disadvantage among tribal households in terms of nutritional outcomes. As we find, such inequality is stark even after accounting for possible influence of poverty, occupations and education.

A number of studies in India provide a preview on the significant extent of nutritional shortfalls in tribal children and adults, mostly explained to be caused by insufficient diet, improper knowledge, and seasonal episodes of food scarcity (Rao et al 1994, 2005, 2006; Rao and Rao 1994; Mukhopadhyay et al 2010; Chakma et al 2009; Laxmaiah et al 2007; Basu et al 2006; Bhattacharjee et al 2011). Most of these studies have found that food intake of tribal children and adults alike, fall much below the recommended dietary allowances (RDA) as laid down by the Indian Council of Medical Research, particularly involving deficiencies in proteins and other micronutrients (NNMB 2000, 2009). The NNMB investigation, for example, found that only about 30% of the preschool and school age children had adequate intakes of both protein and calories; nearly half the adult male and women to suffer from chronic energy deficiency, and significantly higher levels of undernutrition among pre-school children in terms of all three standard anthropometric outcomes. Without providing a detailed review on the possible causes and determinants of adverse nutritional outcomes, for which a rich literature abounds for the general, and to a lesser extent for tribal populations, it may be noted that most of the established frameworks acknowledge the complex interplay of factors – ranging from inadequate food intake, lack of awareness and education particularly regarding feeding practices on young children, access to safe drinking water and sanitation, health care etc. to utilization of nutrition intervention programs – responsible for poor nutritional outcomes. However, most often inability of farming households to produce enough food– both in quantity as well as the required diversity – or lack of income allowing purchase of food through markets, is the most direct determinant of food security, and subsequently nutritional status of household members. As for tribal communities, such poverty-induced risks to food security, linked to reliance on un-remunerative and primitive, subsistence agriculture with low productivity are most likely to be directly responsible for worse-off FNS outcomes vis-à-vis non-tribal populations.

However, systematic comparisons of tribal and non-tribal populations in terms of FNS outcomes are relatively rare in the Indian context. In a brief but informative piece, Das and Mehta (undated) highlights that *adivasi* children show worse levels of malnutrition compared to non-tribals, largely attributable to chronic food insecurity and deeper poverty-levels among tribal households. In another earlier study across all districts of undivided Bihar state, the authors Yadav and colleagues (1999) find that although proportion of malnourished children is largely similar between tribal and non-tribal districts, but chronic energy deficiency levels among adults is substantially high in the former areas. Also, non-tribal districts tend to have better intake levels of proteins and other micronutrients. In tribal-dominated regions of Maharashtra, Tagade (2009) also finds a higher incidence of food insecurity among the tribals as compared to that of non-tribals, and accordingly, a much lower nutritional status of tribal children than that of their non-tribal counterparts. Again, tribal households are also more likely to be excluded, or have less-than-adequate levels of access to public programmes and interventions that can influence nutrition outcomes in low-income settings; these includes the Targeted Public Distribution System (TPDS), the Integrated Child Development Services (ICDS) and the Mid-Day Meal (MDM) Program in primary schools.

As indicated above, this paper attempts to explain the determinants of the incidence of adverse nutrition security outcomes among tribal households in India. We look for factors which significantly differ between tribal and non-tribal households of similar socio-economic status and other observable socio-economic attributes, and hence explain the observed differentials. The paper is organized as follows: Section 2 describes the data and methods, Section 3 presents the main results including the descriptive results and estimation results from the econometric models. Section 4 discusses the findings and concludes.

2. Data and Methods

The data for this paper is from the latest available rounds of the National Family Health Survey (NFHS-III, 2005-06). The NFHS datasets have been the primary source of the extensive body of literature that exists on nutritional outcomes in India, with the major emphasis being on analyzing the levels, trends, differentials and determinants of child (anthropometric) nutritional status. The availability of conventional anthropometric indicators – height-for-age, weight-for-age and height-for-weight and body mass indices (for adults only) – and a number of key socioeconomic attributes of the households have stimulated empirical research in this area. However, a clear gap in the available literature is the *individual-centric* focus of available studies in considering nutritional outcomes of either children or their mothers, with household-level covariates, without attempting to develop any aggregate household level indicator of nutrition outcomes. In the context of household food and nutrition security, this, however, is the key parameter of interest. Accordingly, the starting point of our analysis in the paper was to develop such an aggregate household-level indicator combining available information pertaining to children, women and adult male members of the households, for whom information was collected in the NFHS. Apart from the standard anthropometric data mentioned above, we also consider the incidence of anaemia, considered to be an indicator of micronutrient deficiency. As explained below, we develop a simple additive, equal-weighted indicator of household nutritional outcomes, which is the main outcome variable used in the analysis.

Given the focus of the present research on tribal populations, and analyzing differences between tribal and non-tribal population groups in terms of the outcomes and underlying determinants, social-group based differentials serve as the main lens of dictating the empirical strategy of this exercise. Unlike the primary study which focuses on the tribal population of a particular state (Jharkhand), the secondary analysis presents a national perspective. However, although tribal populations (scheduled tribes according to the official, and the NFHS data definitions) are spread across the country, there is a clear spatial pattern in the concentration of tribal groups which we use to serve as a filter in selecting the appropriate population group. Accordingly, on the basis of the Census 2001 population distribution, states with more than 5% of ST population are included in our analysis, but with the exclusion of the north-eastern states where the ethno-cultural nature of tribal groups are sharply different than the rest of India. The analysis presented below is thus restricted among 11 major tribal concentration states in India – Karnataka, Maharashtra, Andhra Pradesh, Gujarat, Madhya Pradesh, Chhattisgarh, Rajasthan, Jharkhand, Odisha, West Bengal and Jammu & Kashmir. According to the Census 2001, these 11 states account for about 84% of the total ST population in India.

2.1.1 Outcome Variable

The major outcome variable, as stated above, is an aggregate indicator of household food and nutrition security outcomes on the basis of available anthropometric measurement, and biomarker tests (blood haemoglobin levels for anaemia detection). The variables from NFHS included in the construction of the aggregate indicator were therefore, height-for-age, weight-for-age and height-for-weight z-scores of children in the age-group 0-5 years (indicator variable for -2 standard deviations of the z-scores from the WHO-NCHS reference median), body mass index for adult men and women (<18.5 kg/m2) and incidence of anaemia (blood haemoglobin levels <11g/dl). Three different datafiles were used for the required information which was finally combined to derive a family datafile[1]. Incidence of any indicators of undernutrition (coded in a binomial, presence/absence manner) was added for each household where more than one children, women or men were measured/data collected. Consider the following schematic diagram for an illustration of how the indicators were combined and aggregated into a household FSN outcome 'index'.

Members	**HAZ**	**WAZ**	**WHZ**	**C-ANM**	**W-BMI**	**W-ANM**	**M-BMI**	**M-ANM**	**Score**
Child 1	1	0	1	0	-	-	-	-	2
Child 2	0	1	1	1	-	-	-	-	3
Mother 1	-	-	-	-	1	0	-	-	1
Male 1	-	-	-	-	-	-	0	1	1

where HAZ, WAZ and WHZ denote the height-for-age, weight-for-age and weight-for-height indicator respectively, C-ANM, W-ANM and M-ANM stands for anaemia indicator among children, women and men respectively, and W-BMI and M-BMI represents the BMI indicator for women and men respectively. Score is the aggregate household score thus derived by aggregating indicator values.

For the above hypothetical household, the aggregate score would be 7, combining the 'counts' of undernutrition or undesirable outcomes (denoted by '1' in the respective cells). In the absence of any a-priori justification of a differential weighting scheme, it was felt that a simple, equal weighted additive aggregate would be appropriate in observing differentials in FSN outcomes across social-groups and subsequently for inter- and intra-group variations in terms of background socioeconomic and other covariates[2].

2.1.2 Explanatory Variables

The explanatory variables included for descriptive analysis and for the multivariate regression models are selected based on careful consideration and review of the literature on determinants and predictors

[1] Child-level information was available for 22752 children, women-level information for 57626 women and male/partner information for 34864 males. Once aggregated for common households, this resulted into a family datafile containing information for 50142 households/families. Note that while children could be matched to their mothers (information was also collected and included for mothers without living children - ever married women), the same is not true for the male members, who cannot be matched with children directly. Our matching strategy was based on unique household-level identifier, the two variables v001 and v002 provided in the NFHS unit-record data.

[2] Two alternative forms of the aggregate FSN outcome indicator were also computed. The first was on the basis of a factor analysis of the 8 component indicators, where the first rotated factor was retained and used as the score (following normalization). In the second variant, a subjective scoring matrix assigning a weight of 2 to each of the child anthropometrics indicators, 1.5 to each of the adult anthropometric indicators, and 1 to the each of the anemia results-indicators were used. However, for the main, multivariate analysis the *direction* of the associations derived using wither form of the indicator were largely similar. In the subsequent analysis, accordingly, we have used and reported results based on the equal-weighted aggregate.

of household FSN behaviour and outcomes. We have included variables that can be classified as basic socioeconomic variables, those that reflect food consumption behaviour and overall health and nutrition practices and community-level availability of relevant public services. An additional layer of variables reflecting women's autonomy and decision-making was included, given the well-acknowledged pathways of influence of women's status and agency on FSN outcomes in the South Asian context (ref.). While some of these variables were readily available in the NFHS, some required additional computations and deriving 'synthetic' indicators, which are described below.

Socioeconomic variables include whether the household owns agricultural land, and if so, amount of land owned; an aggregate index of the households' standard of living – captured by the conventional DHS wealth index provided in the data; whether the household posses a BPL (below poverty line) card used to identify poor households as per official records making them eligible to receive certain benefits such as food-grains at subsidized prices; and whether the household belongs to an urban or rural area. Two other variables – whether the household is headed by a female, and number of children (0-5 years) in the household – were also included, the first to capture any trajectories of deprivation that may be likely in a female-headed household and the second, to standardize for higher number of children (and indirectly the family size) contributing to the aggregate FSN outcome score.

The gender dimension of the covariates is captured through four variables, which also partially accounts for food consumption behaviour. Owing to the importance of women's education, years of schooling for women has been considered as a key explanatory variable, as also economic emancipation of women through an indicator variable denoting whether the woman works for cash. The NFHS asks a set of questions to assess women's autonomy and independence in decision-making in terms of certain decisions (*who has the 'final say' on….)* such as: purchase of household assets and durables (large purchases), household purchases for daily needs, own healthcare, visits to family or relatives and deciding on what to do with husband's income. The responses include – alone, jointly with husband, husband alone and others. The responses for these five variables were aggregated based on a novel scoring measure: decision-making for which woman was not a part at all was coded lowest ('0'), joint-decisions with husband was considered to be of moderate decision-making power (coded '1'), and self-decisions accorded highest (coded '2') importance. The aggregate measure of decision-making was a household-average of the responses, thus coded, for all women in the household, which was then, divided into three categories – low, moderate and high decision-making power. The last variable related to women is concerned with women's 'personal' dietary diversity, based on intake of different food-types – milk/curd, pulses/beans, dark green leafy vegetables, fruits, eggs, fish and chicken or meat. The question was asked only to currently pregnant, lactating or women with young children. Responses were rather subjective however; instead of exact quantities consumed, it relied on rough frequencies – daily, weekly, occasionally or never. Each responses were recoded with highest score ('3') given to daily consumption, and least ('0') to never consumed. An aggregate dietary diversity score was derived for each women adding up the individual score for each of the 7 food-items. The aggregate score was finally divided into three equal-sized classes, and termed as low, moderate and high dietary diversity.

An important nutrition indicator, apart from the anthropometrics and biomarker indicators, available in the NFHS datasets is quality of household salt consumption. Denoting micronutrient (iodine) consumption, this variable is a rare nutrition 'input' indicator available in the NHFS data. The variable, based on test-results of cooking-salt samples collected from surveyed households, provides iodine content classified following international standards into 'absence' (zero iodine content), 'inadequate' (0-15 ppm of iodine) and 'adequate' (>15 ppm of iodine). This variable is used in the analysis both as a direct indicator for micronutrient availability and also as an indirect proxy for the quality of household food-intake.

Health behaviours and practices are significant in determining absorptive capacity or 'utilization' of the food and nutrients consumed. Examples include source of drinking water and sanitation, household fuel use, cooking practices and purification of drinking water. In the NFHS data, some of the above information, such as drinking water or sanitation sources are available, but were not included in our analysis primarily to avoid risks of collinearity as aggregate standard of living indicators such as the wealth index is already included. However, as a proxy for health behaviour, which has relatively less risk of multicollinearity, we include an indicator variable denoting whether the household adopts any medium for purifying drinking water. Lastly, as a community-level indicator and also access to public programs, we include an indicator variable denoting whether the community (to which the household/family belongs) is served by an *anganwadi* centre.

In the next section, we first discuss the broad correlations and descriptive statistics on the parameters of interest, followed by a multivariate analysis involving regression models and decompositions.

2.2 RESULTS

2.2.1 Descriptive Results

A straightforward starting point is to examine sample averages of the aggregate household FSN outcome indicator across the social groups – scheduled tribes, scheduled castes and other backward castes, and general castes. In order to enable some indication on the origin of the differentials of the aggregate indicator, we also present average scores of the component indicators. Table 1 summarizes the results.

It can be clearly seen that in terms of the aggregate FSNO index, tribal households face a disproportionate burden of undesirable nutrition outcomes, both at the family-level, as well as for all the component indicator domains, as compared to their non-tribal counterparts. In fact, nutrition outcomes in tribal households are almost twice as worse than the general caste households. The difference is starker in the case of child stunting and wasting, anaemia among both children and mothers and for body mass index among women. However, if tribal households have a higher number of children and women, who also happen to report undernutrition based on the thresholds used for each of the component or sub-indicators, this estimate can be somewhat biased. Since the aggregate FNSO index is a sum of all individual incidences of undernutrition, the average is highly susceptible to higher number of observations within a common household. To control for such potential effects, in Figure 1 we present the patterns for a dichotomous variable: the likelihood of at least one member in an individual family with undernutrition-levels, expressed in percentage terms. As seen from the figure, in 53% of tribal households, at least one family member suffers from undernutrition (of any form, considering the 8 sub-indicators), as against 46% of the SC/OBCs and only about a third (36%) in the case of upper-caste households. Similarly, in the case of all the other sub-indicators (with the exception of male BMI) tribal households – denoted by the dark bars – have a significantly higher risk of undernutrition outcomes.

Although, a direct inter-state comparison may not be feasible due to unbalanced sample sizes and proportion of ST populations, some broad contours do emerge from observing the inter-state differentials between the tribal and non-tribal groups for the aggregate FNSO index. As shown in table 2, tribal families in all of the states considered in the analysis have far worse nutrition outcomes; in terms of the absolute average score, tribal households appears worst-off in Madhya Pradesh, Jharkhand and Rajasthan with nearly three 'counts' of undernutrition outcomes, and somewhat at-par with non-tribals in Karnataka. A similar pattern is evident on the basis of the average incidence of *any* form of undernutrition. In Andhra Pradesh, for example, more than two-thirds of the tribal households are found to report at least one member suffering from undernutrition, either of the micronutrient deficiency variety or anthropometric outcomes. In Jharkhand, more than half the tribal households are found to suffer from undernutrition on an aggregate level.

To differentiate for the aggregate nutritional outcomes on the gradients of socioeconomic factors, we further disaggregate the outcome indicators in terms of two such variables – the aggregate standard of living (wealth index) and education. This would standardize the outcomes for the possible confounding effect of these covariates and allow some preliminary guesses on whether the

differentials are accruing more due to underlying differences in these background socioeconomic attributes.
A simple cross-tabulation of the wealth index terciles and women's years of schooling (as a proxy for household educational levels) yield interesting social group-based differentials. Compared to about 16% households from the upper ('general') castes and 37% of the SC/OBCs, 74% of the tribal households are from the poorest wealth classes, or of the lowest socioeconomic standards. On the other hand, while about a third of the non-tribal households (or an almost equi-proportional share of the wealth/living standards distribution) fall under the highest or the well-off wealth index class, only about five percent of the tribal household qualify as such. This pattern of marked inequality in living standards persists in the case of educational levels as well: An average tribal woman has only about two years of schooling compared to about five years and eight years for her SC/OBC and general caste counterparts.

Nevertheless, a marked gradient in socioeconomic status (SES) is evident in the between-group differentials for the aggregate FNSO outcome indicator, as depicted in Figure 2. Apart from supporting the premise of a higher disadvantage among tribal households persisting even controlling for SES, few other points emerge. For example, there is very little differential among the tribal households of poor and middle SES in terms of the outcomes considered. In fact, the middle third of the tribal households on the basis of their SES (i.e. the 'middle' tercile) reports higher average of the aggregate index and a higher proportion of average incidence, when compared with the lowest SES non-tribal households. In other words, even the relatively better-off tribal families are found to have equal or worse undernutrition scenario than the poorest non-tribal households.

While the above results lend some support to the fact that tribal households have far worse FSN outcomes than non-tribals – across states, SES classes, and female education levels – a more robust inference requires testing for such association patterns in a multivariate framework. This is taken up in the following section, first through fixed-effects regression models, followed by an intuitive decomposition analysis trying to dissociate relative contribution of social groups, or being a tribal family *per se*, in the observed inequality or variance in the aggregate FSN outcome index measure.

2.2.2 Multivariate Analysis Results

The main motivation guiding the empirical strategy for the multivariate analysis is to explicitly distinguish between two distinct pathways of association between the outcome parameter on the one hand and explanatory variables on the other. These can be termed as the *between-group* and the *within-group* models. The between-group models include social-groups as an independent variable and observe the parameter estimates to infer whether, controlling for the effect of other model covariates, belonging to a tribal household, increases risks for having worse FSN outcomes. Although of much significance, the between-group results however, does not shed any light on the possible causes for variance, or heterogeneity in FSN outcomes within tribals, for e.g., vis-à-vis other social groups. Inferences of the later kind is only possible by observing within-group models, i.e. estimating separate models using the same set of covariates for each social group, and comparing parameter estimates or coefficients on similar predictor variables across the models.

The rationale for including the explanatory variables has been explained earlier in detail in Section 2.2. The specification we use in the models below considers the aggregate FSN outcome index as a continuous, dependent variable. However, there is an important distinction in the specification forms and estimation strategy of the models which needs some further elaboration.

A. Estimation Issues

While it is a common starting point to estimate OLS-type multivariate regression models for evaluating associations between a continuous dependent variable such as our aggregate outcome indicator and other covariates, a closer observation of the distributional form of the outcome variable suggests that this may not be the most efficient strategy, and has risks of leading to biased coefficient estimates. The outcome indicator has a mean of 1.39 and a variance of 5.49 (S.D. 2.34), indicating a potential problem of *overdispersion*. This distributional nature is observed typically in health sector studies, where the outcome variable is a non-negative count of events. Typically, the distribution of such variables tends to be right skewed, often comprising a large proportion of zeros and a long right-hand tail. The discrete nature of a nonnegative count dependent variable and the shape of its distribution require the use of particular estimators, as OLS may not guarantee required unbiasedness.

The general method of choice for estimating such outcomes (i.e. with overdispersion) is the family of Poisson-type regressions, which constrains the conditional mean to equal the conditional variance. However, adding to the problem of overdispersion, our outcome variable also has a disproportionate share of zero-scores, known also as the 'excess-zero' situation. In our case, the zeros occur when households have no member suffering from any form of undernutrition, or in other words, enjoy full nutrition security in terms of the outcome measures. Intuitively, the pathways of influence or role of the explanatory factors can be thought of to be distinct between these households on the one hand, and among households those are found with one or more family-members to report undernutrition outcomes. This practically suggests two different data-generating process, or two unique distributions being actually contained in the single outcome variable; one that explains the probability of a household having no members with undernutrition as against those that have at least one member with such outcomes, the other – limiting to the households with non-zero counts (or number of members reporting any forms of undernutrition) of the outcome variable – testing the associations of a household's probability of reporting progressively higher counts of the outcome. This family of models are, quite simplistically thus, known as *two-part models*.

The empirical literature on two-part models in a scenario of a large number of zero observations combined with a limited number of positive counts of any event offer a choice between two-types of models – the zero-inflated Poisson model (ZIP) and the negative binomial (NB) models[3]. The fundamental difference between the two being, while the ZIP models do not allow incorporating unobserved heterogeneity (or errors in the variance), the NB models allow so. A few standard econometric tests have been suggested to decide on the suitability between these two models[4]. Others[5] suggest some quick back-of-the-envelope computations to check which of the two models fits best to the data at hand. Accordingly, we first independently run the ZIP and NB models, observe the model fit based on the zeroes (or whether the overdispersion problem is overcome) and finally compare the log-likelihood values of the two competing models following the Akaike Information Criterion (AIC) tests. Without providing detailed results here, it may suffice to state that the ZIP model was found to be the preferred choice, or in the present context, the underlying mechanisms explaining non-occurrence of undernutrition and varying counts of it across households are distinct enough.

However, since the ZIP is still restrictive that it does not allow between-subject (or household) heterogeneity, we also fit a zero-inflated negative binomial (ZINB) model to the data which removes such restriction and allows both unobserved heterogeneity as well as assumes a separate process for the zero and non-zero counts[6].

2.2.3 Estimation results

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[3] For a lucid, non-technical discussion on these issues, and illustrative examples see Chapter 11 of O'Donnell et al. available online at http://siteresources.worldbank.org/INTPAH/Resources/Publications/459843-1195594469249/HealthEquityCh11.pdf. Greene (2000) proposes a log-likelihood based test to decide between the suitability of the two models.

[4] For e.g. Greene (2000) has recommended a Vuong test, which can be indirectly implemented in STATA.

[5] See the tutorial by German Rodriguez of Princeton University on Generalized Linear Models (GLM), available online at http://data.princeton.edu/wws509/stata/overdispersion.html

[6] Cameron and Trivedi () discusses these issues in detail, including routines for estimating in STATA, which we have followed here. An illustrative comparison provided by David Drukker is also available in the STATA Resources webpage at http://www.stata.com/support/faqs/statistics/overdispersion-and-excess-zeros/

Nevertheless, we start with 'naïve' models, temporarily ignoring the more complex issues discussed above. The results of the fixed-effects OLS models – both between-group and within-group estimations are shown in Table 4.

In the base or null model, regressing the aggregate outcome scores on only social groups as predictors suggest significantly higher risks of undernutrition outcomes among tribal households – nearly double – as compared to upper caste families. However, introducing other explanatory variables scale down the magnitude of the differentials; being a tribal household increases the risks of reporting higher aggregate levels of undernutrition by about 34% vis-à-vis a general caste household. Nutrition outcomes tend to be much better as one moves up across the SES classes, with households in the richest tercile having almost 50% less levels of undernutrition[7]. Among other variables, rural households and those with more children, are found to be associated with significantly higher levels of aggregate undernutrition, while those with better-educated females, and better health practices (water-purification) are associated with much lesser risks. For the nutritional or 'food input' factors, it is clearly seen that households using iodized salts, or those where the women enjoy a richer dietary diversity (in frequency terms) have better nutrition levels. Lastly, highlighting the role of women's agency, a strong, significant positive association is evident between better levels of women's autonomy and decision-making and nutritional outcomes, but surprisingly, woman working for cash is not found to have a statistically significant effect.

The within-group model results echo much of the patterns observed in the between-effects models. We are more concerned with what explains the observed variance in aggregate nutrition outcomes within the tribal groups, and compare the effects across the two other competing social groups. A few interesting points emerge. Firstly, being a household with a better-off SES level pays more among the tribals than the other groups; it reduces aggregate undernutrition risks by about 78% among the former while it does so only by half in the other groups. Secondly, female education loses its significance in tribal households and has a very weak effect, perhaps due to extremely low absolute levels of female education in tribal communities. Thirdly, and perhaps indicating a disproportionate young dependency burden, tribal households with more children have extremely high risks of higher aggregate levels of undernutrition. Fourthly, tribal households owning agricultural land which is potentially an indicator of contributing to subsistence and household food security, are not different from their landless counterparts in terms of the aggregate nutrition outcomes. Of course the effect of land ownership withers away in all the between-effect models suggesting a strong social-group pattern in land ownership. Lastly, although higher level of women's decision-making has a significant positive role, its statistical significance declines but could be largely due to sample size issues.

Table 5 introduces the two-part models. Similar to the OLS models, we separately estimate the between-effects and within-effects regressions, and with similar set of explanatory variables. For each model, following the specification of the ZIP model, two set of outcomes are modelled – the first, labelled as count-models, test for the association of the explanatory variables with non-zero or positive outcomes of the dependent variable. In other words, the count models, ignore the observations with no incidence of undernutrition and run the models on a reduced set of (the counts of) 'undernutrition' outcomes. However, ZIP also estimates a standard logit-type model used for conventional dichotomous outcomes, where it reports the coefficients – odds ratios for the logit – for the probability of a household having no undernutrition (or, with a zero score on the aggregate outcome variable) vis-à-vis having any positive or non-zero occurrence of undernutrition (i.e. the 'count' part of the distribution)[8].

[7] We have also tested for possible interaction effects between SES classes and social groups. However, the interaction effects were not found to be significant and dropped from the final models.
[8] This is in departing to the common form of expressing coefficients in logistic models, where it is the probability of non-zero (or the 'success' coded usually as '1') for which the coefficients are reported. This distinction needs to be noted while interpreting the directional association between the outcome and explanatory variables.

The parameter estimates, however, reiterate much of the patterns that had emerged from the naïve models, but a larger number of the explanatory variables assume statistical significance[9]. For example, economic emancipation of women which was found not to have any significant effect on the outcomes in the OLS models, has a highly significant effect in the ZIP modification – a household with a woman engaged in cash-income providing work has about 5% lower aggregate undernutrition levels. SES, female education, women's decision-making capacities and dietary diversity are all negatively associated with absolute numbers or occurrences of undernutrition outcomes among the family members. On the other hand, being a tribal household increases the risks of a higher number (or levels) of adverse nutrition outcomes by about 15% corresponding to a general caste household. The binary (logit) model results too indicate similar associations; interestingly SES is not as good as a predictor for discriminating between households that does not have any member having undernutrition outcomes at all, with those that have one or more members with such adverse outcomes. Alternatively, land-ownership, which has a weak, non-significant effect in explaining absolute levels or numbers of adverse nutrition outcomes among households that have at least one member with undernutrition, explains rather well in differentiating between the two groups of competing households – which we may term as nutrition-secure or insecure in purely outcome terms.

Such differential gradients of influence between the *incidence* of nutritional outcome insecurity (estimated and represented by the logit model coefficients) and the *levels* of nutritional outcome insecurity (estimated and represented by the Poisson-type count data model coefficients) persists equally for the within-effects models, for each of the three social groups. For brevity, we discuss the results for the tribal model, with references across groups as required.
As for the *incidence* of aggregate nutritional outcome-insecurity it appears that tribal households with female household headships, and those where women have a higher degree of autonomy are more likely to have better nutritional outcomes; conversely, those with a higher number of children are at a higher risk of having undesirable nutrition outcomes. Somewhat confusing however, is the effect of certain other covariates such as women's cash-earning work, or dietary diversity of women, or for that matter micronutrient availability in terms of iodized salt consumption. While it would be natural to expect that positive levels of these covariates are likely to report a higher odds-ratio, indicating lower risks of aggregate nutritional outcome-insecurity (or a higher probability of no member in such households being diagnosed with adverse nutritional outcomes), the odds-ratio values for these variables in all the four models are lower than 1, although in most of the cases they are close to 1. A possible explanation could be measurement or reporting errors, more for the 'synthetic' or derived variables such as the dietary diversity groups, but all of these variables also have their effects for the *levels* or count models in the expected direction. Apparently, the logit model used to discriminate the binary outcomes and accommodate the large occurrences of 'zero's in the outcomes in the ZIP models misses some aspects of the underlying pathways that distinguishes nutrition-secure households from nutrition-insecure ones, while considering aggregate levels of undernutrition outcomes. The decomposition analysis that follows tries to provide some related indications on the relative contribution of the explanatory factors in a group-based comparison (between tribal and non-tribal households), but it is felt that qualitative insights into the pathways that affect the interaction of the background factors while explaining FSN outcomes can provide valuable understanding and disentangle the association patterns.

2.2.4 Explaining Differences in Aggregate Nutrition Outcomes between Tribal and Non-Tribal Households: The Oaxaca Decomposition

The models in the preceding section provide some amount of understanding on the possible determinants explaining the observed differentials in aggregate nutrition outcomes. However, although informative, the above models have certain limitations. For e.g. although the results allows

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[9] As suggested by the literature, we use heteroscedasticity-adjusted robust standard errors for the ZIP models. The SEs are not reported in the table below, but detailed results are available from the authors.

to infer on the strength and direction of influence by certain explanatory factors on the nutrition outcome variable, it does not explicitly provide robust estimates on which factors contribute more to the observed inequality in the outcomes across social groups, or, to the disproportionate incidence of the burden of undernutrition outcomes in tribal households.

A suitable approach befitting our objective can be found in conventional methodologies often used to study labour market outcomes by groups, where mean differences in variables such as wages are 'decomposed' in a counterfactual manner following a procedure known as the Blinder-Oaxaca decomposition (Jann 2008). The Oaxaca decomposition technique allows partitioning the wage differentials between two groups such as gender into a part that is 'explained' by group differences in certain characteristics such as education or work experience, and an 'unexplained' part, often used as a measure of discrimination. However, the Blinder-Oaxaca decomposition can be easily adapted for application in other fields, and in fact, have been used by some researchers to analyze inequalities in health (O'Donnell et al. 2008) or child undernutrition () by poverty status. Owing to the technique's clear appeal to our problem at hand, we use it to decompose observed variance in the aggregate nutrition outcome between tribal and non-tribal households, and comment on the possible sources of such differentials.

A. Empirical Approach and Estimation

Following the illustrative exposition in O Donnell and others (2008), let us define our outcome variable Y, observed across two groups, tribals (T) and non-tribals (NT). We assume that Y is explained by a vector X of explanatory variables, according to a regression model,

(1) $$Y_i = \beta^T X_i + \varepsilon_i^{NT} \text{ if tribal}$$
$$= \beta^{NT} X_i + \varepsilon_i^{T} \text{ if non-tribal}$$

As we have observed earlier the aggregate nutrition outcome variable Y, has a higher mean for the tribal households denoting a greater degree of unfavourable outcome. Consequently it is easy to imagine that for the regression line indicated by these two equations in (1) above, the tribal relationship will lie above the non-tribal regression line.

It follows from (1) that the 'gap' or differential in outcomes Y^T and Y^{NT} is equal to,

(2) $$Y^T - Y^{NT} = \beta^T X^T - \beta^{NT} X^{NT}$$

Where X^T and X^{NT} are vectors of explanatory variables evaluated at the mean for tribal and non-tribal households respectively. In case of only two explanatory variables, say SES (x_1) and female education (x_2), we can write (2) as,

(3) $$Y^T - Y^{NT} = (\beta_0^T - \beta_0^{NT}) + (\beta_1^T x_1^T - \beta_1^{NT} x_1^{NT}) + (\beta_2^T x_2^T - \beta_2^{NT} x_2^{NT})$$
$$= G_0 + G_1 + G_2$$

Where the differences or 'gaps' between Y^T and Y^{NT} can be considered as due in part to,

i. Difference in intercepts – (G_0)
ii. Difference in SES (x_1) – (G_1)
iii. Difference in female education (x_2) – (G_2)

In other words, G_1 will measure the part of the difference in aggregate nutrition outcome (Y) between tribal and non-tribal households due to differences in mean SES (x_1) and the effects of SES (β_1), and so on.

The Oaxaca decomposition technique seeks to explain that how much of the observed 'overall' difference between the two social groups in the outcome variable, specific to any of the explanatory variable (the x's) is attributable to

i. Differences in the xs (i.e., the ‘explained’ component), rather than
ii. Differences in the βs (i.e., the ‘unexplained’ component).

To express in the model’s notations, the gap or observed difference in Y between tribal and non-tribal households can be expressed in either of the two ways,

(4) $$Y^T - Y^{NT} = \Delta x \beta^T + \Delta \beta x^{NT}$$

Where $\Delta x = x^T - x^{NT}$; $\Delta\beta = \beta^T - \beta^{NT}$ or as

(5) $$Y^T - Y^{NT} = \Delta x \beta^{NT} + \Delta \beta x^T$$

Either way this allows us to partition the difference in outcomes between tribal and non-tribal households into a part attributable to the fact that tribal households have worse xs than non-tribals, and a part attributable to the fact that they have worse βs than non-tribals.
The decompositions in (4) and (5) can be considered as special cases of a more general decomposition,

(6) $$Y^T - Y^{NT} = \Delta x \beta^T + \Delta \beta x^T + \Delta x \Delta \beta$$
$$= E + C + CE$$

Where the difference in mean outcomes is considered as being accounted for by,

- Difference in endowments (E)
- Difference in coefficients (C)
- Difference due to interaction between endowments and coefficients (CE)

In our case, the ‘E’ values will indicate the proportion of the observed outcome differentials due to differences in the values or levels of the covariates, while ‘C’ will suggest, the interesting counterfactual of what would be the improvements (or reduction in the outcome variable) in aggregate household nutrition outcomes among tribal households if they (or the covariate levels pertaining to the tribals) were to experience the similar strengths of association or degrees of influence that the explanatory variables of the non-tribal household has on the outcome.

B. Decomposition results

Estimating a Blinder-Oaxaca form of decomposing outcome parameters can be easily conducted by standard procedures available in most of the common statistical softwares. Here we use the – oaxaca – routine available in STATA developed by Jann (2008). The outcome variable is a normalized version of the aggregate FSN outcome indicator used in the previous regression models in order to allow a wider spread of the distribution. We retain most of the explanatory variables used in the earlier models but drop some found to be having a weak or insignificant effect in the earlier models. The results, including estimates of E, C and CE as in (6) above are presented in table 6.

The top panel of the table presents the coefficient estimates for the model covariates separately for the two competing groups, i.e. tribal and non-tribal households. The results, which are not discussed in detail here, are similar in spirit to the salient inferences following the ‘within-effect’, ‘naïve’ models of the preceding section. The only difference being that in the decomposition models the two non-tribal groups, SC/OBCs and general castes have been collapsed into a single ‘non-tribal’ group for facilitating the decomposition model specifications and easier inference.

The decomposition output in the lower panel of Table 6 reports the mean predictions by groups and their difference. In our sample, the mean of the aggregate FSN outcome indicator is 4.74 for non-tribal households and 8.15 for tribals, yielding a gap of 3.4. It may be noted that since the outcome indicator is a normalized index score, a straightforward quantitative interpretation is not much meaningful, but important enough in stating the broad magnitude[10]. In the second panel of the decomposition output the outcome differential is divided into three parts. The first part reflects the mean increase in the outcome among tribal households if they have the same characteristics as non-tribals. The reduction of 2.959 indicates that differences in endowments account for a huge 87% of the outcome differential, or the difference in aggregate nutrition outcome between tribals and non-tribals. In other words, only about 13% of the observed differential remains unexplained. The second term quantifies the change in the outcome for tribal households when applying the non-tribal household's coefficients to the tribal households' characteristics (or average levels of the explanatory variables). The third part is the interaction term that measures the simultaneous effect of differences in endowments and coefficients.

While the estimates following from the decomposition results in table 6 provide useful illumination into the possible sources of the observed inequality or differential in aggregate nutrition outcomes between tribal and non-tribal families and intuitive counterfactual scenarios, it does not provide any information on further sources of these differentials so far as the explanatory factors are concerned. This could be easily achieved from the predicted coefficient parameters on the (pooled) regression equation (not shown), where following the notations in (6) above, we can dissociate the contribution of each explanatory factors on the outcome variable, in terms of the endowments (the levels, or 'E'), the coefficients (effects, or 'C') and the interaction. For easier interpretation, we retain only the (sub)-decompositions for 'E' and 'C' and represent them in the form of a stacked bar chart in Figure 3.

As we have seen above, the endowments or 'explained' component account for about 87% of the differential; as seen in Figure 3, much of it is due to two factors – SES and number of young children in the family (or the young dependency burden) – indicated by the two large blocks in the first bar of the figure. Apart from these two factors, the other variables which are found to have a higher contribution to the observed differential include women's years of education, dietary diversity of the women, and whether women have cash income, although the last variable does not have a statistically significant effect. Micronutrient availability, proxied through the quality of household salt intake, although found to have a significant effect on aggregate nutrition outcomes earlier, has a weak discriminating effect. Turning to the 'unexplained' part of the observed tribal-nontribal differential, i.e. the decomposition of the coefficient (C) term, a largely similar pattern could be observed. Again, although the variable denoting women's autonomy and decision-making was found to have a modest degree of contribution to the unexplained variance, or the counterfactual outcomes in terms of the parameter effects, its statistical effects were non-significant.

2.3 SUMMARY & DISCUSSION

In the preceding sections we have presented and commented on the results following analysis of household-level information on nutrition outcomes based on unit record data from NFHS-III covering the 11 major tribal-population concentration states. The main aim of these analyses were to identify the determinants of aggregate, household-level nutrition insecurity considering the nutrition outcomes – anthropometric and biomarker-based – for which information is available in the NFHS data. Additionally, we were interested to dissociate the differential levels of influence the background explanatory variables are likely to have on the aggregate outcomes considered, depending on the social-group affiliations of the household, or to be more specific, between the tribal and non-tribal households.

[10] We had deliberately avoided using the simple (unweighted) additive index used for the regression models in the preceding section, because of the overdispersion and excess-zero problems. Since the Blinder-Oaxaca decompositions rely on an underlying OLS estimator for estimating the regression coefficients, the results are likely to be biased. To avoid it, we have used an alternative index derived on the basis of a factor analysis of the component sub-indicators of undernutrition, and scoring using the first retained (and rotated) factor, which was normalized for the decomposition exercise to a scale of 0-100. However, for the inquisitive reader we may mention that the counterpart results of the decomposition were a mean of 1.56 for non-tribal households and 2.52 for tribals; and values of E, C, and CE to be -0.6874, -0.1953 and -0.0780 respectively.

A few salient findings emerge from the analyses detailed above, which is summarized as following:

- Tribal households, across all the 11 states under analysis, are in a clear disadvantaged position in terms of both nutrition outcomes – aggregate as well as those specific to men, women and young children – as well as key background attributes such as SES, female education and economic emancipation or decision-making power of women.

- The tribal-non-tribal divide in aggregate nutrition outcomes – or nutrition security as we may term it intuitively – transcends conventional differentials across socioeconomic categories; Tribal households of relatively better-off living standards have worse nutrition outcomes as compared to the non-tribal households with far lower living standards.

- The multivariate model results underscore such effects; controlling for other background characteristics, an average tribal family has about 15% higher risks for both the *incidence* of nutrition outcome-insecurity and, among those with varying levels of undernutrition outcomes, a higher *intensity* of nutrition outcome-insecurity

- Women's autonomy and ability to take diverse set of household decisions independently is found to be a crucial input in determining aggregate levels in nutrition outcomes, cutting across social-groups. Households, both in the entire sample as well as those belonging to the three different social groups, with women having higher levels of decision-making, have, on an average, about 50% less risks of nutrition insecurity.

- Being a tribal family is clearly far more disadvantageous in terms of the levels of the endowments – factors that are likely to explain levels or intensity of nutrition insecurity – they possess vis-à-vis non-tribal families; The results of the Blinder-Oaxaca decomposition suggests that a simple 'transfer' of the non-tribal households' endowments to their tribal counterparts can virtually erase the entire (87%) observed differentials in aggregate nutritional outcomes between these groups.

- Of the individual explanatory factors, two clearly stand out in explaining the disproportionate burden of adverse aggregate nutrition outcomes in tribal households. One is overall living standards – ownership of assets and basic household amenities – and the other is high young dependency burden resulting from higher fertility levels in tribal populations and a higher number of children per family compared to non-tribal households, which together explains close to 90% of the observed differentials.

The analysis based on NFHS could provide some broad emerging patterns into the possible factors explaining higher levels of nutrition insecurity among tribal households across India. However, the NFHS data has very weak coverage of crucial information on food-intake – both in quantity and quality terms – that comprises the dimension of food security in the context of aggregate household-level FSN outcomes. This is an issue which is possible to study to some extent from the consumption expenditure surveys of the NSSO, which we take up for analysis in the next part of this study.

Table 1.1: Descriptive statistics across social groups for the aggregate FSN outcome indicator and component sub-indicators

Social Group	BMI (male)	Anaemia (male)	Child-stunting	Child-wasting	Child-under-nourished	Anaemia (child)	BMI (female)	Anaemia (female)	Aggregate FSNO score
Gen (N=17441)	0.166	0.109	0.095	0.110	0.052	0.161	0.113	0.198	1.003
SC/OBC (N=24729)	0.239	0.142	0.168	0.182	0.081	0.242	0.191	0.272	1.517
ST (N=5630)	0.236	0.196	0.263	0.249	0.136	0.335	0.277	0.417	2.108
All sample (N=47800)	0.212	0.136	0.152	0.163	0.077	0.224	0.172	0.262	1.399

Table 1.2: Average incidence and scores for the aggregate FSN outcome indicator, across social groups and states

States	Aggregate FNSO index - average score			Average Incidence - Aggregate FNSO		
	Gen	SC/OBC	ST	Gen	SC/OBC	ST
Andhra Pradesh	0.896	1.223	1.913	38.8%	47.9%	67.3%
Chhattisgarh	0.858	1.687	2.070	30.2%	43.9%	51.4%
Gujarat	1.069	1.721	1.934	35.7%	43.3%	44.8%
Jammu & Kashmir	0.923	1.544	1.896	31.4%	45.0%	54.0%
Jharkhand	1.290	2.154	2.530	36.7%	49.9%	54.4%
Karnataka	1.119	1.308	1.503	44.9%	47.2%	52.4%
Madhya Pradesh	1.122	1.841	2.685	33.8%	45.3%	54.5%
Maharashtra	0.968	1.301	1.706	38.4%	49.6%	54.3%
Odisha	0.935	1.339	1.988	33.2%	39.9%	50.3%
Rajasthan	1.330	1.837	2.210	39.0%	47.7%	52.8%
West Bengal	0.958	1.353	2.085	32.5%	41.3%	50.5%

Table 1.3: OLS Models – Within-group and Between-group fixed-effects Regression results

Variables	Null Model	Between Groups – Fixed Effects	Within-Group Fixed Effects		
			General Castes	Scheduled Castes/OBCs	Scheduled Tribes
Place of residence – Rural		0.085**	0.114**	0.06	0.114
		(0.028)	(0.041)	(0.037)	(0.119)
Female-headed household		-0.145***	-0.084*	-0.149***	-0.228*
		(0.031)	(0.043)	(0.045)	(0.114)
Number of children in the household		1.804***	1.503***	1.879***	2.190***
		(0.011)	(0.017)	(0.015)	(0.035)
Household uses water purification		-0.055*	-0.045	-0.079*	0.03
		(0.022)	(0.033)	(0.031)	(0.074)
Household owns agricultural land		0.062**	0.047	0.055	0.11
		(0.022)	(0.033)	(0.030)	(0.075)
Medium SES		-0.247***	-0.299***	-0.237***	-0.211*
		(0.027)	(0.046)	(0.035)	(0.097)
Rich SES		-0.515***	-0.557***	-0.508***	-0.787***
		(0.039)	(0.06)	(0.054)	(0.187)
Possess BPL card		0.050*	0.088*	0.063*	-0.082
		(0.023)	(0.038)	(0.03)	(0.069)
Social Group - SC/OBC	0.461***	0.111***			
	(-0.024)	(0.022)			
Social Group - ST	0.976***	0.342***			
	(-0.036)	(0.035)			
Iodized salt consumption - Inadequate		0.087***	0.122**	0.082*	0.011
		(0.026)	(0.04)	(0.035)	(0.085)
Iodized salt consumption - Absent		0.176***	0.152***	0.196***	0.071
		(0.025)	(0.042)	(0.034)	(0.082)
Women's years of education		-0.017***	-0.025***	-0.015***	0.007
		(0.003)	(0.003)	(0.004)	(0.011)
Woman works for cash		0.007	0.023	0.012	-0.001
		(0.024)	(0.036)	(0.034)	(0.075)
Women's Dietary diversity - Medium		0.038	0.054	0.06	-0.037
		(0.027)	(0.039)	(0.039)	(0.106)
Women's Dietary diversity - High		0.047*	0.044	0.053	-0.033
		(0.02)	(0.031)	(0.029)	(0.07)
Women's Decision-making - Medium		-0.134***	-0.121*	-0.198***	0.042
		(0.032)	(0.049)	(0.043)	(0.108)
Women's Decision-making - High		-0.303***	-0.280***	-0.356***	-0.310*
		(0.035)	(0.052)	(0.048)	(0.12)
Community served by AWC		0.04	-0.019	0.071*	0.054
		(0.024)	(0.033)	(0.035)	(0.094)
N	48486	38611	13753	20264	4594
Adjusted R-squared	0.016	0.476	0.433	0.486	0.487

Table 1.4: Zero-inflated Poisson (ZIP) Regression Model Results

Explanatory Variables	Between-Group Effects		Within-Group Effects					
			General Castes		SC/OBCs		STs	
	Count-Model	Logit-Model	Count-Model	Logit-Model	Count-Model	Logit-Model	Count-Model	Logit-Model
Place of residence - Rural	-0.008	0.938	0.010	0.833**	-0.007	0.993	-0.011	1.027
Female-headed household	-0.004	1.512***	-0.027	1.348***	0.008	1.585***	-0.035	1.648***
Number of children in the household	0.414***	0.186***	0.437***	0.207***	0.408***	0.182***	0.418***	0.153***
Household uses water purification	0.022**	1.005	0.031*	0.979	0.024*	1.056	-0.005	0.882
Household owns agricultural land	0.001	0.920**	0.026	0.940	-0.021	0.898**	0.039**	1.004
Medium SES	-0.135***	0.906**	-0.120***	0.902	-0.146***	0.930	-0.110***	0.976
Rich SES	-0.402***	1.034	-0.359***	0.998	-0.391***	1.020	-0.479***	1.288
Possess BPL card	-0.012	0.840***	0.014	0.812***	-0.014	0.832***	-0.034*	0.947
Social Group - SC/OBC	0.050***	0.876***	-	-	-	-	-	-
Social Group - ST	0.154***	0.857***	-	-	-	-	-	-
Iodized salt consumption – Inadequate	0.016	0.843***	0.021	0.780***	0.006	0.848***	0.034	1.010
Iodized salt consumption - Adequate	0.020**	0.637***	0.033	0.660***	0.021	0.605***	0.007	0.771**
Women's years of education	-0.011***	1.006	-0.022***	1.014**	-0.007***	0.997	0.000	0.989
Woman works for cash	-0.054***	0.858***	-0.060***	0.903	-0.055***	0.858***	-0.051**	0.815**
Women's Dietary diversity - Medium	-0.088***	0.759***	-0.064***	0.849**	-0.101***	0.732***	-0.095***	0.764**
Women's Dietary diversity - High	-0.024**	0.875***	0.027	1.080	-0.036***	0.795***	-0.031	0.813**
Women's Decision-making - Medium	-0.025**	1.035	-0.040*	1.078	-0.034**	1.050	0.005	0.838
Women's Decision-making - High	-0.094***	1.476***	-0.143***	1.416***	-0.087***	1.505***	-0.069**	1.511***
Community served by AWC	0.017	0.911**	-0.023	0.924	0.030	0.931	0.022	0.824
No. of Observations	38611		13753		20264		4594	

Table 1.5: Blinder-Oaxaca Decomposition Results – Differences in aggregate FSN outcome between tribal and non-tribal groups

Group regression Models	Non-tribal Households Model		Tribal Households Model	
Predictor variables	β^{NT}	SE	β^{T}	SE
Place of residence - rural	0.085	0.094	0.048	0.412
Female-headed household	-0.169	0.110	-0.775*	0.409
Number of children in the household	6.850***	0.039	8.797***	0.128
Household uses water purification	0.096	0.074	0.315	0.255
Household owns agricultural land	-0.136*	0.079	0.127	0.268
SES (normalized wealth index scores)	-0.041***	0.002	-0.063***	0.010
Possess BPL card	-0.240***	0.080	-0.470**	0.242
Women's years of education	-0.017*	0.009	0.081**	0.041
Iodized salt consumption - Inadequate	0.159*	0.093	0.016	0.309
Iodized salt consumption - Adequate	0.182**	0.090	0.019	0.285
Women's Dietary Diversity score	-0.092***	0.012	-0.140***	0.045
Woman works for cash	-0.002	0.074	-0.385	0.256
Women's Decision-making score	0.248***	0.059	0.050	0.211
N	35437		4594	
Decomposition Results				
Differentials				
Prediction_1	4.744	0.048		
Prediction_2	8.158	0.171		
Difference	-3.414	0.178		
Decomposition				
Endowments (E)	-2.959	0.212		
Coefficients (C)	-1.005	0.129		
Interaction (CE)	0.550	0.171		

Figure 1.1: Average incidence of each component sub-indicator and aggregate FSN outcome indicator across social groups

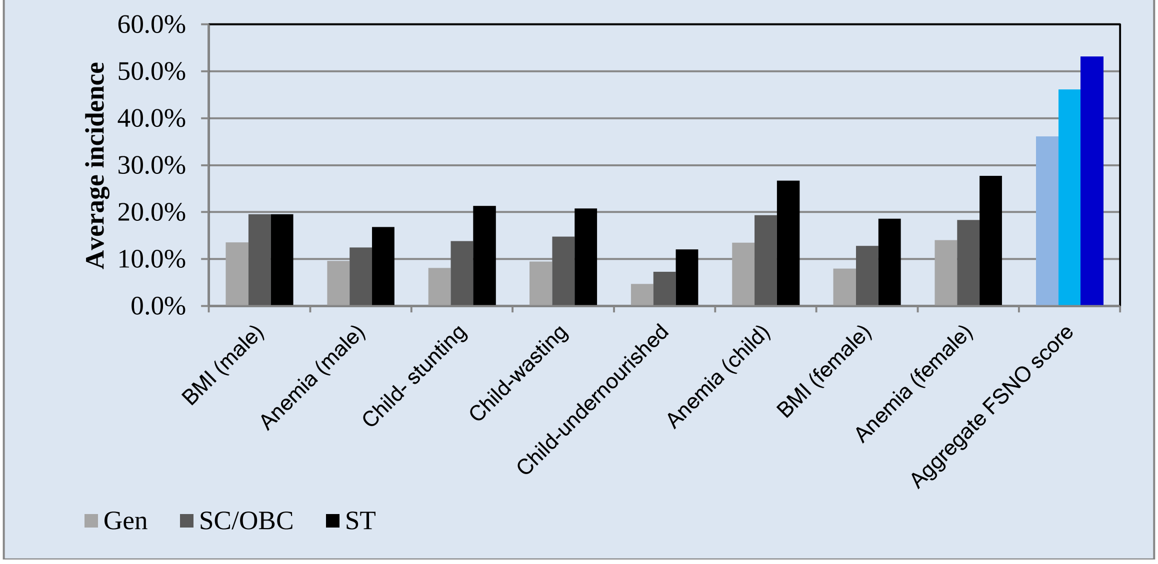

Figure 1.2: Group-differentials in Aggregate FNS score and average incidence, SES adjustments

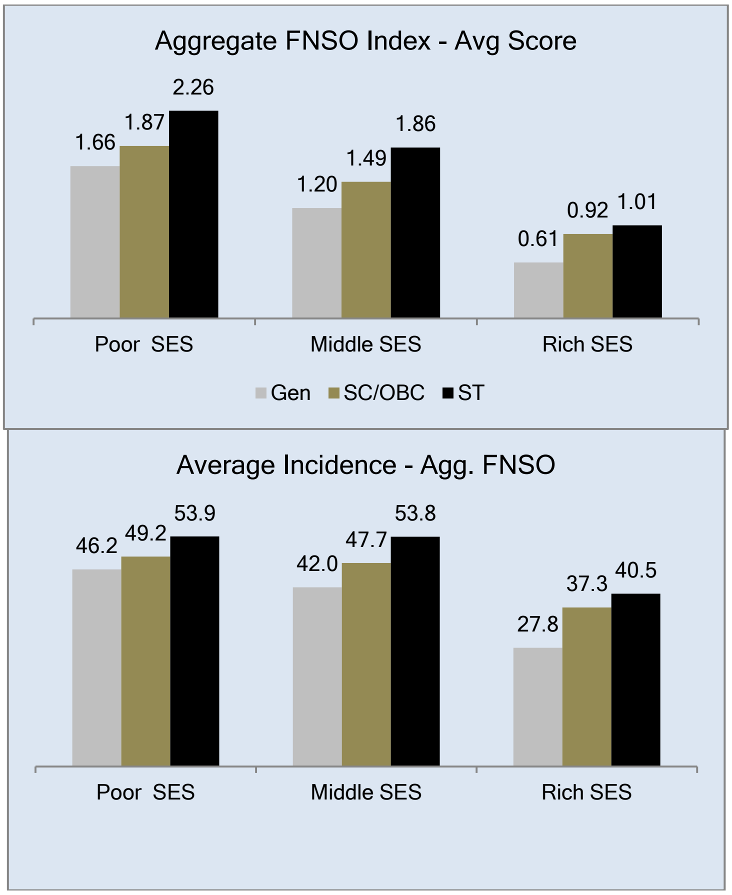

Figure 1.3: Contributions in Means and in Coeffcients to Tribal-Nontribal Difference in Aggregate Household Nutrition Outcome