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Socioeconomic Gaps in Child Development: Evidence from a National Health and Nutrition Survey in Bolivia

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Abstract: This paper examines socioeconomic gaps in child development in Bolivia using a representative sample of children 0–59 months old and a rich set of outcomes, including micronutrient deficiencies, gross motor and communicative development. Compared to the poorest quintile, children in the richest quintile are less likely to have iron deficiency, anemia, to be stunted, and to show risk of delays in gross motor and communicative skills. When comparing children at age three, most of these gaps have increased substantially. Our findings are robust to the choice of socioeconomic measurement and highlight the need for targeted policies to reduce developmental gaps.

Keywords: Socioeconomic gap, child nutrition, early childhood development, Bolivia

JEL Codes: I14, J13

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1. Introduction

As of 2010, an estimated 249.4 million children worldwide risked failing to meet their development potential because of poor health and poverty (Lu et al, 2016). A large body of evidence shows that socioeconomic status (SES) is a strong predictor of children's health and development outcomes. Studies analyzing socioeconomic gradients in health and development outcomes show that poorer children are less likely to be healthy and well-nourished, achieve optimal cognitive abilities, and adequately communicate with others (Van De Poel et al. 2008; Hamadani et al. 2014; Rubio-Codina et al. 2015; Schady et al. 2015). These early disparities are carried through life, with implications for educational attainment and performance, income generation, health, risk behaviors and other dimensions of individual and social well-being (Walker et al., 2001; Naudeau et al., 2011). The effects of disparities in child development by SES thus have important implications for the inter-generational transmission of poverty and economic development.

There are several mediating factors related to poverty that prevent children's optimal health and development. Black et al. (2013) find that child undernutrition and unstimulating household environments contribute to deficits in children's health and development and to reduced productivity in adulthood. Similarly, micronutrient deficiencies such as iron and vitamin A have also been found to affect cognitive, motor, and socio-emotional development (Lozoff et al. 2006). Other risk factors include lack of access to clean water and sanitation, parents with low education, and low access to quality early childhood development services (Naudeau et al. 2011). These detrimental effects on development have long lasting consequences in adult life. Losses from poor cognitive and educational performance in poor children account for subsequent lower employability and earnings (Almond and Currie 2011), high fertility and poorer parenting practices for their children in the future (Grantham-McGregor et al. 2007).

This paper contributes to a growing literature on SES gradients in child development by analyzing a large nationally representative sample of children under five years old in Bolivia using a rich set of outcomes. Our study focuses on measures of physical and linguistic development including micronutrient deficiencies, anemia, stunting, underweight and overweight, as well as gross motor and communicative skills. A major contribution of this paper is the use of dried blood samples to measure Vitamin A and iron deficiency disparities, allowing us to make within-sample comparisons to bio-markers and child development. To measure SES, we construct direct and *proxy* measures of living standards based on household expenditures and on ownership of assets combined with access to services and dwelling characteristics. This allows us to test the sensitivity of our results to measures of SES. Thus, our study complements the existing body of literature that focuses on particular subpopulations of disadvantaged children (Rubio-Codina et al. 2015) or analyzes SES gaps in child development across countries using a single SES indicator and measure of child development (Schady et al. 2015).

Our main research question addresses the SES gaps in child development in Bolivia. We disaggregate results by subnational region and child's age and consider the sensitivity of results to SES measure. These analyses are relevant for the design and targeting of evidence-based interventions that can prevent or revert the negative patterns of low development for poor and disadvantaged children.

The remainder of the paper is organized as follows. Section 2 describes the data, explains the construction of child development outcomes and SES, and describes the strategy to measure SES gradients. Section 3 presents SES gaps by developmental domain and explores the timing of the gaps. Section 4 presents robustness checks of our results to the choice of the socioeconomic indicator. Section 5 concludes.

2. Methods

A. Data sources

The data for this study come from the Health and Nutrition Evaluation Survey (ESNUT). The ESNUT is a large household survey implemented between April and December 2012 with the objective of generating updated health and nutrition information to evaluate two national social protection programs in Bolivia[4]. It used a multistage cluster design to provide representative information at the national and regional levels of households with children younger than five years old, allowing for further disaggregation by place of residence, with an emphasis in the rural areas. The sample for our analysis includes 11,358 children under the age of five in 8,433 households (2,456 urban and 5,977 rural).

The ESNUT collected data using three main questionnaires: i) a household questionnaire collected basic sociodemographic characteristics of household members (family composition, education, labor participation and income), physical housing quality, access to basic services, household asset ownership, and household expenditure; ii) a woman's questionnaire, administered to all eligible women aged 14 to 49 years, collected birth histories for a five year

[4] These are: The Bono Juana Azurduy (BJA) and the Zero Malnutrition Program. The BJA is a conditional cash transfer program that aims to improve the utilization of maternal and child health services. The Zero Malnutrition program is a multisector program that has the objective of eradicating child malnutrition through comprehensive nutritional strategies.

period preceding the survey (2007-2012) and included detailed information on prenatal, birth and postnatal care; and iii) a child's questionnaire gathered data from all children under five years, including health status, measures of height and weight, hemoglobin levels, immunizations, nutritional practices, and history of visits to health providers (reported and recorded in health cards). To assess developmental progress in children younger than 3 years, the ESNUT included gross motor and communicative modules of a child development screening questionnaire, with items based on report and observation according to child's age. In a random subsample of children between 6 and 23 months, the survey additionally collected blood samples using Dried Blood Spots (DBS) to measure vitamin A and iron levels in blood.

B. Assessment of child development

We assessed child development on a range of physical and language development indicators. Physical development was evaluated considering child's gross motor development and nutritional status, including height, weight, anemia, vitamin A deficiency and iron deficiency. Language development was based on caregivers' information about the child's communication abilities.

Nutritional status

We employ anthropometric indicators and biomarkers to measure nutritional status. Biomarkers include hemoglobin levels to identify presence of anemia, and blood concentration of vitamin A and iron to identify micronutrient deficiencies.

Child growth indicators were constructed following World Health Organization (WHO) guidelines (WHO 2006). Standardized z-scores (standard deviation scores) were constructed for the three most common anthropometric indices: height for age, weight for age, and weight for height. The z-score system expresses the anthropometric value as a number of standard deviations from the median of the WHO reference population[5,6]. In addition to the use of continuous z-scores, we computed indicators of prevalence of chronic malnutrition (stunting), underweight, and overweight, based on standard cut-off values of below or above two standard deviations from the reference median.

High prevalence of anemia in small children has been a top public health concern in Bolivia where 54% of children under five are anemic (Instituto Nacional de Estadística 2017). To measure anemia, the ESNUT obtained levels of hemoglobin in blood for each child between 3 and 59 months using a *HemoCue*® test for the photometric detection of hemoglobin. This

[5] Z-score = (observed value - median value of the reference population) / standard deviation value of reference population.

[6] The WHO reference growth standards were established in 2006 and represent the growth patterns of healthy children from different regions of the world.

method has been used extensively in household surveys in developing countries, including the Demographic and Health Surveys (www.dhsprogram.com). Presence of mild, moderate or severe anemia was then determined based on altitude-adjusted hemoglobin levels and standard cut-off points corresponding to each level of anemia[7].

One of ESNUT's specific objectives was to assess deficits of key micronutrients in small children; specifically, vitamin A deficiency (VAD) and iron deficiency (ID). VAD in children is responsible for over one million child deaths annually, and is the leading cause of preventable child blindness in developing countries (West, Jr. and Darnton-Hill 2001). ID, in turn, is a main health concern in children under five globally. In countries with high prevalence of anemia, most anemia is caused in part or in whole by iron deficiency (Yip 2001). ID is also associated with poorer child cognitive, motor, and social-emotional functions (Lozoff et al. 2006), although causal relationships have been difficult to establish (Grantham-McGregor and Ani 2001). To measure VAD and ID, blood samples were obtained from a subsample of 2,000 children ages 6 to 23 months using the Dried Blood Spots (DBS) method (GIZ and Univ. Giessen 2012). This method collects a few blood drops from a heel or finger prick that are then impregnated in filter paper and let to dry; the DBS can then be analyzed in laboratory[8].

All DBS were rehydrated and analyzed in laboratory using the Enzyme-Linked Immunosorbent Assay method (ELISA)[9] (Erhardt et al. 2004). The indicator to estimate concentration of Vitamin A was the Retinol Binding Protein (RBP), whereas for iron levels it was the Free Transferrin Receptor (sTfR). VAD was defined as RBP below 0.7µmol/l (Sommer and Davidson 2002) and ID as sTfR above 8.3 mg/l. Excluding samples with low quality (damaged or small blood spots) and with indication of inflammation, the total sample size for analysis was 1,655[10].

Gross motor and communicative development

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[7] Mild anemia: hemoglobin level between 10.0 and 10.9 g/dL. Moderate anemia: hemoglobin level between 7.0 and 9.9 g/dL. Severe anemia: hemoglobin level <7.0 g/dL.

[8] DBS were collected at the end of the interview after caregiver's consent. Samples were identified and stored in hermetic plastic containers with drying agents to accelerate the dehydration process and to control humidity during transportation. Once dry they were packed using Ziploc bags. The DBS method had several advantages in field work. First, its simplicity and micro volume of blood required makes it appropriate for its use in small children, with very low health and biological risks. Second, the technique does not require specialized health personnel, intensive training or equipment. Third, DBS are stable to normal outside temperature for relatively long periods, which allows sufficient time to transport samples from rural areas and then to laboratories. In addition, it does not require special transportation conditions (such as cold chain), except humidity control and excess heath, which can both damage samples.

[9] For analysis, all samples were flown to a specialized laboratory at the University of Giessen, Germany.

[10] From the subsample of 2,000 children 6-23 months selected for the DBS study, the ESNUT was able to collect 1,701 valid blood samples (the rest had either quality problems or were not available for analysis). In addition, 46 samples had to be discarded due to identification issues (incorrect household or id codes).

Gross motor and communicative development are evaluated using a gross motor and communication scales based on the second edition of the Ages and Stages Questionnaires® (ASQ-2)[11]. The ESNUT used 11 age-specific survey modules for age ranges between 3.5 and 36.5 months[12]. To increase variability in the sample, the ESNUT added items of decreasing and increasing difficulty. Similar adaptations have been used in other studies (Rubio-Codina et al. 2016; Fernald et al. 2012). The questionnaires' language was also adapted to the local context of rural and urban Bolivia. Questions about tasks that the child is (or is not) able to perform were asked to the main caregiver by an interviewer, while some specific items were directly administered directly to the child.

Each item has a score of 10, 5 or 0 depending on whether the child can perform the task always, sometimes, or never, respectively. Raw scores were constructed for each domain as the sum of scores across items. Because the population on which the ASQ was standardized (US children) was not considered an appropriate reference population for our sample, we constructed within sample or internally standardized scores adjusted by age. Following standard procedures internal *z*-scores were constructed within age groups to have a mean of 0 and a SD of 1 (by subtracting the age-group specific mean of the raw score and dividing by the age-group specific SD).

C. Measures of socioeconomic status: direct versus proxy indicator

There are several ways to measure socioeconomic status from household survey information, including direct monetary measures (income or expenditure), and *proxy* measures including composite indices derived from ownership of household assets and living conditions. We use the rich information collected by ESNUT on household income, expenditures, and asset ownership to construct alternative measures of SES and check the sensitivity of our results to those measures. The availability of detailed information to construct multiple measures of SES is unusual for most health surveys.

Direct measure of SES: household consumption

Household consumption was used as our preferred direct measure of SES. In our context, we believe consumption is a better measure of SES than income, considering the problems with measuring income in settings with a high proportion of self-employed and informal workers. In

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[11] The ASQ-2 is a developmental screening tool for children between 4 and 60 months, comprising 19 age-specific questionnaires designed to screen infants and young children for developmental delays during the first 5 years of life (Ages & Stages Questionnaires, Second Edition. A Parent-Completed, Child Monitoring System, by Diane Bricker and Jane Squires. Copyright © 1999 by Paul H. Brookes Publishing Co.).

[12] Age ranges were: 3.5-6.5 months; 6.5 to 9.5 months; 9.5-11.5 months; 11.5-13.5 months; 13.5-15.5 months; 15.5-17.5 months; 17.5-19.5 months; 19.5-22.5 months; 22.5-24.5 months; 24.5-30.5 months; 30.5-36.5 months.

addition, irregular and intermittent earnings from informal employment make income measurements more volatile than consumption and, therefore, more directly related to current living standards (Deaton and Grosh 2000; O'Donnell et al. 2008).

Our consumption index is based on the aggregation of payments for goods and services collected using monthly, quarterly, and yearly reference periods. For food consumption, we used information about monthly purchases of a list of 41 food items as well as spending on food consumed outside the house. Because home-produced foods are an important part of food consumption in rural areas, we included self-reported valuations of consumption from household production. Nonfood consumption includes payments in housing, household services, education, personal goods, health, transport, recreation, and financial services. For non-renters, housing consumption was imputed using a hedonic price model. We excluded spending on durable goods and other lumpy spending such as hospitalizations[13]. To construct total consumption, individual items based on quarterly and yearly recall periods were converted into monthly figures and then all food and nonfood items were added together. We adjusted for household size by dividing total consumption by the number of household members and obtaining a per capita measure.

Proxy measure of SES: wealth index

Additionally, we developed an alternative *proxy* measure of SES by estimating a composite indicator "wealth index" that combines information about ownership of household assets, physical characteristics of the dwelling and access to basic services using principal components analysis (Filmer and Pritchet 2001; Rutstein and Johnson 2004)[14]. Asset-based indices have several advantages over direct measures of living standards: data on assets and dwelling characteristics are less expensive and easier to collect; they are more robust to measurement error and reporting biases than income and expenditures; and an asset-based index reflects the notion of permanent income more closely, and is based on a long term conceptualization of wealth, which is more relevant for inequality analysis (Filmer and Pritchet 2001; Rutstein and Johnson 2004; Gakidou et al. 2007; O'Donnell et al. 2008; Vyas and Kumaranayake 2006). Wealth indices based on principal components analysis have also been used in analyses of socioeconomic gaps in health and child development outcomes in low- and middle-income countries (Gwatkin et al. 2007; Rutstein and Johnson 2004; Rubio-Codina et al. 2015; Van De Poel et al. 2008; Hamadani et al. 2014). For this study, a wealth index was estimated based on

[13] The ESNUT did not collect information about the use value of durables to construct a complete measure of household consumption.
[14] Principal components analysis uses statistical methods to determine the weights of items in the index. Individual items are weighted to maximize the variability of the new composite variable.

assets ownership, including refrigerator, radio, television, fixed phone line, car, motorcycle, bicycle; and information about water sources, toilet facilities, electricity, and the construction material of wall, roof, and floor in the household[15]. The resulting score is a standardized wealth index with a mean of zero and a standard deviation of one. All members in the household receive the same wealth index score. Figure 1 shows the distribution of households by the value of the wealth index.

The question of whether the choice of SES measure matters in the analysis of socioeconomic inequalities has been explored in the literature, yet without a conclusive answer. While some studies find that the choice between consumption and the asset index makes little difference to the measured degree of inequality (Wagstaff and Watanabe 2003), others argue that results are actually sensitive to the choice of SES measure (Lindelow 2006), or even to the choice of assets and characteristics that are included in the wealth index (Houweling, Kunst, and Mackenbach 2003). Consistent with previous findings, the relationship between our consumption and wealth index is relatively low, with a correlation coefficient of 0.45; therefore, as suggested in O'Donnell et al. (2008), we use both measures of SES to test the robustness of our results to the choice of the SES indicator.

D. Measuring SES gradients: analysis approaches

SES gradients in child development are evaluated by comparing development outcomes across five quintiles of the population ranked by the level of consumption or wealth index. Quintiles were constructed based on the distribution of the household population rather than on the distribution of households; therefore, Quintile 1 (Q1) corresponds to children in the poorest 20% of the population, whereas Quintile 5 (Q5) to children in the richest 20%[16]. The same classification of quintiles was used for the analysis of all child development outcomes. Given its straightforward interpretation, comparisons of outcomes by quintile has been widely used to characterize gradients in child's health and development and are considered a preferable approach when other more complex measures of inequality do not provide additional insight of the problem (WHO 2013).

In addition to the descriptive approach based on unconditional means, we used a regression framework to assess the adjusted associations between child development outcomes and

[15] Principal components were computed using the Stata® command *factor* with the *pcf* option specified.

[16] Following Rutstein and Johnson (2004), the quintile cutoffs are based on total household population, instead of the households themselves. Quintiles were constructed using a weighted frequency distribution of households where weights were the product of the number of de jure household members and the sampling weight of the household. Consequently, a tabulation of the unweighted sample will not produce five quintile groups of equal size, but the weighted sample will.

socioeconomic status, after controlling for other demographic factors that might affect child's development. The SES gap in child development was estimated by OLS using the following equation:

$$Y_i = \alpha + \sum_{k=2}^{5} \beta_k Q_{ki} + \gamma age_i + \delta female_i + \varepsilon_i \qquad (1)$$

where Y_i is the development outcome for child *i; age_i* are semi-paramedic controls for child's age in months using 3-month bins; $female_i$ is a dummy variable equal one if child is a girl and zero otherwise. Q_{ki} is a dummy indicator for the *k*th quintile of the SES distribution where the omitted category is Q_1. Hence, the estimated coefficient $\hat{\beta}_k$ represents the difference in the average outcome obtained by children in quintile *k* with respect to the average outcome in Q_1. Joint hypothesis testing was used to test the effect of the levels of socioeconomic status (e.g. quintiles) taken as a whole[17].

For all analytical approaches, survey sampling design, including sample weights and clustering effects, were considered when calculating point estimates and standard errors.

3. Results

A. Descriptive overview

This section presents descriptive statistics and unadjusted mean differences between high and low consumption quintiles for our outcomes of interest. For each development measure, Table 1 shows mean, standard error and sample size for the whole sample of children and disaggregated for children at the bottom quintile (Q1) and the top quintile (Q5) of household consumption. The last two columns show the difference in means between high and low quintile children and the p-value for the test of equality of means.

There are large and statistically significant differences in all standardized anthropometrics z-scores between children in Q5 and children in Q1: height for age (0.95 SD), weight for age (0.70 SD), and weight for height (0.21 SD). Differences are also demonstrated for prevalence of stunting: while one in every ten children are stunted in the richest population, this proportion more than triples to one in every three children in the poorest population. Although the prevalence of underweight is low in Bolivia, the percentage of poor children that are underweight (2.5%) more than doubles that of the richest group. On the other hand, the prevalence of overweight for children in the top quintile (10.1%) almost doubles that of children at the bottom quintile (5.7%).

[17] We test whether the coefficients for the quintile indicators are jointly zero.

The biomarkers show that the prevalence of anemia is high in Bolivia with 6 out of 10 children suffering from anemia in 2012, one of the highest in the Latin American region. When we divide the sample into children at the bottom and top consumption quintiles the results show that 74.2% of children in the poorest quintile are anemic. While this percentage falls to 46.4% for children in the richest quintile, it remains high compared to other countries in the region. Similarly, the prevalence of Vitamin A deficiency is 29.9% for children in the richest quintile and almost 10 percentage points higher for those at the bottom quintile (39.0%); the prevalence of Iron deficiency for children in the top and bottom quintiles id 16.4% and 23.8%, respectively. The differences for these indicators were statistically significant at the 5% confidence level, except iron deficiency for which differences were significant at the 10% level.

Finally, Table 1 shows mean standardized gross motor and communication z-scores which are centered at zero since they are constructed within sample. The results show that children in the richest quintile have a Gross motor score 0.21 SD higher than children in the poorest quintile. For the communication z-scores, the difference between children in the poorest and richest quintiles was 0.11 SD but not statistically significant. Overall, the descriptive analysis indicates that there are large and significant gaps in child development by socioeconomic status.

B. Non-Parametric relation of SES gap and age

To explore when the development gaps between children in different socioeconomic groups start and how it changes for children at different ages, we analyze the differences in outcomes between the bottom and top quintiles by child's age. In Figure 2 we plot kernel weighted local polynomial regressions of standardized scores for all child development indicators and report 95% confidence intervals for each group.

The first panel shows that children born in the richest and poorest quintile have significant differences in height for age very young, and this gap widens with age. In the first five months of life, the gap is approximately 0.5 SD. As we move the analysis to older children, the z-score of height for age tends to decrease for both groups when compared to the WHO standard; however, the gap between richest and poorest children starts to increase markedly at 6 months, until it reaches its maximum at 24 months and then tends to stabilize at around 1 SD. The gap path over age is similar when we analyze prevalence of stunting (Panel 4). At the first five months of age children in the poorest households are approximately 7 percentage points more likely to be stunted than those in the richest households. This gap reaches a noticeable peak of more than 25 percentage points for 24-month-old children. While the gap tends to decrease slightly for older cohorts, it remains at 20 percentage points when children reach their fifth birthday.

The next panels show weight for age and weight for height z-scores as well as prevalence of children underweight and overweight. In the case of weight for age (Panel 2), the socioeconomic gap widens from approximately 0.5 SD during the first 6 months of age to 0.65 SD at the age of 18 months, stabilizing around this number at older ages. For prevalence of underweight (Panel 5) the evidence suggests that any initial (non-significant) gap between children in the top and bottom quintiles tends to disappear with age. The gap between rich and poor children in the weight for height z-score shows that while it tends to increase significantly from birth until 15 months of age, it reduces again in the next two years (Panel 3). Finally, while differences in prevalence of overweight between the richest and poorest children are less clear during the first two years of life, the gap increases and becomes more relevant by the age of three, remaining relatively stable at approximately 6 percentage points (Panel 6).

In Panels 7 to 9 we analyze the SES gap of nutritional indicators obtained from biomarkers. Panel 7 shows how the prevalence of anemia for children in the richest and poorest quintile changed by age. For both groups of children, the relationship between prevalence of anemia and age shows a reverse U-shape pattern, where anemia peaked at around 30 months of age and declined for older cohorts. While the initial SES gap in anemia remained relatively constant (around 20 percentage points) during the first 30 months of age, it increased markedly among children between three and five years of age. Panels 8 and 9 present vitamin A deficiency and iron deficiency by age, respectively. Since DBS were taken only for a random sample of children aged 6 to 24 months, confidence intervals for indicators based on DBS are substantially larger. The results for VAD show a difference of approximately 20 percentage points between the poorest and richest quintile for children 6 to 9 months of age; however, the gap tends to close rapidly at older ages. The prevalence of iron deficiency shows no significant differences between Q1 and Q5 children when we compared within age subgroups.

The last two panels of Figure 2 show socioeconomic differences in standardized scores of gross motor and communication skills across age groups. The gap in gross motor skills becomes positive around the age of 15 months, stabilizing at around 0.30 SD in favor of the richest group. For communication skills, results show no significant differences between children in Q1 and Q5 within age subgroups, although for some multivariate regression models discussed below the SES gaps in communication become apparent.

Overall, the nonparametric analysis of differences within age subgroups show that, for key nutritional indicators, there is a significant SES gap that starts early in life and increases as for older children (e.g. stunting, anemia). The gap, while it exists, is less noticeable for measures of Vitamin A and Iron deficiency.

C. Parametric estimation of SES gaps in child development

Results of parametric regressions defined in equation (1) for the whole sample and disaggregated by subnational regions are presented in Table 2. After adjusting for sex and age, there is a strong and significant association between SES and almost every anthropometric indicator. Compared to children in the poorest quintile, children in Q2 are 0.30 SD taller for their age, and 0.65 SD taller in Q3; this gap increases to 0.96 SD for children in the richest quintile. The results follow a similar positive SES gradient for weight for age and weight for height z-scores, where higher quintiles are associated with higher z-scores. The results for prevalence of stunting show that 30% of children in Q1 are stunted, after adjusting for age and sex. This number is reduced by one third (11.2 percentage points) for children in the next consumption quintile and decreases even more markedly across higher quintiles. We find a similar pattern of inequality for the prevalence of underweight. Children in Q5 have a 21% lower probability of being underweight than children in Q1. In the case of prevalence of overweight, children in the richest quintile are 4.6 percentage points more likely to be overweight than children in the poorest quintile, a relative difference of 37%.

The results also show a clear SES gradient when we look at differences in prevalence of anemia across consumption quintiles. When compared to children in the poorest quintile, the prevalence is 7.6 and 15.2 percentage points lower in Q2 and Q3, respectively. Among children in the richest quintile, the prevalence drops by 28.4 percentage points (compared to Q1). For vitamin A deficiency, iron deficiency and gross motor development the association with socioeconomic status is less strong. Although the percentage of children with deficits in vitamin A or iron does not differ for children in Q2-Q4, relative to children in Q1, it does reduce significantly for children in Q5 (8.5 and 8.4 percentage points for vitamin A and iron, respectively). Similarly, gross motor z-score among children in the richest quintile is 0.21 SD higher compared to children in the poorest quintile.

Table 2 also presents adjusted SES gaps for subnational regions. While for some indicators SES gradients are strongly significant in all regions (e.g. height for age, weight for age, stunting, underweight and anemia), other indicators present mixed results. Notably, there are significant SES gaps in the prevalence of overweight children in the highlands (Q4 vs Q1) and lowlands (Q5 vs Q1) and, but not in the valleys. Socioeconomic related inequalities in vitamin A deficiency are more evident in the highlands than in the valleys or lowlands.

Table 3 presents estimated coefficients disaggregating the sample by age subgroups. The results for height for age, weight for age, and prevalence of stunting show that the SES gradient becomes steeper during the first three years of life. Prevalence of stunting is 9.4 percentage points lower for children in Q5 with respect to Q1 in the first 3-11 months of age, whereas this difference becomes 28.6 percentage points for children aged 12 to 23 months. This pattern is similar for other nutritional indicators such as anemia and is partly explained by the fact that older children in the poorest quintile experience a worsening situation. Regarding gross motor skills, we find that differences across income groups become more noticeable in the group of older children: while gross motor z-score did not vary by quintile at very young ages, the gap between the richest and poorest quintile became significant (0.44 SD) among children aged 24-36 months. For vitamin A and iron deficiency the sample is too small to efficiently estimate SES gaps within age subgroups.

In addition to anthropometrics, the communication dimension of child development has been widely analyzed in the SES gradient literature (Fernald et al 2012, Rubio-Codina et al 2015, Schady et al 2016). While our estimated coefficient on communication z-score for Q5 in Table 2 is positive for the full sample, it is not statistically significant at conventional levels. In Table 3 we observe a heterogenous relationship, with large and significant SES gaps between Q3 and Q5 for the 3-11- and 24-36-month categories, and a reverse effect for intermediate SES quintiles of the 12-23-month group. However, the effects on communication z-score using alternative measures of SES in Table 4 show large and statistically significant differences between Q1 and Q5. The lack of consistency on the communication dimension may be related to the specific instrument used for this analysis (ASQ-2), which has been shown to have lower internal validity compared to the "gold standard" Bayley-III, particularly for children younger than 31 months, in an analysis of concurrent validity and feasibility conducted on a sample of children in Bogotá, Colombia (Rubio-Codina et al 2016)[18].

We re-estimate all the results using a wealth index as the measure of socioeconomic status. All the analyses show similar results, which suggest that previous findings are consistent across different measures of socioeconomic status. A summary of these results is presented in Table 4, and detailed results presented in the Web Appendix (Tables A3). We also run all the analyses in the subsample of children with DBS data. The results are similar, although standard errors are larger due to reduced sample size. This suggests that the comparison of results across health measures are not biased due to sample composition. We also reweight the sample for differences in missing data for the outcomes that we study since children for which we have

[18] Note that Rubio-Codina et al 2016 study the ASQ-3.

information on health outcomes may be systematically different than those whose parents agree to health measures (Web Appendix Tables A1 and A2). Finally, we ran all our analysis using Inverse Probability Weighting to account for sample selection of missing data (Wooldridge 2007). Results, shown in Web Appendix Table A4 and A5, remain similar.

4. Discussion

Developmental delays in early childhood have life-long consequences for an individual's future health, school performance, productivity, earnings and well-being (Walker et al 2011, Gertler et al 2014, Campbell et al 2014, Almond and Currie 2010) and for a society at large (Naudeau et al. 2011). Research shows that poverty is one of the most detrimental risk factors associated with a child's health and development, with poorer children failing to reach their developmental potential (Fernald et al 2012; Grantham-McGregor et al. 2007). Some of the mediating factors contributing to this negative relationship are illness, nutritional deficiencies, low parental education and poor home environments (Rubio-Codina et al. 2016, Grantham-McGregor et al. 2007). SES gradients in child health and development are present and extensively documented across countries. However, analyzing disparities within countries is particularly important for public policy and development. It provides information to identify, target, implement and evaluate more efficient policies and interventions aimed at reducing disparities in child development.

Our study explores SES disparities in the context of Bolivia using a broadly representative sample of the population and analyzing a more comprehensive set of outcomes than considered in the literature to date. Measures of child development include anthropometric measures, anemia, vitamin A and iron deficiency, and measures of gross motor and communicative development. In our main analysis we use household consumption to measure socioeconomic status of children, though results are robust to alternative SES measures.

We find large disparities by socioeconomic status in several child development measures. A nonparametric analysis of the SES gap within age groups indicates that the gap between the richest and poorest quintile starts early in life and that it increases for older children (e.g. anemia and prevalence of stunting). In measures of height-for-age and stunting, the SES gap tends to increase rapidly from the sixth month of age, reaching its peak at 24 months and stabilizing at older ages. Socioeconomic inequalities are less noticeable for other nutritional indicators including vitamin A deficiency and iron deficiency, though our sample size and age range is more limited for these measures. The analysis for other early child development indicators shows that while motor skills varied across quintiles, particularly after the first year of age, the SES gap was not as clear for communication skills.

The parametric analysis suggests that SES inequality persists after adjusting for demographic factors that affect child development. The analysis disaggregated by subnational regions sheds light on the heterogenous relationship between socioeconomic status and child development. While some indicators (height for age, weight for age, stunting, anemia) demonstrate common large and significant SES gaps in all regions, others show significant disparities in some regions and not in others (overweight, vitamin A deficiency).

These findings highlight the need for targeted public policies that invest in multiple dimensions of child development as early as possible, including health, nutrition and cognitive and verbal stimulation. While there is a clear need to focus efforts on improving development outcomes for the bottom quintiles of the income distribution to help close the development gaps, children on the higher end may also be at risk for overweight and obesity with the associated health risks later in life.

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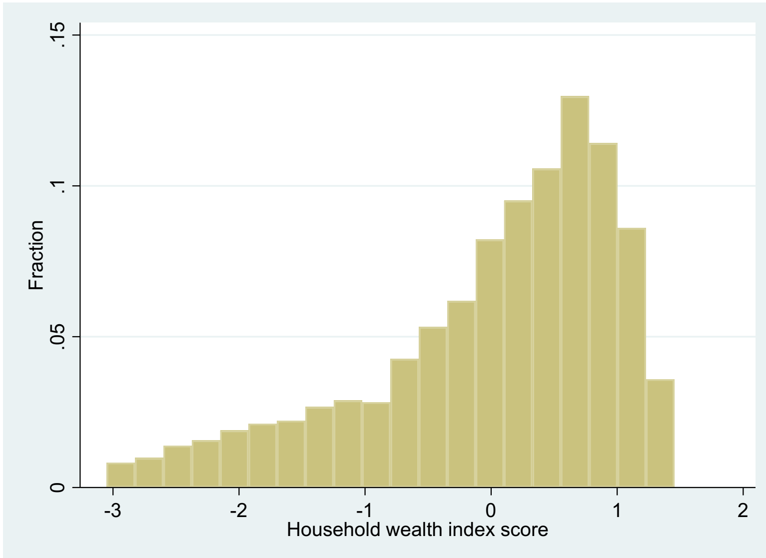
Figure 1. Distribution of households by wealth scores, Bolivia 2012



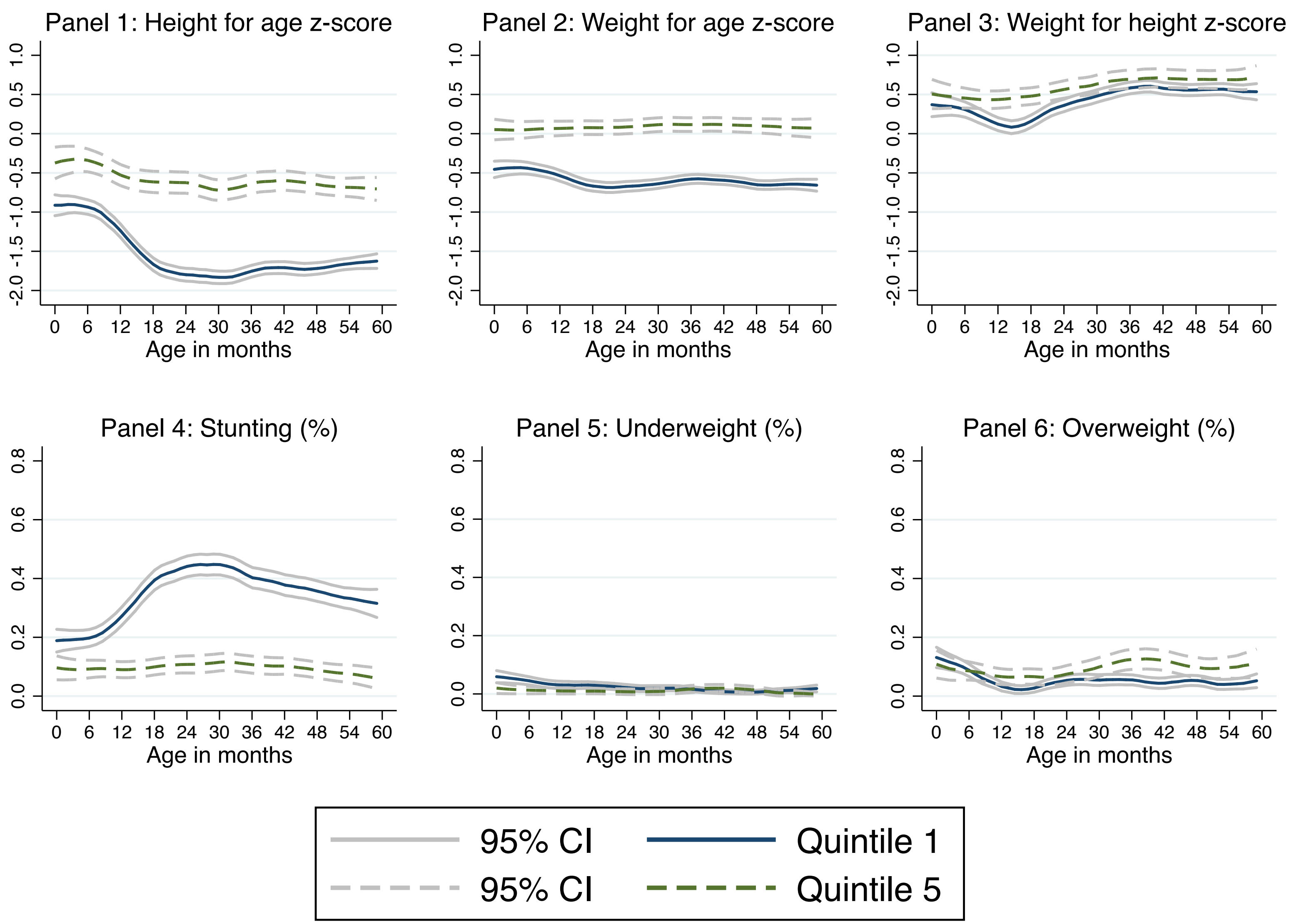
Notes. Cases weighted by household weight.

Table 1. Estimated means and standard errors by SES

Indicator	All			Poorest 20% (Q1)			Richest 20% (Q5)			Q5-Q1	
	Mean	SE	N	Mean	SE	N	Mean	SE	N	diff	p-value
Height for age z-score	-0.979	0.024	10,870	-1.528	0.036	3,895	-0.577	0.049	1,334	0.952	0.000
Weight for age z-score	-0.185	0.021	10,469	-0.582	0.034	3,665	0.114	0.044	1,321	0.696	0.000
Weight for height z-score	0.523	0.022	10,453	0.411	0.034	3,660	0.624	0.043	1,317	0.213	0.000
Stunting (%) (<-2SD HfA)	0.181	0.007	10,870	0.333	0.013	3,895	0.099	0.010	1,334	-0.234	0.000
Underweight (%) (<-2SD WfA)	0.016	0.002	10,453	0.025	0.004	3,660	0.010	0.003	1,317	-0.015	0.007
Overweight (%) (>+2SD WfH)	0.074	0.004	10,453	0.057	0.006	3,660	0.101	0.010	1,317	0.045	0.000
Anemia (%)	0.601	0.010	9,414	0.742	0.015	3,260	0.464	0.019	1,157	-0.278	0.000
RBP level (mmol/l)	0.943	0.105	1,609	1.040	0.238	516	1.032	0.130	216	-0.009	0.957
sTfR level (mg/l)	7.965	0.239	1,609	8.247	0.518	516	7.407	0.438	216	-0.840	0.226
Vitamin A deficiency (%) (<0.7 mmol/l)	0.391	0.023	1,609	0.390	0.031	516	0.299	0.035	216	-0.091	0.044
Iron deficiency (%) (>8.3mg/l)	0.240	0.017	1,609	0.238	0.030	516	0.164	0.027	216	-0.074	0.062
Gross motor z-score	-0.001	0.032	5,753	-0.061	0.056	2,031	0.151	0.047	680	0.212	0.003
Communication z-score	-0.005	0.031	5,753	0.007	0.049	2,031	0.115	0.057	680	0.108	0.160

Notes: Data are from the ESNUT 2012. Means and standard errors estimated considering survey sampling design, including sample weights and clustering effects.

Figure 2. Changes in SES gap in child development by age



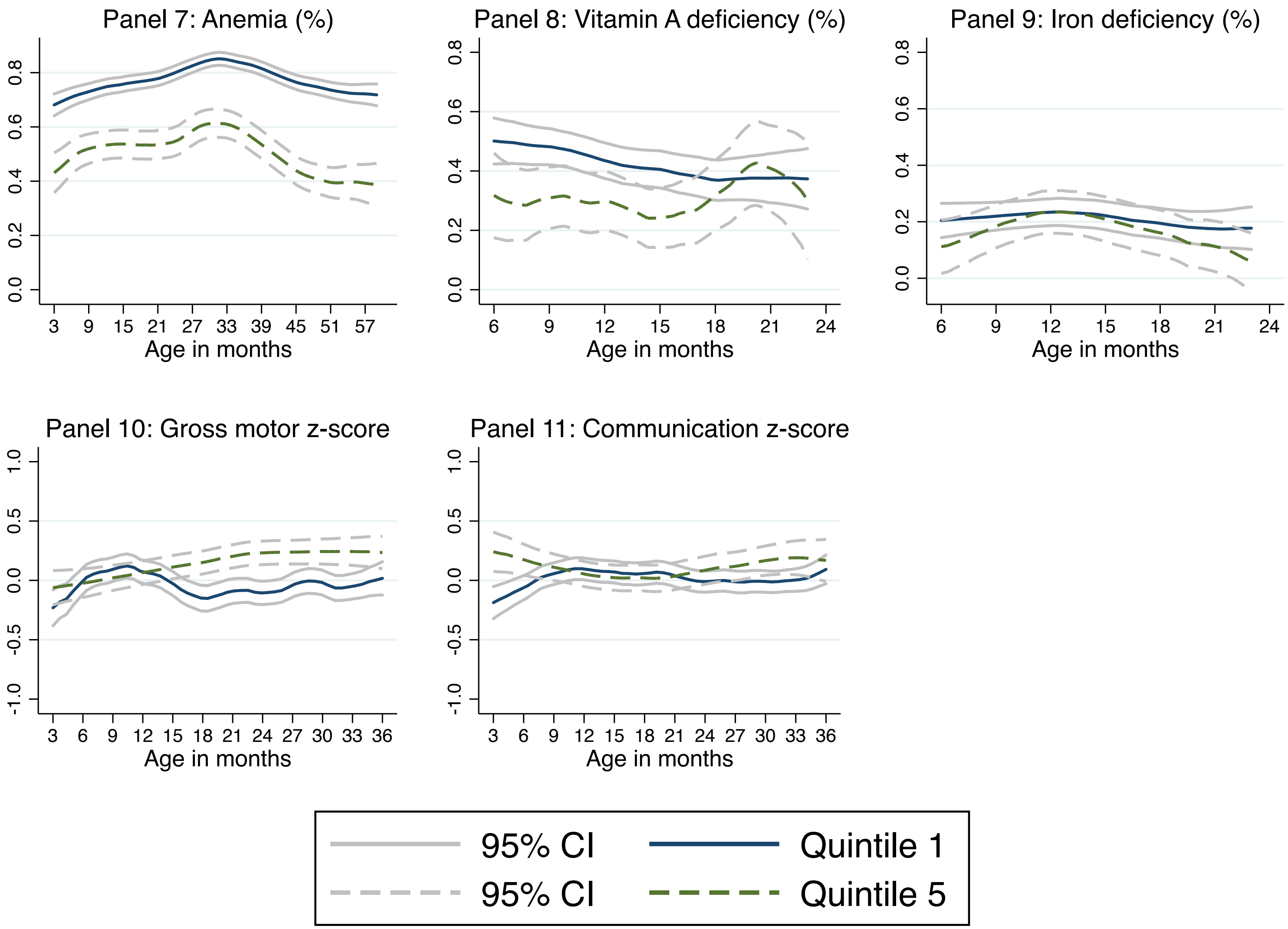

Panel 7: Anemia (%)
Panel 8: Vitamin A deficiency (%)
Panel 9: Iron deficiency (%)
Panel 10: Gross motor z-score
Panel 11: Communication z-score
Age in months
95% CI
95% CI
Quintile 1
Quintile 5

Table 2. Adjusted SES gradients in child development by subnational region

	Height for age z-score				Weight for age z-score				Weight for height z-score			
VARIABLES	All	Highlands	Valleys	Lowlands	All	Highlands	Valleys	Lowlands	All	Highlands	Valleys	Lowlands
Quintile 2 = 1	0.297***	0.252***	0.220***	0.291***	0.229***	0.193**	0.268***	0.146**	0.073	0.085	0.177**	-0.044
	(0.052)	(0.084)	(0.077)	(0.088)	(0.045)	(0.079)	(0.071)	(0.072)	(0.045)	(0.065)	(0.078)	(0.094)
Quintile 3 = 1	0.647***	0.451***	0.656***	0.613***	0.451***	0.331***	0.501***	0.382***	0.110**	0.095	0.197**	0.027
	(0.051)	(0.080)	(0.071)	(0.086)	(0.049)	(0.081)	(0.084)	(0.076)	(0.050)	(0.079)	(0.078)	(0.099)
Quintile 4 = 1	0.780***	0.526***	0.684***	0.775***	0.541***	0.450***	0.409***	0.556***	0.162***	0.265**	0.056	0.168
	(0.058)	(0.107)	(0.084)	(0.086)	(0.050)	(0.088)	(0.080)	(0.087)	(0.049)	(0.104)	(0.071)	(0.103)
Quintile 5 = 1	0.962***	0.722***	0.819***	1.014***	0.697***	0.555***	0.563***	0.746***	0.214***	0.182	0.143	0.253**
	(0.061)	(0.096)	(0.079)	(0.107)	(0.058)	(0.126)	(0.087)	(0.096)	(0.055)	(0.141)	(0.086)	(0.101)
Female	0.099***	0.179***	0.122**	0.014	0.075**	0.220***	0.064	-0.018	0.033	0.169***	0.009	-0.037
	(0.034)	(0.052)	(0.056)	(0.058)	(0.029)	(0.043)	(0.047)	(0.056)	(0.030)	(0.053)	(0.046)	(0.056)
Constant	-1.281***	-1.534***	-1.433***	-0.706***	-0.843***	-1.114***	-0.891***	-0.433**	0.132	0.110	0.256	0.030
	(0.098)	(0.189)	(0.153)	(0.133)	(0.096)	(0.138)	(0.151)	(0.169)	(0.121)	(0.148)	(0.172)	(0.292)
Observations	10,870	3,446	3,701	3,723	10,469	3,404	3,395	3,670	10,453	3,397	3,391	3,665
R-squared	0.132	0.094	0.115	0.157	0.067	0.071	0.051	0.076	0.020	0.038	0.017	0.044
p-value (F-test for quintile effects)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0020	0.1649	0.0728	0.0146

	Stunting (%)				Underweight (%)				Overweight (%)			
VARIABLES	All	Highlands	Valleys	Lowlands	All	Highlands	Valleys	Lowlands	All	Highlands	Valleys	Lowlands
Quintile 2 = 1	-0.112***	-0.143***	-0.077***	-0.070**	-0.009	-0.012	-0.017*	-0.003	0.005	0.009	0.007	-0.010
	(0.018)	(0.030)	(0.029)	(0.032)	(0.006)	(0.009)	(0.009)	(0.013)	(0.009)	(0.014)	(0.016)	(0.017)
Quintile 3 = 1	-0.184***	-0.198***	-0.186***	-0.120***	-0.003	-0.004	-0.002	-0.005	0.014	0.016	0.022	-0.009
	(0.016)	(0.031)	(0.025)	(0.026)	(0.005)	(0.010)	(0.010)	(0.009)	(0.010)	(0.018)	(0.017)	(0.021)
Quintile 4 = 1	-0.216***	-0.201***	-0.206***	-0.161***	-0.016***	-0.020***	-0.006	-0.022***	0.023**	0.049**	-0.003	0.017
	(0.017)	(0.037)	(0.025)	(0.029)	(0.005)	(0.007)	(0.010)	(0.008)	(0.011)	(0.024)	(0.016)	(0.022)
Quintile 5 = 1	-0.236***	-0.260***	-0.229***	-0.163***	-0.013**	-0.013	-0.017**	-0.012	0.046***	0.049	0.011	0.061**
	(0.016)	(0.034)	(0.022)	(0.030)	(0.005)	(0.012)	(0.009)	(0.009)	(0.012)	(0.032)	(0.016)	(0.025)
Female	-0.034***	-0.060**	-0.041**	-0.008	-0.012***	-0.018***	-0.012*	-0.010	-0.013*	0.011	-0.020	-0.026**
	(0.011)	(0.024)	(0.018)	(0.016)	(0.003)	(0.006)	(0.006)	(0.006)	(0.008)	(0.011)	(0.012)	(0.013)
Constant	0.295***	0.310***	0.345***	0.169***	0.075***	0.052**	0.089***	0.076***	0.119***	0.093**	0.136***	0.136*
	(0.026)	(0.049)	(0.044)	(0.036)	(0.016)	(0.021)	(0.031)	(0.025)	(0.029)	(0.043)	(0.033)	(0.072)
Observations	10,870	3,446	3,701	3,723	10,453	3,397	3,391	3,665	10,453	3,397	3,391	3,665
R-squared	0.067	0.074	0.073	0.045	0.014	0.022	0.022	0.021	0.011	0.025	0.013	0.027
p-value (F-test for quintile effects)	0.0000	0.0000	0.0000	0.0000	0.0164	0.0083	0.2071	0.0008	0.0051	0.3072	0.5655	0.0097

	Anemia (%)				VAD (%)				Iron deficiency (%)			
VARIABLES	All	Highlands	Valleys	Lowlands	All	Highlands	Valleys	Lowlands	All	Highlands	Valleys	Lowlands
Quintile 2 = 1	-0.076***	-0.108***	-0.045	-0.059	0.067	-0.122	0.216**	0.134	0.029	0.095	0.032	-0.074
	(0.020)	(0.030)	(0.031)	(0.036)	(0.055)	(0.085)	(0.090)	(0.113)	(0.048)	(0.077)	(0.074)	(0.086)
Quintile 3 = 1	-0.152***	-0.154***	-0.061	-0.190***	0.073	-0.141**	0.068	0.177*	0.020	0.103	0.097	-0.081
	(0.025)	(0.045)	(0.037)	(0.037)	(0.049)	(0.063)	(0.077)	(0.100)	(0.043)	(0.094)	(0.063)	(0.078)
Quintile 4 = 1	-0.178***	-0.096**	-0.142***	-0.184***	-0.023	-0.184**	-0.106*	0.050	0.019	0.322***	0.090	-0.105
	(0.025)	(0.041)	(0.035)	(0.042)	(0.064)	(0.091)	(0.061)	(0.126)	(0.047)	(0.109)	(0.060)	(0.090)
Quintile 5 = 1	-0.284***	-0.266***	-0.230***	-0.277***	-0.085*	-0.144*	-0.070	-0.077	-0.084**	-0.017	-0.052	-0.099
	(0.023)	(0.046)	(0.032)	(0.037)	(0.044)	(0.081)	(0.061)	(0.108)	(0.038)	(0.077)	(0.056)	(0.090)
Female	-0.053***	-0.087***	-0.056***	-0.022	-0.012	-0.017	-0.017	-0.009	-0.109***	-0.150***	-0.122***	-0.069
	(0.014)	(0.029)	(0.020)	(0.024)	(0.029)	(0.050)	(0.039)	(0.056)	(0.029)	(0.050)	(0.044)	(0.047)
Constant	0.600***	0.782***	0.522***	0.526***	0.466***	0.601***	0.353***	0.547***	0.229***	0.358***	0.148**	0.216**
	(0.038)	(0.067)	(0.064)	(0.056)	(0.045)	(0.088)	(0.064)	(0.102)	(0.040)	(0.075)	(0.057)	(0.095)
Observations	9,414	2,894	3,205	3,315	1,609	548	535	526	1,609	548	535	526
R-squared	0.066	0.075	0.081	0.074	0.034	0.086	0.060	0.072	0.046	0.091	0.090	0.046
p-value (F-test for quintile effects)	0.0000	0.0000	0.0000	0.0000	0.0079	0.1262	0.0062	0.0149	0.0239	0.0011	0.0499	0.8080

	Gross motor z-score				Communication z-score			
VARIABLES	All	Highlands	Valleys	Lowlands	All	Highlands	Valleys	Lowlands
Quintile 2 = 1	0.028	0.035	-0.019	0.066	-0.133*	-0.171**	-0.101	-0.092
	(0.072)	(0.085)	(0.086)	(0.227)	(0.071)	(0.082)	(0.106)	(0.176)
Quintile 3 = 1	0.016	-0.000	-0.099	0.106	0.037	0.042	0.039	0.056
	(0.061)	(0.122)	(0.079)	(0.150)	(0.059)	(0.106)	(0.100)	(0.122)
Quintile 4 = 1	0.041	-0.078	-0.081	0.126	-0.084	-0.038	-0.101	-0.112
	(0.069)	(0.161)	(0.112)	(0.144)	(0.067)	(0.149)	(0.110)	(0.113)
Quintile 5 = 1	0.210***	-0.015	0.051	0.367*	0.113	-0.015	0.126	0.159
	(0.070)	(0.149)	(0.090)	(0.197)	(0.073)	(0.136)	(0.108)	(0.156)
Female	-0.076*	-0.059	-0.080	-0.088	0.091***	0.098	0.075	0.110*
	(0.040)	(0.066)	(0.057)	(0.077)	(0.035)	(0.060)	(0.062)	(0.063)
Constant	-0.114	-0.053	-0.102	-0.159	0.098	-0.019	0.099	0.159
	(0.076)	(0.135)	(0.104)	(0.206)	(0.078)	(0.129)	(0.139)	(0.140)
Observations	5,753	1,909	1,912	1,932	5,753	1,909	1,912	1,932
R-squared	0.015	0.027	0.033	0.025	0.016	0.017	0.031	0.048
p-value (F-test for quintile effects)	0.0076	0.9613	0.5239	0.0039	0.0082	0.2081	0.3110	0.1033

Note: ***significant at the 1% level; ** significant at the 5% level; *significant at the 10% level. SE clustered at the PSU level (census sector or segment) in parentheses. OLS Estimation. Controls include child's sex and a set of child dummies for age categories in months (0-2, 3-5, 6-8, 9-11, 12-14, 15-17, 18-20, 21-23, 24-26, 27-29, 30-32, 33-35, 36-38, 39-41, 42-44, 45-47, 48-50, 51-53, 54-56, 57-59). Quintiles are population quintiles using monthly per capita household consumption as the ranking variable. *p*-value (*F*-test for quintile effects) is the *p*-value of the *F*-test of Q2=Q3=Q4=Q5=0.

Table 3. Adjusted SES gradients in child development by child's age

	Height for age z-score				Weight for age z-score				Weight for height z-score			
VARIABLES	3-11 Months	12-23 Months	24-36 Months	37-59 Months	3-11 Months	12-23 Months	24-36 Months	37-59 Months	3-11 Months	12-23 Months	24-36 Months	37-59 Months
Quintile 2 = 1	0.133	0.288***	0.383***	0.313***	0.204*	0.296***	0.267***	0.204***	0.165	0.186**	0.097	0.025
	(0.127)	(0.095)	(0.087)	(0.069)	(0.106)	(0.091)	(0.080)	(0.062)	(0.100)	(0.089)	(0.085)	(0.067)
Quintile 3 = 1	0.429***	0.617***	0.692***	0.749***	0.381***	0.538***	0.388***	0.508***	0.211*	0.293***	0.015	0.079
	(0.134)	(0.091)	(0.080)	(0.069)	(0.108)	(0.087)	(0.086)	(0.066)	(0.112)	(0.088)	(0.093)	(0.065)
Quintile 4 = 1	0.606***	0.821***	0.962***	0.768***	0.449***	0.561***	0.676***	0.538***	0.116	0.226**	0.198**	0.147**
	(0.136)	(0.104)	(0.088)	(0.074)	(0.128)	(0.100)	(0.087)	(0.061)	(0.129)	(0.103)	(0.090)	(0.063)
Quintile 5 = 1	0.608***	0.988***	1.124***	1.067***	0.521***	0.781***	0.739***	0.755***	0.241*	0.390***	0.159*	0.167**
	(0.146)	(0.127)	(0.099)	(0.084)	(0.131)	(0.107)	(0.086)	(0.082)	(0.123)	(0.108)	(0.086)	(0.076)
Female = 1	0.173**	0.244***	0.157**	-0.061	0.165**	0.193***	0.111**	-0.084	0.098	0.105*	0.039	-0.051
	(0.084)	(0.072)	(0.062)	(0.053)	(0.074)	(0.065)	(0.053)	(0.052)	(0.073)	(0.061)	(0.054)	(0.048)
Constant	-0.798***	-1.665***	-1.854***	-1.646***	-0.352***	-0.728***	-0.721***	-0.539***	0.280***	0.107	0.376***	0.553***
	(0.118)	(0.099)	(0.087)	(0.092)	(0.109)	(0.089)	(0.075)	(0.092)	(0.104)	(0.092)	(0.074)	(0.092)
Observations	1,718	2,391	2,411	3,882	1,693	2,285	2,325	3,707	1,689	2,285	2,323	3,702
R-squared	0.045	0.097	0.125	0.129	0.034	0.071	0.080	0.077	0.008	0.023	0.009	0.008
p-value (*F*-test for quintile effects)	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.1991	0.0027	0.1407	0.0864

VARIABLES	Stunting (<-2SD) 3-11 Months	Stunting (<-2SD) 12-23 Months	Stunting (<-2SD) 24-36 Months	Stunting (<-2SD) 37-59 Months	Underweight (<-2SD) 3-11 Months	Underweight (<-2SD) 12-23 Months	Underweight (<-2SD) 24-36 Months	Underweight (<-2SD) 37-59 Months	Overweight (>2SD) 3-11 Months	Overweight (>2SD) 12-23 Months	Overweight (>2SD) 24-36 Months	Overweight (>2SD) 37-59 Months
Quintile 2 = 1	-0.061*	-0.149***	-0.120***	-0.116***	-0.009	-0.033***	-0.009*	0.008	0.002	0.022	0.014	0.004
	(0.031)	(0.039)	(0.040)	(0.027)	(0.014)	(0.012)	(0.005)	(0.011)	(0.022)	(0.017)	(0.020)	(0.014)
Quintile 3 = 1	-0.103***	-0.207***	-0.225***	-0.189***	-0.000	-0.035***	0.003	0.006	0.019	0.023	0.006	0.017
	(0.030)	(0.034)	(0.036)	(0.026)	(0.017)	(0.013)	(0.009)	(0.007)	(0.027)	(0.018)	(0.017)	(0.017)
Quintile 4 = 1	-0.128***	-0.261***	-0.260***	-0.224***	-0.027**	-0.032**	-0.009*	-0.007	0.015	0.004	0.035	0.025
	(0.029)	(0.034)	(0.033)	(0.026)	(0.012)	(0.014)	(0.005)	(0.004)	(0.025)	(0.014)	(0.022)	(0.018)
Quintile 5 = 1	-0.094***	-0.286***	-0.295***	-0.255***	-0.029**	-0.030**	-0.006	-0.000	0.015	0.061***	0.042*	0.069***
	(0.034)	(0.032)	(0.034)	(0.023)	(0.011)	(0.014)	(0.007)	(0.006)	(0.030)	(0.023)	(0.023)	(0.020)
Female = 1	-0.045**	-0.090***	-0.060***	0.026	-0.035***	-0.007	-0.004	-0.008	0.006	-0.002	-0.021	-0.025*
	(0.020)	(0.024)	(0.023)	(0.018)	(0.010)	(0.007)	(0.004)	(0.006)	(0.019)	(0.014)	(0.018)	(0.013)
Constant	0.206***	0.407***	0.465***	0.327***	0.061***	0.040***	0.018**	0.007	0.097***	0.036**	0.050***	0.078***
	(0.028)	(0.032)	(0.035)	(0.030)	(0.014)	(0.014)	(0.007)	(0.005)	(0.019)	(0.017)	(0.019)	(0.024)
Observations	1,718	2,391	2,411	3,882	1,689	2,285	2,323	3,702	1,689	2,285	2,323	3,702
R-squared	0.029	0.073	0.070	0.061	0.023	0.013	0.005	0.011	0.007	0.010	0.008	0.013
p-value (*F*-test for quintile effects)	0.0002	0.0000	0.0000	0.0000	0.0466	0.0913	0.2188	0.1251	0.9426	0.0539	0.2821	0.0149

	Anemia				Vitamin A deficiency		Iron deficiency	
VARIABLES	3-11 Months	12-23 Months	24-36 Months	37-59 Months	6-11 Months	12-23 Months	6-11 Months	12-23 Months
Quintile 2 = 1	-0.043	-0.028	-0.100***	-0.100***	0.067	0.068	0.048	0.015
	(0.050)	(0.037)	(0.036)	(0.034)	(0.099)	(0.060)	(0.080)	(0.057)
Quintile 3 = 1	-0.105*	-0.073*	-0.249***	-0.162***	0.057	0.085	0.026	0.015
	(0.054)	(0.038)	(0.053)	(0.040)	(0.078)	(0.059)	(0.068)	(0.054)
Quintile 4 = 1	-0.144**	-0.061	-0.227***	-0.235***	-0.054	-0.004	0.046	0.003
	(0.058)	(0.042)	(0.044)	(0.038)	(0.089)	(0.072)	(0.070)	(0.067)
Quintile 5 = 1	-0.310***	-0.253***	-0.281***	-0.290***	-0.118	-0.064	-0.093*	-0.080
	(0.053)	(0.045)	(0.043)	(0.038)	(0.078)	(0.054)	(0.055)	(0.052)
Female = 1	-0.078**	-0.041	-0.001	-0.081***	-0.021	-0.006	-0.109**	-0.110***
	(0.034)	(0.026)	(0.031)	(0.025)	(0.049)	(0.039)	(0.047)	(0.035)
Constant	0.591***	0.811***	0.895***	0.840***	0.487***	0.283***	0.220***	0.347***
	(0.044)	(0.039)	(0.035)	(0.040)	(0.059)	(0.054)	(0.045)	(0.057)
Observations	1,488	2,167	2,179	3,580	600	1,009	600	1,009
R-squared	0.078	0.040	0.056	0.064	0.021	0.019	0.057	0.041
p-value (*F*-test for quintile effects)	0.0000	0.0000	0.0000	0.0000	0.2829	0.0565	0.1933	0.3113

	Gross motor z-score			Communication z-score		
VARIABLES	3-11 Months	12-23 Months	24-36 Months	3-11 Months	12-23 Months	24-36 Months
Quintile 2 = 1	-0.058	-0.067	0.179	-0.161	-0.293***	0.057
	(0.108)	(0.103)	(0.116)	(0.115)	(0.090)	(0.097)
Quintile 3 = 1	-0.066	-0.051	0.135	0.239**	-0.259***	0.233**
	(0.107)	(0.087)	(0.121)	(0.098)	(0.085)	(0.090)
Quintile 4 = 1	-0.060	0.002	0.146	0.006	-0.199*	-0.025
	(0.104)	(0.119)	(0.117)	(0.108)	(0.104)	(0.111)
Quintile 5 = 1	-0.032	0.143	0.439***	0.221*	-0.095	0.252**
	(0.111)	(0.098)	(0.114)	(0.119)	(0.088)	(0.125)
Female = 1	-0.135**	-0.035	-0.079	-0.003	0.148**	0.091
	(0.062)	(0.066)	(0.069)	(0.066)	(0.065)	(0.060)
Constant	0.024	-0.066	-0.210*	0.067	0.032	-0.229**
	(0.089)	(0.088)	(0.113)	(0.091)	(0.091)	(0.089)
Observations	1,476	2,185	2,092	1,476	2,185	2,092
R-squared	0.010	0.008	0.034	0.027	0.018	0.019
p-value (*F*-test for quintile effects)	0.9680	0.2535	0.0016	0.0007	0.0019	0.0283

Note: ***significant at the 1% level; ** significant at the 5% level; *significant at the 10% level. SE clustered at the PSU level (census sector or segment) in parentheses. OLS Estimation. Controls include child's sex and a set of child dummies for age categories in months (0-2, 3-5, 6-8, 9-11, 12-14, 15-17, 18-20, 21-23, 24-26, 27-29, 30-32, 33-35, 36-38, 39-41, 42-44, 45-47, 48-50, 51-53, 54-56, 57-59). Quintiles are population quintiles using monthly per capita household consumption as the ranking variable. *p*-value (*F*-test for quintile effects) is the *p*-value of the *F*-test of Q2=Q3=Q4=Q5=0.

Table 4. Estimated Gap using alternative SES measures

	Regression Coefficient for Q5	
	Consumption	Wealth Index
Height for age (z-score)	0.962***	0.934***
Weight for age (z-score)	0.697***	0.665***
Weight for height (z-score)	0.214***	0.210***
Stunting (<-2SD HfA)	-0.236***	-0.220***
Underweight (<-2SD WfA)	-0.013**	-0.010*
Overweight (>+2SD WfH)	0.046***	0.034***
Anemia (%)	-0.284***	-0.269***
Vitamin A deficiency (%)	-0.085*	-0.167***
Iron deficiency (%)	-0.084**	0.030
Gross motor (z-score)	0.210***	0.176**
Communication (z-score)	0.113	0.174**

Note: ***significant at the 1% level; ** significant at the 5% level; *significant at the 10% level. OLS Estimation. Controls include child's sex and a set of child dummies for age categories in months (0-2, 3-5, 6-8, 9-11, 12-14, 15-17, 18-20, 21-23, 24-26, 27-29, 30-32, 33-35, 36-38, 39-41, 42-44, 45-47, 48-50, 51-53, 54-56, 57-59).

Web Appendix

Table A1. Adjusted SES gradients in child development by subnational region: DBS Subsample

	Height for age z-score				Weight for age z-score				Weight for height z-score			
VARIABLES	All	Highlands	Valleys	Lowlands	All	Highlands	Valleys	Lowlands	All	Highlands	Valleys	Lowlands
Quintile 2 = 1	0.162	-0.087	0.090	0.562**	0.218*	0.080	0.226	0.336*	0.169	0.146	0.234	0.074
	(0.125)	(0.168)	(0.170)	(0.255)	(0.111)	(0.177)	(0.168)	(0.189)	(0.107)	(0.174)	(0.185)	(0.177)
Quintile 3 = 1	0.481***	0.155	0.407**	0.612**	0.409***	0.354**	0.462**	0.250	0.203*	0.340*	0.333**	-0.082
	(0.121)	(0.179)	(0.195)	(0.240)	(0.107)	(0.178)	(0.181)	(0.177)	(0.104)	(0.176)	(0.167)	(0.167)
Quintile 4 = 1	0.742***	0.736	0.360**	0.817***	0.478***	0.491	0.260	0.410**	0.126	0.154	0.081	0.011
	(0.132)	(0.469)	(0.162)	(0.231)	(0.112)	(0.335)	(0.178)	(0.182)	(0.113)	(0.273)	(0.194)	(0.169)
Quintile 5 = 1	0.847***	0.526*	0.794***	0.911***	0.686***	0.567**	0.644***	0.603***	0.329**	0.367	0.302	0.216
	(0.131)	(0.267)	(0.184)	(0.259)	(0.116)	(0.217)	(0.213)	(0.174)	(0.136)	(0.293)	(0.241)	(0.174)
Female	0.275***	0.314***	0.177*	0.448***	0.160**	0.207	0.101	0.246*	0.023	0.044	0.026	0.017
	(0.073)	(0.112)	(0.097)	(0.135)	(0.073)	(0.140)	(0.112)	(0.128)	(0.082)	(0.147)	(0.147)	(0.134)
Constant	-0.899***	-1.327***	-0.792***	-0.577**	-0.397***	-0.624***	-0.191	-0.333*	0.212*	0.263	0.401**	0.030
	(0.119)	(0.187)	(0.157)	(0.259)	(0.108)	(0.196)	(0.171)	(0.196)	(0.120)	(0.216)	(0.199)	(0.194)
Observations	1,597	544	530	523	1,553	534	502	517	1,553	534	502	517
R-squared	0.154	0.118	0.150	0.237	0.073	0.074	0.077	0.086	0.012	0.034	0.024	0.035

	Stunting (%)				Underweight (%)				Overweight (%)			
VARIABLES	All	Highlands	Valleys	Lowlands	All	Highlands	Valleys	Lowlands	All	Highlands	Valleys	Lowlands
Quintile 2 = 1	-0.089**	-0.089	-0.063	-0.140	-0.018	-0.022	-0.036	0.008	-0.012	0.002	-0.036	-0.013
	(0.044)	(0.076)	(0.072)	(0.086)	(0.018)	(0.030)	(0.025)	(0.024)	(0.016)	(0.026)	(0.027)	(0.026)
Quintile 3 = 1	-0.164***	-0.221***	-0.113*	-0.156**	-0.030*	-0.050*	-0.021	-0.012	0.005	-0.003	0.010	-0.010
	(0.036)	(0.063)	(0.066)	(0.067)	(0.017)	(0.026)	(0.032)	(0.016)	(0.017)	(0.013)	(0.036)	(0.029)
Quintile 4 = 1	-0.202***	-0.187	-0.146***	-0.223***	-0.026	-0.051**	-0.006	-0.014	0.001	0.058	-0.020	-0.021
	(0.039)	(0.115)	(0.055)	(0.076)	(0.018)	(0.025)	(0.035)	(0.016)	(0.018)	(0.053)	(0.032)	(0.026)
Quintile 5 = 1	-0.224***	-0.226***	-0.193***	-0.227***	-0.024	-0.049**	-0.022	0.005	0.034	0.070	0.025	-0.001
	(0.035)	(0.075)	(0.048)	(0.076)	(0.018)	(0.024)	(0.031)	(0.027)	(0.024)	(0.057)	(0.041)	(0.030)
Female	-0.089***	-0.079	-0.050	-0.139***	-0.008	-0.024	-0.003	-0.002	0.001	0.012	0.006	-0.015
	(0.023)	(0.050)	(0.038)	(0.038)	(0.009)	(0.018)	(0.019)	(0.009)	(0.014)	(0.022)	(0.029)	(0.020)
Constant	0.261***	0.322***	0.188***	0.288***	0.053***	0.084**	0.023	0.053*	0.062**	0.080*	0.081*	0.042
	(0.033)	(0.073)	(0.041)	(0.076)	(0.019)	(0.042)	(0.026)	(0.029)	(0.024)	(0.046)	(0.046)	(0.028)
Observations	1,597	544	530	523	1,553	534	502	517	1,553	534	502	517
R-squared	0.104	0.099	0.098	0.136	0.011	0.047	0.020	0.039	0.012	0.064	0.012	0.026

	Anemia (%)				VAD (%)				Iron deficiency (%)			
VARIABLES	All	Highlands	Valleys	Lowlands	All	Highlands	Valleys	Lowlands	All	Highlands	Valleys	Lowlands
Quintile 2 = 1	-0.035	-0.163**	0.118	0.143	0.067	-0.122	0.216**	0.134	0.029	0.095	0.032	-0.074
	(0.047)	(0.069)	(0.072)	(0.097)	(0.055)	(0.085)	(0.090)	(0.113)	(0.048)	(0.077)	(0.074)	(0.086)
Quintile 3 = 1	-0.048	0.017	-0.061	0.091	0.073	-0.141**	0.068	0.177*	0.020	0.103	0.097	-0.081
	(0.052)	(0.056)	(0.088)	(0.117)	(0.049)	(0.063)	(0.077)	(0.100)	(0.043)	(0.094)	(0.063)	(0.078)
Quintile 4 = 1	-0.098**	-0.009	-0.068	0.055	-0.023	-0.184**	-0.106*	0.050	0.019	0.322***	0.090	-0.105
	(0.045)	(0.073)	(0.067)	(0.105)	(0.064)	(0.091)	(0.061)	(0.126)	(0.047)	(0.109)	(0.060)	(0.090)
Quintile 5 = 1	-0.222***	-0.137	-0.239***	-0.032	-0.085*	-0.144*	-0.070	-0.077	-0.084**	-0.017	-0.052	-0.099
	(0.053)	(0.094)	(0.073)	(0.114)	(0.044)	(0.081)	(0.061)	(0.108)	(0.038)	(0.077)	(0.056)	(0.090)
Female	-0.070**	-0.119***	-0.075*	-0.052	-0.012	-0.017	-0.017	-0.009	-0.109***	-0.150***	-0.122***	-0.069
	(0.029)	(0.045)	(0.044)	(0.058)	(0.029)	(0.050)	(0.039)	(0.056)	(0.029)	(0.050)	(0.044)	(0.047)
Constant	0.672***	0.776***	0.664***	0.461***	0.466***	0.601***	0.353***	0.547***	0.229***	0.358***	0.148**	0.216**
	(0.046)	(0.065)	(0.071)	(0.119)	(0.045)	(0.088)	(0.064)	(0.102)	(0.040)	(0.075)	(0.057)	(0.095)
Observations	1,593	545	528	520	1,609	548	535	526	1,609	548	535	526
R-squared	0.045	0.086	0.115	0.026	0.034	0.086	0.060	0.072	0.046	0.091	0.090	0.046

	Gross motor z-score				Communication z-score			
VARIABLES	All	Highlands	Valleys	Lowlands	All	Highlands	Valleys	Lowlands
Quintile 2 = 1	-0.168	-0.204	-0.057	-0.417*	-0.302**	-0.499***	-0.078	-0.409
	(0.110)	(0.168)	(0.168)	(0.240)	(0.123)	(0.181)	(0.186)	(0.250)
Quintile 3 = 1	-0.084	-0.133	-0.162	-0.189	-0.086	-0.350**	0.017	-0.149
	(0.106)	(0.221)	(0.165)	(0.197)	(0.111)	(0.175)	(0.187)	(0.197)
Quintile 4 = 1	-0.072	-0.362	-0.246	-0.088	-0.152	-0.083	-0.117	-0.328
	(0.148)	(0.293)	(0.250)	(0.271)	(0.127)	(0.252)	(0.190)	(0.222)
Quintile 5 = 1	0.173*	0.154	0.193	-0.097	-0.016	-0.098	0.203	-0.290
	(0.100)	(0.208)	(0.162)	(0.215)	(0.124)	(0.195)	(0.223)	(0.204)
Female	-0.107	0.007	-0.119	-0.183	0.105	0.174	0.079	0.097
	(0.071)	(0.137)	(0.109)	(0.111)	(0.085)	(0.130)	(0.141)	(0.141)
Constant	-0.020	-0.133	-0.036	0.280	0.147	-0.019	0.000	0.558**
	(0.101)	(0.165)	(0.144)	(0.251)	(0.109)	(0.190)	(0.160)	(0.214)
Observations	1,473	515	489	469	1,473	515	489	469
R-squared	0.021	0.031	0.044	0.051	0.022	0.056	0.020	0.062

Note: ***significant at the 1% level; ** significant at the 5% level; *significant at the 10% level. SE clustered at the PSU level (census sector or segment) in parentheses. OLS Estimation. Controls include child's sex and a set of child dummies for age categories in months (0-2, 3-5, 6-8, 9-11, 12-14, 15-17, 18-20, 21-23, 24-26, 27-29, 30-32, 33-35, 36-38, 39-41, 42-44, 45-47, 48-50, 51-53, 54-56, 57-59). Quintiles are population quintiles using monthly per capita household consumption as the ranking variable. *p*-value (*F*-test for quintile effects) is the *p*-value of the *F*-test of Q2=Q3=Q4=Q5=0.

Table A2. Adjusted SES gradients in child development by child's age: DBS Subsample

	Height for age z-score		Weight for age z-score		Weight for height z-score		Stunting (%)		Underweight (%)		Overweight (%)	
VARIABLES	6-11 Months	12-23 Months	6-11 Months	12-23 Months	6-11 Months	12-23 Months	6-11 Months	12-23 Months	6-11 Months	12-23 Months	6-11 Months	12-23 Months
Quintile 2 = 1	0.126	0.199	0.068	0.343**	0.003	0.305**	-0.045	-0.125*	0.012	-0.038	-0.056**	0.018
	(0.217)	(0.153)	(0.157)	(0.152)	(0.158)	(0.147)	(0.051)	(0.065)	(0.026)	(0.026)	(0.027)	(0.019)
Quintile 3 = 1	0.581***	0.458***	0.448***	0.434***	0.181	0.257*	-0.127***	-0.197***	-0.016	-0.041	-0.052**	0.039*
	(0.214)	(0.131)	(0.146)	(0.136)	(0.142)	(0.138)	(0.031)	(0.051)	(0.010)	(0.027)	(0.026)	(0.020)
Quintile 4 = 1	0.632***	0.817***	0.355**	0.578***	0.027	0.214	-0.109***	-0.263***	-0.018*	-0.033	0.012	0.000
	(0.210)	(0.163)	(0.179)	(0.151)	(0.187)	(0.152)	(0.038)	(0.054)	(0.009)	(0.028)	(0.044)	(0.012)
Quintile 5 = 1	0.615***	0.991***	0.364**	0.896***	0.033	0.526***	-0.125***	-0.290***	0.001	-0.041	-0.008	0.063**
	(0.204)	(0.153)	(0.159)	(0.151)	(0.200)	(0.174)	(0.035)	(0.051)	(0.022)	(0.027)	(0.043)	(0.028)
Female = 1	0.173	0.331***	0.001	0.253**	-0.138	0.118	-0.036	-0.121***	-0.006	-0.011	-0.003	0.005
	(0.130)	(0.101)	(0.115)	(0.101)	(0.123)	(0.104)	(0.026)	(0.034)	(0.014)	(0.012)	(0.025)	(0.017)
Constant	-0.777***	-1.614***	-0.185	-0.815***	0.428***	-0.027	0.176***	0.412***	0.036***	0.056*	0.090***	0.029
	(0.144)	(0.138)	(0.119)	(0.145)	(0.131)	(0.152)	(0.030)	(0.048)	(0.013)	(0.031)	(0.032)	(0.019)
Observations	598	999	589	964	589	964	598	999	589	964	589	964
R-squared	0.055	0.118	0.031	0.078	0.008	0.026	0.048	0.081	0.024	0.011	0.021	0.021

	Anemia		VAD (%)		Iron deficiency (%)		Gross motor z-score		Communication z-score	
VARIABLES	6-11 Months	12-23 Months	6-11 Months	12-23 Months	6-11 Months	12-23 Months	6-11 Months	12-23 Months	6-11 Months	12-23 Months
Quintile 2 = 1	-0.032	-0.038	0.067	0.068	0.048	0.015	-0.474***	0.044	-0.405**	-0.220
	(0.081)	(0.059)	(0.099)	(0.060)	(0.080)	(0.057)	(0.165)	(0.144)	(0.205)	(0.139)
Quintile 3 = 1	-0.042	-0.047	0.057	0.085	0.026	0.015	-0.261	0.042	0.073	-0.164
	(0.079)	(0.062)	(0.078)	(0.059)	(0.068)	(0.054)	(0.177)	(0.126)	(0.173)	(0.131)
Quintile 4 = 1	-0.153*	-0.067	-0.054	-0.004	0.046	0.003	-0.223	0.041	-0.074	-0.191
	(0.080)	(0.059)	(0.089)	(0.072)	(0.070)	(0.067)	(0.177)	(0.183)	(0.204)	(0.158)
Quintile 5 = 1	-0.277***	-0.190***	-0.118	-0.064	-0.093*	-0.080	-0.087	0.344***	0.200	-0.133
	(0.077)	(0.070)	(0.078)	(0.054)	(0.055)	(0.052)	(0.150)	(0.130)	(0.200)	(0.146)
Female = 1	-0.055	-0.078*	-0.021	-0.006	-0.109**	-0.110***	-0.157	-0.062	0.009	0.164
	(0.055)	(0.041)	(0.049)	(0.039)	(0.047)	(0.035)	(0.108)	(0.092)	(0.130)	(0.101)
Constant	0.685***	0.834***	0.487***	0.283***	0.220***	0.347***	0.189	-0.210	0.137	0.010
	(0.055)	(0.053)	(0.059)	(0.054)	(0.045)	(0.057)	(0.121)	(0.131)	(0.128)	(0.143)
Observations	598	995	600	1,009	600	1,009	556	917	556	917
R-squared	0.053	0.042	0.021	0.019	0.057	0.041	0.038	0.022	0.044	0.016

Note: ***significant at the 1% level; ** significant at the 5% level; *significant at the 10% level. SE clustered at the PSU level (census sector or segment) in parentheses. OLS Estimation. Controls include child's sex and a set of child dummies for age categories in months (0-2, 3-5, 6-8, 9-11, 12-14, 15-17, 18-20, 21-23, 24-26, 27-29, 30-32, 33-35, 36-38, 39-41, 42-44, 45-47, 48-50, 51-53, 54-56, 57-59). Quintiles are population quintiles using monthly per capita household consumption as the ranking variable. *p*-value (*F*-test for quintile effects) is the *p*-value of the *F*-test of Q2=Q3=Q4=Q5=0.

Table A3. Adjusted SES gradients in child development using wealth index as measure of SES

VARIABLES	Height for age z-score	Weight for age z-score	Weight for height z-score	Stunting (%)	Underweight (%)	Overweight (%)	Anemia	VAD (%)	Iron deficiency (%)	Gross motor z-score	Commun. z-score
Quintile 2 = 1	0.244***	0.217***	0.104**	-0.105***	-0.006	0.007	-0.071***	-0.102*	0.098**	-0.016	-0.008
	(0.056)	(0.049)	(0.045)	(0.018)	(0.005)	(0.009)	(0.023)	(0.053)	(0.048)	(0.078)	(0.073)
Quintile 3 = 1	0.519***	0.392***	0.131**	-0.172***	-0.013***	0.025**	-0.166***	-0.117*	0.039	0.150**	0.081
	(0.060)	(0.051)	(0.057)	(0.019)	(0.004)	(0.011)	(0.024)	(0.065)	(0.051)	(0.066)	(0.072)
Quintile 4 = 1	0.713***	0.530***	0.189***	-0.187***	-0.004	0.049***	-0.214***	-0.056	0.024	0.002	0.007
	(0.068)	(0.054)	(0.054)	(0.018)	(0.006)	(0.014)	(0.025)	(0.053)	(0.044)	(0.074)	(0.074)
Quintile 5 = 1	0.934***	0.665***	0.210***	-0.220***	-0.010*	0.034***	-0.269***	-0.167***	0.030	0.176**	0.174**
	(0.067)	(0.056)	(0.057)	(0.017)	(0.005)	(0.012)	(0.027)	(0.053)	(0.043)	(0.079)	(0.080)
Female	0.110***	0.083***	0.035	-0.035***	-0.012***	-0.012	-0.056***	-0.011	-0.105***	-0.083**	0.087**
	(0.034)	(0.029)	(0.029)	(0.012)	(0.003)	(0.008)	(0.015)	(0.028)	(0.029)	(0.039)	(0.035)
Constant	-1.202***	-0.805***	0.117	0.276***	0.073***	0.114***	0.600***	0.553***	0.184***	-0.105	0.048
	(0.101)	(0.098)	(0.123)	(0.026)	(0.016)	(0.030)	(0.035)	(0.045)	(0.041)	(0.073)	(0.094)
Observations	10,884	10,481	10,466	10,884	10,466	10,466	9,427	1,610	1,610	5,761	5,761
R-squared	0.126	0.063	0.020	0.059	0.013	0.011	0.067	0.028	0.036	0.016	0.013

Table A4. Adjusted SES gradients in child development by subnational region with IPW Adjustments for missing data

	Height for age z-score				Weight for age z-score				Weight for height z-score			
VARIABLES	All	Highlands	Valleys	Lowlands	All	Highlands	Valleys	Lowlands	All	Highlands	Valleys	Lowlands
Quintile 2 = 1	0.298***	0.240***	0.209***	0.302***	0.237***	0.193**	0.267***	0.167**	0.080*	0.083	0.184**	-0.023
	(0.054)	(0.086)	(0.075)	(0.095)	(0.046)	(0.081)	(0.069)	(0.075)	(0.045)	(0.066)	(0.080)	(0.096)
Quintile 3 = 1	0.626***	0.417***	0.608***	0.611***	0.449***	0.313***	0.486***	0.390***	0.113**	0.080	0.198***	0.040
	(0.052)	(0.081)	(0.071)	(0.092)	(0.049)	(0.084)	(0.079)	(0.077)	(0.050)	(0.082)	(0.076)	(0.104)
Quintile 4 = 1	0.766***	0.516***	0.659***	0.767***	0.539***	0.436***	0.406***	0.562***	0.160***	0.248**	0.062	0.175
	(0.058)	(0.117)	(0.085)	(0.088)	(0.052)	(0.091)	(0.082)	(0.086)	(0.049)	(0.105)	(0.073)	(0.108)
Quintile 5 = 1	0.941***	0.715***	0.772***	0.986***	0.691***	0.564***	0.544***	0.739***	0.212***	0.191	0.145	0.262**
	(0.063)	(0.100)	(0.084)	(0.111)	(0.059)	(0.138)	(0.088)	(0.099)	(0.057)	(0.148)	(0.089)	(0.108)
Female	0.119***	0.183***	0.130**	0.040	0.085***	0.223***	0.063	-0.005	0.038	0.177***	0.012	-0.040
	(0.035)	(0.055)	(0.060)	(0.060)	(0.030)	(0.047)	(0.049)	(0.056)	(0.030)	(0.053)	(0.046)	(0.054)
Constant	-1.278***	-1.599***	-1.327***	-0.800***	-0.573***	-0.781***	-0.565***	-0.304***	0.200***	0.159**	0.247***	0.201
	(0.053)	(0.092)	(0.075)	(0.097)	(0.048)	(0.081)	(0.074)	(0.094)	(0.051)	(0.077)	(0.075)	(0.126)
Observations	10,870	3,446	3,701	3,723	10,469	3,404	3,395	3,670	10,453	3,397	3,391	3,665
R-squared	0.102	0.069	0.080	0.113	0.056	0.054	0.037	0.057	0.015	0.020	0.013	0.029

	Stunting (%)				Underweight (%)				Overweight (%)			
VARIABLES	All	Highlands	Valleys	Lowlands	All	Highlands	Valleys	Lowlands	All	Highlands	Valleys	Lowlands
Quintile 2 = 1	-0.112***	-0.141***	-0.074***	-0.070**	-0.010	-0.010	-0.017*	-0.005	0.004	0.005	0.009	-0.008
	(0.018)	(0.030)	(0.028)	(0.033)	(0.006)	(0.010)	(0.009)	(0.013)	(0.009)	(0.014)	(0.016)	(0.019)
Quintile 3 = 1	-0.181***	-0.190***	-0.175***	-0.118***	-0.004	-0.006	-0.001	-0.007	0.013	0.013	0.026	-0.009
	(0.016)	(0.031)	(0.024)	(0.026)	(0.006)	(0.010)	(0.010)	(0.010)	(0.010)	(0.017)	(0.017)	(0.024)
Quintile 4 = 1	-0.213***	-0.196***	-0.200***	-0.158***	-0.018***	-0.022***	-0.008	-0.026***	0.020*	0.048*	-0.001	0.012
	(0.017)	(0.037)	(0.025)	(0.030)	(0.005)	(0.007)	(0.010)	(0.008)	(0.011)	(0.025)	(0.016)	(0.025)
Quintile 5 = 1	-0.232***	-0.259***	-0.219***	-0.156***	-0.015***	-0.013	-0.018**	-0.015	0.042***	0.050	0.011	0.055*
	(0.016)	(0.034)	(0.022)	(0.031)	(0.006)	(0.011)	(0.009)	(0.010)	(0.013)	(0.033)	(0.017)	(0.028)
Female	-0.039***	-0.067***	-0.043**	-0.011	-0.012***	-0.017***	-0.012*	-0.009	-0.011	0.012	-0.018	-0.023*
	(0.011)	(0.025)	(0.018)	(0.016)	(0.003)	(0.005)	(0.006)	(0.006)	(0.007)	(0.011)	(0.012)	(0.013)
Constant	0.323***	0.382***	0.340***	0.200***	0.042***	0.041***	0.049***	0.036***	0.067***	0.055***	0.087***	0.066**
	(0.016)	(0.031)	(0.022)	(0.031)	(0.006)	(0.010)	(0.011)	(0.011)	(0.011)	(0.017)	(0.015)	(0.031)
Observations	10,870	3,446	3,701	3,723	10,453	3,397	3,391	3,665	10,453	3,397	3,391	3,665
R-squared	0.052	0.054	0.052	0.031	0.008	0.010	0.012	0.007	0.004	0.009	0.004	0.012

	Anemia (%)				VAD (%)				Iron deficiency (%)			
VARIABLES	All	Highlands	Valleys	Lowlands	All	Highlands	Valleys	Lowlands	All	Highlands	Valleys	Lowlands
Quintile 2 = 1	-0.072***	-0.116***	-0.038	-0.060*	0.082	-0.117	0.204**	0.111	0.024	0.102	0.018	-0.094
	(0.020)	(0.031)	(0.032)	(0.033)	(0.052)	(0.084)	(0.080)	(0.110)	(0.047)	(0.078)	(0.070)	(0.092)
Quintile 3 = 1	-0.149***	-0.139***	-0.073**	-0.197***	0.060	-0.158**	0.025	0.158	0.047	0.104	0.135**	-0.065
	(0.024)	(0.046)	(0.036)	(0.036)	(0.052)	(0.068)	(0.077)	(0.104)	(0.042)	(0.085)	(0.065)	(0.078)
Quintile 4 = 1	-0.170***	-0.084**	-0.137***	-0.190***	-0.022	-0.183**	-0.105*	0.036	0.047	0.418***	0.088	-0.098
	(0.025)	(0.042)	(0.035)	(0.042)	(0.063)	(0.092)	(0.060)	(0.126)	(0.050)	(0.107)	(0.067)	(0.095)
Quintile 5 = 1	-0.278***	-0.267***	-0.232***	-0.272***	-0.080*	-0.182**	-0.058	-0.096	-0.059	-0.022	-0.022	-0.098
	(0.023)	(0.049)	(0.032)	(0.038)	(0.045)	(0.083)	(0.061)	(0.105)	(0.037)	(0.069)	(0.053)	(0.092)
Female	-0.054***	-0.085***	-0.057***	-0.028	-0.001	0.011	-0.005	-0.006	-0.110***	-0.148***	-0.132***	-0.058
	(0.014)	(0.029)	(0.021)	(0.023)	(0.030)	(0.050)	(0.039)	(0.059)	(0.031)	(0.055)	(0.043)	(0.053)
Constant	0.813***	0.907***	0.783***	0.749***	0.454***	0.611***	0.385***	0.504***	0.349***	0.465***	0.353***	0.270***
	(0.021)	(0.032)	(0.029)	(0.039)	(0.059)	(0.104)	(0.082)	(0.133)	(0.049)	(0.088)	(0.070)	(0.100)
Observations	9,414	2,894	3,205	3,315	1,590	542	530	518	1,590	542	530	518
R-squared	0.042	0.045	0.040	0.034	0.017	0.039	0.046	0.034	0.028	0.111	0.051	0.011

	Gross motor z-score				Communication z-score			
VARIABLES	All	Highlands	Valleys	Lowlands	All	Highlands	Valleys	Lowlands
Quintile 2 = 1	-0.008	0.023	-0.069	-0.015	-0.166**	-0.178	-0.156	-0.169
	(0.070)	(0.103)	(0.092)	(0.186)	(0.074)	(0.108)	(0.108)	(0.173)
Quintile 3 = 1	-0.007	0.027	-0.145	0.013	0.041	-0.031	0.012	0.078
	(0.066)	(0.141)	(0.089)	(0.111)	(0.063)	(0.117)	(0.104)	(0.114)
Quintile 4 = 1	0.006	-0.025	-0.179	0.039	-0.083	0.012	-0.155	-0.129
	(0.071)	(0.142)	(0.121)	(0.109)	(0.071)	(0.126)	(0.109)	(0.119)
Quintile 5 = 1	0.110	-0.014	-0.033	0.165	0.099	0.051	0.113	0.061
	(0.073)	(0.173)	(0.101)	(0.150)	(0.078)	(0.163)	(0.101)	(0.153)
Female	-0.101**	-0.073	-0.064	-0.154**	0.065	0.055	0.044	0.096
	(0.041)	(0.076)	(0.061)	(0.076)	(0.040)	(0.074)	(0.059)	(0.071)
Constant	-0.031	-0.076	-0.047	0.084	0.084	-0.034	-0.003	0.284**
	(0.062)	(0.113)	(0.086)	(0.134)	(0.065)	(0.112)	(0.100)	(0.129)
Observations	5,753	1,909	1,912	1,932	5,753	1,909	1,912	1,932
R-squared	0.006	0.002	0.015	0.013	0.012	0.008	0.014	0.040

Note: ***significant at the 1% level; ** significant at the 5% level; *significant at the 10% level. SE clustered at the PSU level (census sector or segment) in parentheses. OLS Estimation. Controls include child's sex and a set of child dummies for age categories in months (0-2, 3-5, 6-8, 9-11, 12-14, 15-17, 18-20, 21-23, 24-26, 27-29, 30-32, 33-35, 36-38, 39-41, 42-44, 45-47, 48-50, 51-53, 54-56, 57-59). Quintiles are population quintiles using monthly per capita household consumption as the ranking variable. *p*-value (*F*-test for quintile effects) is the *p*-value of the *F*-test of Q2=Q3=Q4=Q5=0.

Table A5. Adjusted SES gradients in child development by child's age with IPW Adjustments for missing data

	Height for age z-score				Weight for age z-score				Weight for height z-score			
VARIABLES	3-11 Months	12-23 Months	24-36 Months	37-59 Months	3-11 Months	12-23 Months	24-36 Months	37-59 Months	3-11 Months	12-23 Months	24-36 Months	37-59 Months
Quintile 2 = 1	0.130	0.290***	0.378***	0.316***	0.199*	0.308***	0.269***	0.209***	0.158	0.196**	0.102	0.027
	(0.126)	(0.091)	(0.086)	(0.068)	(0.104)	(0.091)	(0.078)	(0.061)	(0.101)	(0.090)	(0.083)	(0.068)
Quintile 3 = 1	0.435***	0.601***	0.695***	0.758***	0.387***	0.533***	0.393***	0.511***	0.208*	0.293***	0.020	0.079
	(0.136)	(0.091)	(0.079)	(0.069)	(0.106)	(0.087)	(0.085)	(0.066)	(0.112)	(0.086)	(0.091)	(0.065)
Quintile 4 = 1	0.610***	0.827***	0.958***	0.774***	0.445***	0.566***	0.672***	0.538***	0.106	0.231**	0.195**	0.141**
	(0.134)	(0.108)	(0.088)	(0.072)	(0.127)	(0.100)	(0.085)	(0.061)	(0.128)	(0.101)	(0.088)	(0.063)
Quintile 5 = 1	0.616***	0.974***	1.139***	1.066***	0.513***	0.778***	0.743***	0.754***	0.223*	0.391***	0.155*	0.166**
	(0.145)	(0.126)	(0.099)	(0.084)	(0.131)	(0.106)	(0.085)	(0.082)	(0.125)	(0.107)	(0.085)	(0.076)
Female = 1	0.174**	0.239***	0.160**	-0.057	0.158**	0.190***	0.116**	-0.083	0.090	0.103*	0.046	-0.054
	(0.082)	(0.074)	(0.063)	(0.052)	(0.073)	(0.066)	(0.052)	(0.051)	(0.073)	(0.061)	(0.053)	(0.047)
Constant	-0.658***	-1.567***	-2.074***	-1.472***	-0.369***	-0.811***	-1.000***	-0.293	0.275**	-0.196	0.012	0.584**
	(0.153)	(0.181)	(0.302)	(0.173)	(0.124)	(0.174)	(0.225)	(0.204)	(0.128)	(0.184)	(0.231)	(0.228)
Observations	1,718	2,391	2,411	3,882	1,693	2,285	2,325	3,707	1,689	2,285	2,323	3,702
R-squared	0.047	0.092	0.126	0.129	0.033	0.066	0.081	0.076	0.007	0.019	0.009	0.005

	Stunting (<-2SD)				Underweight (<-2SD)				Overweight (>2SD)			
VARIABLES	3-11 Months	12-23 Months	24-36 Months	37-59 Months	3-11 Months	12-23 Months	24-36 Months	37-59 Months	3-11 Months	12-23 Months	24-36 Months	37-59 Months
Quintile 2 = 1	-0.061*	-0.150***	-0.118***	-0.118***	-0.010	-0.032***	-0.009*	0.008	0.002	0.022	0.013	0.006
	(0.032)	(0.038)	(0.039)	(0.026)	(0.014)	(0.012)	(0.005)	(0.011)	(0.022)	(0.017)	(0.019)	(0.014)
Quintile 3 = 1	-0.108***	-0.205***	-0.228***	-0.193***	-0.002	-0.033***	0.004	0.007	0.019	0.022	0.007	0.019
	(0.030)	(0.034)	(0.034)	(0.026)	(0.018)	(0.012)	(0.009)	(0.007)	(0.027)	(0.017)	(0.017)	(0.017)
Quintile 4 = 1	-0.132***	-0.261***	-0.260***	-0.228***	-0.027**	-0.031**	-0.009*	-0.008*	0.013	0.006	0.036	0.025
	(0.029)	(0.033)	(0.032)	(0.025)	(0.012)	(0.013)	(0.005)	(0.004)	(0.025)	(0.015)	(0.022)	(0.018)
Quintile 5 = 1	-0.098***	-0.285***	-0.298***	-0.255***	-0.029**	-0.029**	-0.006	-0.000	0.012	0.062***	0.040*	0.070***
	(0.034)	(0.031)	(0.033)	(0.023)	(0.012)	(0.014)	(0.007)	(0.006)	(0.030)	(0.024)	(0.023)	(0.020)
Female = 1	-0.047**	-0.089***	-0.061***	0.025	-0.035***	-0.006	-0.004	-0.008	0.005	-0.002	-0.020	-0.025*
	(0.021)	(0.023)	(0.023)	(0.017)	(0.010)	(0.007)	(0.004)	(0.006)	(0.019)	(0.014)	(0.017)	(0.013)
Constant	0.216***	0.358***	0.566***	0.370***	0.069***	0.049**	0.047**	-0.010	0.109***	0.020	0.002	0.089*
	(0.030)	(0.060)	(0.090)	(0.057)	(0.016)	(0.023)	(0.021)	(0.021)	(0.027)	(0.034)	(0.064)	(0.052)
Observations	1,718	2,391	2,411	3,882	1,689	2,285	2,323	3,702	1,689	2,285	2,323	3,702
R-squared	0.031	0.073	0.072	0.059	0.022	0.010	0.005	0.005	0.003	0.010	0.006	0.011

	Anemia				Vitamin A deficiency		Iron deficiency	
VARIABLES	3-11 Months	12-23 Months	24-36 Months	37-59 Months	6-11 Months	12-23 Months	6-11 Months	12-23 Months
Quintile 2 = 1	-0.039	-0.025	-0.097***	-0.096***	0.071	0.079	0.052	0.022
	(0.050)	(0.036)	(0.034)	(0.033)	(0.095)	(0.059)	(0.078)	(0.055)
Quintile 3 = 1	-0.103*	-0.073*	-0.245***	-0.165***	0.028	0.077	0.046	0.035
	(0.054)	(0.038)	(0.051)	(0.040)	(0.080)	(0.060)	(0.070)	(0.050)
Quintile 4 = 1	-0.137**	-0.057	-0.228***	-0.234***	-0.056	-0.011	0.052	0.044
	(0.056)	(0.041)	(0.043)	(0.039)	(0.089)	(0.069)	(0.071)	(0.066)
Quintile 5 = 1	-0.310***	-0.254***	-0.284***	-0.285***	-0.119	-0.061	-0.094*	-0.054
	(0.052)	(0.044)	(0.042)	(0.038)	(0.078)	(0.054)	(0.055)	(0.048)
Female = 1	-0.074**	-0.038	-0.000	-0.082***	-0.012	-0.003	-0.120**	-0.099***
	(0.033)	(0.026)	(0.030)	(0.024)	(0.048)	(0.038)	(0.047)	(0.036)
Constant	0.440***	0.921***	1.205***	1.102***	0.381**	0.216**	0.080	0.543***
	(0.063)	(0.071)	(0.126)	(0.086)	(0.151)	(0.106)	(0.109)	(0.086)
Observations	1,488	2,167	2,179	3,580	596	994	596	994
R-squared	0.089	0.040	0.057	0.057	0.020	0.016	0.048	0.037

	Gross motor z-score			Communication z-score		
VARIABLES	3-11 Months	12-23 Months	24-36 Months	3-11 Months	12-23 Months	24-36 Months
Quintile 2 = 1	-0.035	-0.068	0.183	-0.157	-0.290***	0.068
	(0.101)	(0.099)	(0.111)	(0.108)	(0.089)	(0.092)
Quintile 3 = 1	-0.029	-0.036	0.127	0.200**	-0.259***	0.225**
	(0.107)	(0.085)	(0.120)	(0.097)	(0.085)	(0.089)
Quintile 4 = 1	-0.040	0.012	0.130	-0.014	-0.215**	-0.032
	(0.102)	(0.118)	(0.113)	(0.107)	(0.103)	(0.111)
Quintile 5 = 1	-0.013	0.144	0.404***	0.200	-0.114	0.228*
	(0.111)	(0.095)	(0.116)	(0.123)	(0.085)	(0.125)
Female = 1	-0.135**	-0.048	-0.094	0.004	0.141**	0.076
	(0.060)	(0.066)	(0.070)	(0.064)	(0.063)	(0.059)
Constant	-0.149	-0.164	-0.147	0.078	0.153	-0.471
	(0.112)	(0.154)	(0.248)	(0.120)	(0.158)	(0.290)
Observations	1,476	2,185	2,092	1,476	2,185	2,092
R-squared	0.011	0.007	0.019	0.021	0.017	0.014

Note: ***significant at the 1% level; ** significant at the 5% level; *significant at the 10% level. SE clustered at the PSU level (census sector or segment) in parentheses. OLS Estimation. Controls include child's sex and a set of child dummies for age categories in months (0-2, 3-5, 6-8, 9-11, 12-14, 15-17, 18-20, 21-23, 24-26, 27-29, 30-32, 33-35, 36-38, 39-41, 42-44, 45-47, 48-50, 51-53, 54-56, 57-59). Quintiles are population quintiles using monthly per capita household consumption as the ranking variable. *p*-value (*F*-test for quintile effects) is the *p*-value of the *F*-test of Q2=Q3=Q4=Q5=0.