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Son Preference and Child Under Nutrition in the Arab Countries: Is There a Gender Bias Against Girls?

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Son Preference and Child Under nutrition in the Arab Countries: Is There a Gender Bias against Girls?

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Abstract

Although son preference has been demonstrated in the MENA region with different manifestations and at several phases of human development, the literature remains sparse with studies that examined the early childhood phase. The current study aims to explore the presence of a gender bias in child nutrition status and its association with maternal son preference in three Arab countries; namely, Egypt, Jordan, and Yemen on which limited research has been conducted. Child nutritional status is measured using the Height-for-Age z-score (HAZ). To examine the presence of gender bias across the entire nutritional distribution, we utilized a quantile regression framework which characterize the heterogeneous association of each determinant across the different percentiles of the nutrition distribution. We use data from the most recent rounds of the Demographic and Health Survey on a nationally representative sample of children aged 0-4 years, for which we observe their health measures. The multivariate analyses include a set of HAZ determinants that are widely used in the literature. Descriptive statistics show that 21.5% of the mothers have son preference in Yemen compared to 19.10% in Jordan and 13.26% in Egypt. Results of the baseline OLS model demonstrate a robust pro-girl nutrition bias in the three countries. However, results of the quantile regression model show that this pro-girl nutrition bias is only prevalent at the lower segment of the conditional HAZ distribution for Jordan and Yemen and is prevalent across the whole conditional HAZ distribution for Egypt. We also find no statistically significant association between maternal son preference and gender bias in child nutrition in the three countries. Although son preference is manifested in several phases of human development in the MENA region, the current study finds no nutritional bias against girls in the examined countries at early childhood.

Keywords: Child malnutrition; Son Preference; Socio-demographic characteristics; Quantile regression; Egypt. Jordan, Yemen.

JEL Classification: I14; J13; J16.

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1. Introduction

The prevalence of stunting, a widely used measure of chronic malnutrition, across children aged under five years in the Middle East and North Africa (MENA) is one of the highest in the world. For example, in Yemen, 46.5% of the children are stunted in 2013 (Ministry of Public Health Population [Yemen] & ICF International, 2015) while in Egypt one in every five children is stunted in 2014 (Ministry of Health and Population [Egypt] et al., 2015). Poor nutrition in childhood has devastating consequences on a child's health and human development throughout the entire life course. Poor nutrition in early childhood could also have an adverse affect on the labor market outcomes of an individual at adulthood (Case & Paxson, 2008).

Cultural gender preference has been identified as a key determinant of child nutritional status and health (Choe et al., 1995; Das Gupta et al.,2003; Mishra et al., 2004; Jayachandran & Kuziemko, 2011; Maitra & Rammohan, 2011; Fledderjohann et al., 2014). For instance, Maitra and Rammohan (2011) suggested that conditional upon surviving the first year; girls have poorer nutrition status. However, contrary to the situation in South Asia, Wamani et al. (2007) found that, on average, boys are nutritionally disadvantaged compared to girls in Sub-Saharan Africa.

Gender bias in nutrition is a cause of concern as it might lead to gender bias in other dimensions such as educational achievement and other forms of human capital investments. The United Nations Children's Fund (UNICEF) has linked child's poor nutritional status to poor school performance which in turn lowers future employment opportunities (UNICEF, 2016). Gender inequality in educational and labor market outcomes in the MENA region is already well documented in the literature (Krafft & Assaad, 2016; Said, 2013, 2015; Salehi-Isfahani et al., 2014) and it could be that gender inequality in human capital in the region is due to gender bias in nutrition in early childhood.

There is an intensive literature on son preference, its manifestation, and drivers in several regions of the world, especially in East Asia (Das Gupta et al.,2003; Jayachandran and Pande, 2017). For example, in a cross-country study, Das Gupta et al., (2003) attributed the presence of son preference in India, China and Korea to their similar family systems which generate strong disincentives to raise daughters. In these countries, as part of their culture, women are effectively marginalised in the social order despite rising incomes, education and urbanisation. In a recent study, Jayachandran and Pande (2017) showed that cultural gender preferences and gender gaps in perceived returns to investment cause unequal resource allocation across siblings in India.

They found that India's child height disadvantage increases sharply with birth order and attributed this to the favoritism toward eldest sons which affects parents' fertility decisions and resource allocation across children. They also found that the birth order gradient is steeper for high-son-preference regions and religions.

As in several parts of the world, there is evidence that sons are strictly preferred over daughters in the MENA region in several spheres (Al-Akour, 2008; Arnold, 1997; El-Gilany & Shady, 2007; Obermeyer, 1996). The OECD (2014) classified the MENA region as the poorest performer in the Social Institutions and Gender Index, a measure of gender inequality, with most of its countries have the highest discrimination level against females. The report also documented that Yemen has the highest discrimination level against females and that sons bias is highly prevalent in the region with elevated levels in Jordan and Egypt.

There is empirical evidence on the existence of sons' preference in the MENA region which is manifested in different phases of a child's development. For example, sons preference has been manifested in the form of under-investment in girls education [see for e.g. Filmer (2005); Yuki et al., (2013); Krafft & Assaad, (2016)] and at the preconception stage (see for e.g. El-Gilany and Shady (2007)], during pregnancy in the form of a more prenatal care in case of a male fatus (Al-Akour, 2008), and shorter breastfeeding duration of girls (Chakravarty ,2015). However, the evidence found by the previous studies on the presence of son preference in the MENA region at some phases of development does not necessarily imply that it will also be present in other phases such as early childhood nutrition status, and this is what the current study is typically exploring. Our paper complements, and adds to, the extant literature on gender bias in the MENA region. The objective of the current study is to investigate the presence of a gender bias in child nutrition status in three Arab countries; namely, Egypt, Jordan, and Yemen on which limited research has been conducted.

Similar to the findings of Wamani et al. (2007) on sub-Saharan African countries, descriptive statistics presented in Figure 1 suggest that there is a consistent pro-female bias in nutritional status in our examined three countries. However, Aturupane et al. (2011) suggested that looking at the averages or employing the standard OLS technique might be misleading. For instance, boys appear to have worse nutritional status on average. However, quantile estimates show that among children at the lower end of the height distribution, the ones at the highest risk of malnutrition, girls are disadvantaged relative to boys.

Insert Figure 1 here

Several studies have examined the gender-based inequalities experienced by children across several dimensions such as schooling, nutrition, educational aspirations, subjective well-being, and psychosocial competencies (see for e.g. Dercon and Singh, 2013). Nonetheless, the current literature remains sparse with studies that have looked at the linkage between son preference and the gender bias in nutritional outcome in the MENA countries (Assaad et al., 2012; Krafft, 2015) and the current study aims to fill this gap in the literature. In an earlier study, El-Gilany and Shady (2007) examined the causes of sons' preference in Egypt and found that boys' preference arises from economic and social grounds. For instance, sons could inherit family business and contribute to the family income, while girls are viewed as an economic liability. This is consistent with Rosenzweig and Schultz (1982) findings that gender bias in India arises from the fact that the investment return on boys is higher than the return from girls causing an unequal resource allocation. Also, boys are more valued in the MENA countries, as well as in many other regions, as they allow the continuation of a family's name. In Yemen, the preference for sons is derived to a great extent by the patriarchal character of the society and the place of defense in tribal unity and integration.

There is evidence of a gender bias in the investment in health and nutrition in the limited literature that examined the MENA region. For example, Al-Akour (2008) explored the association between knowing fetal gender and seeking prenatal care in Jordan. The study showed that knowing fetal gender influences the number of prenatal care visits, where the number of visits is significantly higher when having a boy. Chakravarty (2015) has replicated Jayachandran and Kuziemko (2011)'s hypothesis on breastfeeding duration in Egypt. Breastfeeding duration is a principal determinant of young child's nutritional status. The paper suggested that mothers in Egypt breastfeed girls less than boys.

The current paper accounts for the heteroscedasticity that is always present in survey data by employing a quantile regression (Deaton, 1997). Beside overcoming the heteroscedasticity problem that invalidates the OLS analysis, quantile regression has additional merits from the policy perspective. It allows the effect of each determinant to vary along different percentiles of the conditional distribution of the outcome variable, which is a very valuable feature when the underlying data displays heteroscedasticity. Unlike the standard OLS analysis where the attention is on the averages, quantile regression considers the tails of the distribution (that is, children at the highest risk of malnutrition).

It is convincing to treat gender as an exogenous variable as it is a predetermined characteristic beyond an individual's control. Furthermore, sex selection is rare in the examined countries because gender selection is legally banned and due to strong religious beliefs, that prohibit gender selection. The birth sex ratio of boys to girls is commonly used as an indicator of sex-selective abortion where a sex ratio that is outside of the normal 105-107 range, necessarily implies sex-selective abortion. According to CIA (2016) estimates, the sex ratio (males/females) in Jordan (1.06), Yemen (1.05), and Egypt (1.05) falls within the normal range and hence there is no evidence of sex-selective abortion in the three countries. Empirical evidence also supports this argument. For example, though several studies found that Jordanian women have a strong preference for male babies (Al-Akour, 2008; Al-Akour, 2009), it has also been found that Jordanian women have no interest in using preconception sex selection for non-medical reasons. For example, Al-Akour (2009) found that pregnant women receiving prenatal care in Jordan, though showed a preference to have more boys than girls, are generally not in favor of using the techniques that select the sex of their prospective children.

The findings of this paper suggest the presence of a robust pro-girl nutrition bias in the three countries. However, results of the quantile regression model show that this pro-girl nutrition bias is only prevalent at the lower segment of the conditional HAZ distribution for Jordan and Yemen and is prevalent across the whole conditional HAZ distribution for Egypt. We also find no statistically significant association between maternal son preference and gender bias in child nutrition in the three countries.

The paper is organized as follows: Section 2 provides a brief overview of the differences between the three countries with a special focus on the social protection programs and food security. Section 3 presents a conceptual framework for the linkage between parental preference for one sex and the gender bias in a child's nutritional outcome. Section 4 describes the data and the empirical methodology. Section 5 presents the results which are then discussed in Section 6 which also concludes the paper.

2. Social Protection Programs and Food Security in Egypt, Jordan, and Yemen: An Overview

In this section, we present a brief overview of the socio-economic background in the examined countries with a special focus on the social protection programs and food security which are directly related to the nutritional outcomes in these countries.

Yemen is one of the poorest countries in the Middle East, with about 40 % of the population live below the poverty line and ranked 160th out of the 187 countries in the 2014 Human Development Index (United Nations Development Programme, 2013). Yemen also has one of the highest malnutrition rates in the world, with almost 60% of the children under the age of five having chronic malnutrition, 35% are underweight, and 13% have acute malnutrition. Yemen relies substantially on imports to meet its domestic food consumption, and the food self-sufficiency rate is decreasing over time.

In 1995, the government of Yemen implemented the Economic, Financial, and Administrative Reform Program (EFARP). This program involved a gradual removal of subsidies on basic needs and food products which had devastating social consequences and increased poverty rates. To mitigate the negative consequences of the subsidy removal on the poor and vulnerable groups, the government launched a battery of social protection and safety net policies. These include the Social Welfare Fund (SWF), Social Fund for Development, Agricultural, and Fishery Promotion Fund, Public Works Program (PWP), Family Productive Program and the Small and Medium Enterprises Fund (Azaki, 2015). The SWF, the main social assistance program in Yemen, provides cash transfers between 2000-4000 YR (US $9-18) per month for over 1.5 Million households, helping Eight Million beneficiaries in 2014. It has been documented that this amount is inadequate to cope with the rising living costs. Also, only half of the low-income families in the targeted areas were benefiting, and the cash transfers were not paid on a regular basis. The SWF and the PWP are used to enhance development in rural areas and to provide temporary jobs to the unemployed.

A pressuring factor on the social welfare system in Yemen is the ‘open door’ policy which opens the immigration floodgates to all Somali refugees and allows them to stay with refugee status. This pressure is amplified by the internal political instability and civil wars. Statistics show that Yemen hosts about 246,000 registered refugees, 95% of whom are Somalis (United Nations High Commissioner for Refugees, 2015). Also, the social protection and safety net in

Yemen faces several other challenges which dampen its effectiveness. These include the increase in population growth rate, and the scattering of the population in small settlements, poor or no coordination between the different government institutions in charge of the safety net, the non-existence of a disaster risk-reduction policy, and the increased number of internally displaced persons due to internal conflicts. As of July 2014, more than 334,000 people were registered as internally displaced due to the civil war (United Nations High Commissioner for Refugees, 2015).

The civil war and military conflict since 2014 have exacerbated the food insecurity problem and child malnutrition in Yemen, leading to one of the worst humanitarian crises in the history of the region. Statistics show that about 11.3 million children need humanitarian assistance, about 1.8 million children and 1.1 million pregnant or lactating women are acutely malnourished, including 400,000 children under age five suffering from severe acute malnutrition. If no action is taken, it is estimated that 100,000 children under 5 in Yemen will die from causes related to malnutrition in 2018 (OCHA, 2018). In a recent study, Ohannessian (2016) used a difference-in-differences technique to examine the impact of the Yemeni armed conflict on children's nutritional status, as measured by the HAZ scores. The empirical findings show that the malnutrition status of children has deteriorated after the start of the armed conflict in Yemen compared to the year 2006.

Unlike Egypt and Yemen which are lower-middle-income economy, Jordan is an upper middle-income economy. Similar to Yemen, Jordan is mainly an importer of food products which exposes the country to food price shocks. Imports cover 96% of Jordan's total cereals consumption and more than 60% of its meat consumption. Also, Jordan is vulnerable to food insecurity due to degradation of agricultural land, self-insufficiency in food products, and water scarcity which places Jordan as one of the five most water - deficit countries in the world. The food insecurity problem is aggravated by the flood of Syrian refugees with more than 600,000 registered Syrian refugees in Jordan.

There are several domestic and international institutions that are involved in the social safety nets and enhancing food security in Jordan. These include the ministry of health, ministry of agriculture, and the Non-Government Organizations (NGOs), in addition to international development partners including World Food Programme (WFP), the Food and Agriculture Organization, the International Fund for Agricultural Development, and the United Nations

Development Programme. In December 2013, the WFP launched an 18-month assistance program to help 160,000 vulnerable Jordanians through cash and food transfers. The WFP also helps the Jordanian government in implementing a national school meals program (2014- 2016) to serve 320,000 school children in the most vulnerable and food insecure areas (Zureiqat and Shama, 2015).

The National Aid Fund (NAF) is the core of Jordan's social protection system. It provides cash transfers necessary to buy basic food and nutrition to 100,000 vulnerable households, about 8% of the Jordanian population (United Nations Development Programme, 2013). The Social Security Corporation is another key provider of social assistance to about one million beneficiaries who are retired, ill, and unemployed.

In addition to the formal governmental agencies, Jordan has a growing non-governmental social safety nets represented by the NGO sector. The main NGOs in Jordan that are active in areas related to social protection include Tkiyet Um Ali, founded in 2003, serving meals and daily humanitarian aid to poor households, and the National Alliance against Hunger and Malnutrition, established in 2004 to support government programs in combating hunger and enhancing food security in Jordan. In March of 2008, the Jordanian Food Bank was launched to provide families and individuals living below the poverty line with access to nutritious food packages. Another active NGO is the Islamic Center Charity Society which provides health, education, and social protection assistance to 74,500 households (Zureiqat and Shama, 2015).

Similar to Yemen and Jordan, Egypt is susceptible to food insecurity due to its heavy reliance on imports of food products (Egypt imports more than 60% of wheat consumption), increasing population, and poverty. The Egyptian government provides social assistance through three main schemes: the food security programs, conditional cash transfers, and the Social Fund for Development Programmes. To tackle food insecurity and to help vulnerable and deprived households, the Egyptian government provides substantial food subsidies on Baladi bread under the food subsidy social assistance program, as well as a ration card system that provides fixed monthly quotas of basic subsidized food such as cooking oil, flour, rice, and sugar. Also, the Egyptian government cooperates with local NGOs, and international donors to tackle malnutrition and stunting among children. For example, the Egyptian government developed a 10-year Food and Nutrition Policy and Strategy (2007-2017) in partnership with international donors such as the WFP. Also, the WFP launched the school feeding program, and the food voucher program which provides about $30 to the poor households (Ameta and El Shafie, 2015).

3. A Conceptual Framework for the linkage between Son's Preference and gender bias in Child Nutrition

In order to understand how parental preference for one sex might affect a child nutritional outcome, we present a simple theoretical unitary model in which the household cares about adults' consumption and their children's level of human capital, health (nutrition) in this case. Assume a household composed of a father, a mother and two children; a boy (b) and a girl (g). Individuals live for two periods. The parents work in the first period and retire in the second period. Children live with their parents in the first period who invest in their health. In period 2, the parents don't work and survive on transfers they receive from their children. We assume that the amount of these transfers is proportional to each child's wealth which in turn depends on a child's health as shown in equations (1) and (2).

$$C_1 = I_1 - P(H_b + H_g) \tag{1}$$

$$C_2 = \alpha W_b + \beta W_g \tag{2}$$

In which C_1 and C_2 are household's consumption in period 1 and 2 respectively. I is household's income in period 1. H_b & H_g is the amount of investment that the household undertakes in their children's health. α and β are the rates of transfer per unit of wealth from the son and daughter in period 2. P is the price of a child's health.

To focus on gender differences, in this model both sons and daughters differ in the return to the investment in their health, and their transfer rates. We also allow for gender difference in the marginal utility of children's health to consider parental preference difference by gender.

The objective of a household is to maximize their life time utility $u = L(C_1) + F(C_2, W_b, W_g)$ subject to their life time budget constraint and their children's transfer functions. Formally, the household's utility maximization problem is given as

$$\max_{\{H_b, H_g\}} u\,(C_1, C_2, W_b, W_g)$$

$$\text{Subject to : } I_1 = C_1 + P(H_b + H_g)$$

$$C_2 = \alpha W_b + \beta W_g$$

$$W_b = \delta H_b$$

$$W_g = \sigma H_g$$

By substituting the constraints into the household's lifetime utility function, we get the following constrained utility maximization problem as shown in equation 3

$$\max_{\{H_b, H_g\}} L\,[I_1 - P(H_b + H_g)] + F[(\alpha\delta H_b + \beta\sigma H_g), \delta H_b, \sigma H_g] \tag{3}$$

By solving this utility maximization problem, we get the first order conditions for H_b & H_g as in equations (4) and (5)

$$\frac{\partial L}{\partial C_1} P = \frac{\partial F}{\partial C_2}\alpha\delta + \frac{\partial F}{\partial W_b}\delta \tag{4}$$

$$\frac{\partial L}{\partial C_1} P = \frac{\partial F}{\partial C_2}\beta\sigma + \frac{\partial F}{\partial W_g}\sigma \tag{5}$$

Equations (4) and (5) are the optimal decision rules for investment in children's health by their parents. These two equations show that to maximize their lifetime utility, a household invest in their children's health to the point at which the marginal cost of this investment in terms of lost consumption in period 1 equals the marginal benefit which consists of the marginal utility of second period consumption multiplied by the transfer rate per unit of a child's health plus the marginal utility to the parents from a unit increase in children's health.

By dividing equation (4) by (5) we get

$$\frac{\partial F}{\partial C_2}\alpha\delta + \frac{\partial F}{\partial W_b}\delta = \frac{\partial F}{\partial C_2}\beta\sigma + \frac{\partial F}{\partial W_g}\sigma \tag{6}$$

Equation (6) shows that a household invests in the health of their children up to the point where the marginal benefit of the investment in health is equal across gender. Equation (6) enables us to conduct some comparative static analyses to see how the amount of a household investment in the health of boys and girls is affected by exogenous variables, namely; monetary market returns on child health (δ, σ), transfer rates (α, β), and the parent's preference for their children's wealth $\left(\frac{\partial F}{\partial W_b}, \frac{\partial F}{\partial W_g}\right)$.

We will observe gender bias in child health if the market rewards the human capital (health) of boys and girls differently or if boys and girls differ in their transfer rate or if the parents place different values on their children's wealth. For example, a household will invest more in a boy's health than a girl if $\delta > \sigma$ or if $\alpha > \beta$ or if $\frac{\partial F}{\partial W_b} > \frac{\partial F}{\partial W_g}$, other things being equal.

4. Data and Methodology

This paper uses data from the most recent rounds of the Demographic and Health Survey (DHS) for Egypt (2014), Jordan (2012), and Yemen (2013). The sample of interest includes children aged between 0–5 years, for which we observe their health outcomes. The DHS is an international survey conducted in 85 countries. The survey contains data for a rich set of indicators in the areas of population, health, and nutrition. The samples are all nationally representative. The 2014 Egypt Demographic and Health Survey (EDHS) has 13,682 children, the Jordanian sample consists of 6,267 children, and the Yemen Demographic and Health Survey (YDHS) includes 13,624 children. For a detailed description of the used surveys see the Ministry of Health and Population [Egypt] et al. (2015), Ministry of Public Health Population [Yemen] and ICF International (2015), and Department of Statistics/Jordan and ICF International (2013).

In this paper, we use the Height-for-Age Z-score (HAZ) as a measure of a child's nutritional status. The HAZ measures a child's body height relative to age, which reflects cumulative linear growth. A low HAZ is referred to as stunting, and it reflects inadequate nutrition for an extended period or chronic malnutrition. It is a continuous variable that is normally distributed. A child whose height is more than two standard deviations below the World Health Organization (WHO) reference group is classified as moderately underweight or stunted. A child is classified as severely malnourished if his/her height relative to age is more than three standard deviations below the WHO reference group (O'Donnell et al., 2008).

We constructed a measure for sons' preference, the key control variable of interest in this paper, based on three questions in the DHS that were asked to the interviewed mothers about their fertility preference. The mother was asked "*What is the ideal number of children?", "What is the ideal number of boys?"* and "*What is the ideal number of girls?*". A son's preference is computed as a dichotomous variable that equals one if the ideal number of boys is greater than the ideal number of girls and equals zero otherwise. The same approach was used in several earlier studies (see for e.g. Clark, 2000; Dasgupta, 2016).

To examine the gender bias in child nutrition and its association with son preference, as a baseline model, we first estimate the following linear regression in equation (7)

$$HAZ_i = \beta_0 + \beta_1 male_i + \beta_2 son\ preference_i + \beta_3 male_{\ i} \times son\ preference_i + \beta_4 X_i + u_i \quad (7)$$

Where HAZ_i is the height-for-age z score of child i. $Male_i$ is a binary variable identifying a child's sex. $Son\ preference$, the key control variable of interest, is a measure of the mothers' preference for sons. X is a vector of control variables that accounts for a set of HAZ determinants that are widely used in the literature (Sharaf et al., 2018; Rashad and Sharaf,2018). The vector X includes child-specific characteristics, parental and household-level factors. Child-specific characteristics include child age, size at birth, birth order of the child, whether the child is a twin. Parental factors include the mother's age, employment status, level of education, nutritional status of the mother measured by her body mass index (BMI), whether the mother had a risky birth interval (defined as a birth-to-birth interval of less than 24 months), receiving regular healthcare during pregnancy. Households' socioeconomic status is measured by the wealth index, mother's level of education, access to clean water, region of residence, and whether there are other children in the household under the age of 5. In fact, the DHS does not include any data about a household's income or expenditures that we can use to measure the household's economic status other than the wealth index. The wealth index is widely used as a living standard measure, especially in countries that lack reliable data on income and expenditures. The EDHS team has developed the wealth index using a statistical method known as principal components analysis. The value of the wealth index depends on household's possession of chosen assets such as cars, floor type, access to water and sanitation, and materials used for housing construction. This index was used to stratify the interviewed households into five wealth quintiles (poorest (reference category), poorer, middle, richer, and richest). For additional information about the wealth index and its importance, please refer to Rutstein and Johnson (2004).

The choice of the nutrition determinants in the vector X is derived by the evidence of earlier previous studies on the linkage between these determinants and the nutrition outcomes. For example, there is empirical evidence that short birth intervals (Conde-Agudelo et al., 2012), mothers' poor nutritional status (Ramakrishnan et al., 2012), having multiple children under the age of 5 in the household (Sharaf et al., 2018), and childbearing by teenagers and older mothers (Chen et al., 2007) adversely affect a child's nutritional status. Previous studies have consistently linked the household's socioeconomic status, usually measured by the household wealth index and maternal education level, to the nutritional outcomes of the children. The wealth status reflects the household ability to purchase nutrition rich food, living in a healthy environment, and to access health care services. Also, a mother's educational attainment affects her nutritional and health knowledge and her awareness of the importance of the hygienic living environment. Also, access to clean drinking-water, and receiving regular healthcare during pregnancy have been consistently linked to better child nutrition outcomes (World Health Organization and UNICEF, 2015). There is also considerable evidence on the existence of regional disparities between urban and rural areas in the nutritional outcomes of children in the MENA countries (Sharaf and Rashad, 2016).

We control for the existence of other children under 5 in the household to account for any potential rivalry between siblings in food consumption and the allocation of other household resources such as mother care time.

As for the quality of the data and sample sizes used in the analyses, it is worth mentioning that the age reporting, both the woman's report of her current age and the child's age, particularly in Yemen may be subject to errors and may not be generally accurate which may create bias. For an assessment of the quality and consistency of age and date reporting in DHS surveys see Pullum and Staveteig (2017). The total sample size in the 2013 YDHS is 13,624 children, 13,682 children in the 2014 EDHS, and 6,267 children in the 2012 JDHS. Due to due to missing anthropometric data or missing covariates, the total sample size for Yemen used in the regression analyses ranged from 11,100 to 12,289 in the different model specifications. For Jordan, the sample size used in the regression analyses ranged from 5,513 to 5,665 and for Egypt it ranged from 12,396 and 12,980. Despite the dropout of some observations in the regression analyses, the used samples are quite large to reach generalized conclusions, yet a potential bias in the results could still remain.

The coefficients of interest are the coefficient of gender (β_1) and the coefficient of the interaction term between son preference and gender (β_3). The coefficient β_1 gives the gender gap in the HAZ score. A positive(negative) sign for β_1 would imply a pro-boy(girl) nutrition bias. The coefficient β_3 gives the gender gap differential in the HAZ score when the mother has son preference compared to when she doesn't. A positive sign for β_3 would imply that son preference leads to a pro-boy nutrition bias.

To examine the gender gap in child nutritional status and the effect of son preference along the whole distribution of the HAZ score, while controlling for the aforementioned demographic and socioeconomic factors, we utilize the following quantile regression equation as shown in equation (8).

$$Q_{HAZ_i}(\mu|male, son\ preference, X) = \alpha(\mu) + \beta_1(\mu)\ male_{\ i} + \beta_2(\mu) son\ preference_i\ + \beta_3(\mu)\ male_{\ i} \times son\ preference_i + \beta_4(\mu) X_i + u_i \qquad (8)$$

Where $Q_{HAZ_i}(\mu|male, son\ preference, X)$ is the μ^{th} conditional HAZ quintile function and μ represent a quintile. All descriptive and multivariate analyses are population weighted using the sampling weights provided in the DHS survey, and the survey design is taken into account in the analyses.

To account for the presence of a potential socioeconomic status (SES) gradient in the gender bias in child nutrition status, additional analyses are conducted by interacting the child's gender with the mother's education level and the household's wealth quintiles.

5. Results

Table 1 presents summary statistics of the variables used in the analyses. The descriptive statistics show that, on average, the children in the three countries are much shorter, compared to the WHO's reference population. The mean HAZ score is -0.47 in Egypt, which indicates that, on average, Egyptian children are about a half standard deviation shorter than the WHO's reference population (children of 6 countries: Brazil, Oman, Ghana, India, USA, and Norway). In Jordan, the mean HAZ score is -0.46 with Jordanian children are almost 0.46 standard deviations shorter than the WHO's reference population. The nutritional status is the worst in Yemen (HAZ is -1.83) in which the Yemeni children are 1.83 standard deviations shorter than the WHO's reference population.

Insert Table 1 here

For Egypt, half of the sample is boys, 42% are aged one year or less, 3.6% are twins, and 14.73 % have size at birth less than average. As for the mothers' characteristics, about 24% of the mothers are below the age of 25, and 36% are between 25-29 years. About 87% of the mothers are unemployed, 0.3% are malnourished, about 18% did not receive regular healthcare during pregnancy, and 13% had a risky birth interval. For mothers' educational level, 18% of the mothers are illiterate, 8.4% have primary education, 58% have completed secondary education, and 16% have more than secondary education. As for the household socioeconomic status and living environment, about 14% of the households have more than one child under the age of 5, 5.25% of the households have no access to clean water, 59.89% live in rural regions, about 38% of the households are poor, and 20% are middle class.

The sample composition of Jordan is in general similar to Egypt except that the Jordanian mothers are more educated, have a higher rate of malnourishment (2.2%), have a risky birth interval (25.1%) and more children under the age of five (24.75%). 18% of the Jordanian children have size at birth less than average. 3.6% of the interviewed mothers did not receive regular healthcare during pregnancy, compared to 18% in Egypt and 50% in Yemen. 44% of the interviewed households have no access to clean water, 30.76% live in rural regions, 54% of the households are poor, and 24% are middle class.

For Yemen, the socioeconomic conditions and living environment are much worse than the other two countries. More than half of the mothers are illiterate, 32% are with primary education, 16% are malnourished, about 50% did not receive regular healthcare during pregnancy. 57% of the households have no access to clean water, 77% live in rural regions. About 31% of the Yemeni children have size at birth less than average.

As for the prevalence of son preference, 21.5% of the mothers have son preference in Yemen compared to 19.10% in Jordan and 13.26% in Egypt.

Insert Figure 2 here

Insert Figure 3 here

Insert Figure 4 here

Figures 2,3 and 4 depict the gender nutrition disparity in the three countries for the whole sample and among households with son preference and those without son preference. The descriptive statistics displayed in figures 2 to 4 suggest that, overall, there is a consistent pro-female bias in nutritional status in all three countries. However, when the sample is stratified by the household son preference status, a striking observation is that in both Yemen and Jordan, there is a pro-boys bias in nutritional status among households with son preference which would imply that in these two countries son preference leads to a pro-boy nutrition bias. However, in Egypt, there is no evidence that son preference leads to a pro-boy nutrition bias.

Insert Table 2 here

Table 2 presents a summary of the results of the Ordinary Least Squares (OLS) model as a baseline, as well as quantile regression estimates at five selected percentile levels (15%, 25%, 50%, 75%, and 90%) for the three countries with different model specifications. In Table 2, for brevity, we present only the estimated coefficients of the gender variable and son preference and the interaction term of gender with the mother's education level to account for the presence of a potential socioeconomic status (SES) gradient in the HAZ. The full results of the estimated models are presented in Tables 3 to 8 in a supplementary file.

For Egypt, the baseline OLS model (1) in panel (a) shows that, on average, Egyptian boys have a 0.169 standard deviation disadvantage, regarding height, over that of girls. Consistent with results of the OLS model, quantile regression estimates show that there is a notable pro-female bias in nutritional status along the whole conditional HAZ distribution. This pro-female bias in nutrition status is robust to the change in the model specification. Model (2) in panel (a) shows that both the OLS and quantile regression results indicate that son preference has no statistically significant effect on the gender nutrition gap in Egypt which is consistent with the results of the unconditional analysis presented in Figure 3.

Results of OLS and quantile regression for Yemen are presented in panel (b) in Table 2. Results of the OLS model show a robust pro-girl nutrition bias in all the different specifications of the model. However, the quantile regression estimates show that this pro-girl nutrition bias exists only at the lower segment of the conditional HAZ distribution. The OLS model show that, though the coefficient of the interaction term between gender and son preference has a positive sign, it is not statistically significant, which would imply that son preference has no influence on the gender gap differential in the HAZ score in Yemen. Results of the quantile regression model show that the sign of the interaction term of son preference and gender is positive at lower quintiles while it becomes negative at upper quintiles of the conditional HAZ distribution. Nonetheless, none of the interaction terms is statistically significant, except at the 25% percentile.

Results of the OLS and quantile regression models for Jordan are presented in panel (c) in Table 2. Similar to Yemen, results of the OLS model show a robust pro-girl nutrition bias in all the different specifications of the model. However, the quantile regression model shows that this pro-girl nutrition bias is prevalent only at the lower segment of the conditional HAZ distribution.

As for the effect of son preference on the gender gap in nutrition, the coefficient of the interaction term between gender and son preference in the OLS model, though has a positive sign, is not statistically significant. The quantile regression model also show that son preference has no statistically significant effect on the gender gap differential in the HAZ score in Jordan at the 5% significance level.

For the interaction of the child's gender with the mother's education level, the results show that for the three countries, none of the interaction terms is statistically significant at the 5% significance level. Though not reported but available upon request, we also estimated another specification that involves interacting gender with the household wealth quintiles. Also, in this specification, none of the interaction terms of the household wealth quintiles with gender was statistically significant at 5%. This implies the absence of a potential socioeconomic status (SES) gradient in the gender bias in child nutrition status, additional analyses are conducted by interacting the child's gender with the mother's education level and the household's wealth quintiles.

Insert Figure 5 here

Figures 5, 6 and 7 compare the quantile regression estimate of the gender dummy with the OLS estimate for model 1 along with the OLS confidence interval (CI). The horizontal line is the OLS estimate of the gender bias in nutrition which is constant across the entire conditional HAZ distribution. The confidence intervals also appear as dashed lines in the figure. Figure 5 shows that for Egypt, the gender's coefficient is negative over the entire conditional HAZ distribution and has a greater impact around the lower quantile, and a smaller effect at the median quantiles.

However, the quantile coefficient is within the CI of the OLS coefficient; thus, it is not significantly different from the OLS coefficient.

Insert Figure 6 here

For Jordan, Figure 6 shows that The OLS estimate is close to zero, while the quantile model shows that the association between gender and the HAZ is heterogeneous across the HAZ distribution. The association is negative at lower and median quantiles and flips its sign at the upper quantiles, and it falls outside the CI of the OLS coefficient; thus, it is significantly different from the OLS estimate. For Yemen, Figure 7 shows a pro-girl nutrition bias at lower and middle quintiles while at upper quantiles, the coefficient of gender becomes positive and it falls outside the CI of the OLS coefficient; thus, it is significantly different from the OLS estimate.

Insert Figure 7 here

Looking at the other covariates, the results in general reveal the existence of a SES gradient in child nutrition status across the three countries, where children from high-income families and those whose mothers have a higher level of education, have higher HAZ score compared to those from lower SES. This SES is also partly reflected by other covariates such as access to clean water, and receiving regular healthcare during pregnancy. The extent of this SES gradient varies across the conditional quantiles of the HAZ distribution. The quantile regression shows that children from richer families have a statistically significant height advantage over poorest children only at lower percentiles of the conditional HAZ distribution, while this advantage becomes not statistically significant at higher points of the HAZ distribution.

In the three countries, twin children have height disadvantage compared to non-twin children. Likewise, child size at birth is also significantly associated with the HAZ score, where small-sized children have worse nutritional status than big-sized children. Receiving a regular healthcare during pregnancy is positively and significantly associated with the HAZ across the three countries.

6. Discussion and Conclusion

Gender bias and son preference has been demonstrated in the MENA region at several phases of human development. Son preference was manifested at the preconception (El-Gilany and Shady, 2007), pregnancy (Al-Akour, 2008), and breastfeeding (Chakravarty ,2015) phases, as well as in the form of under-investment in girls' human capital such as education (Krafft & Assaad, 2016). There is a concern that the observed gender inequality in human capital and labor market outcomes at adulthood in the region is, in part, derived by gender bias in nutrition in early childhood. Nonetheless, just because son preference has been demonstrated in one phase does not necessarily mean that it will be present in another in the same context. Extant literature on the association between son preference and nutrition status at childhood in the Arab world remains sparse and the current study aimed to fill this gap in the literature. The current study aimed to explore the presence of a gender bias and son preference in child nutrition status in three Arab countries; namely, Egypt, Jordan, and Yemen.

To examine the presence of gender bias across the entire nutritional distribution, we utilized a quantile regression framework which characterize the heterogeneous association of each determinant across the different percentiles of the nutrition distribution. This is of particular importance in nutrition research, where attention is focused on the tail ends of the nutrition distributions.

Results of the baseline OLS model demonstrate a robust pro-girl nutrition bias in the three countries. However, results of the quantile regression model show that this pro-girl nutrition bias is only prevalent at the lower segment of the conditional HAZ distribution for Jordan and Yemen and is prevalent across the whole conditional HAZ distribution for Egypt. We also find no statistically significant association between maternal son preference and gender bias in child nutrition in the examined countries.

Our result on the presence of a pro-girl nutrition bias is consistent with the findings of several previous studies applied on other regions. For example, in a meta-analysis of 16 demographic and health surveys, Wamani et al. (2007) examined whether there are systematic sex differences in stunting rates in children under-five years of age, in sub-Saharan Africa. They found male children under-five years of age are more likely to become stunted than females. They also found that the sex differences in stunting were more pronounced in the lowest SES groups. In another study, Dercon and Singh (2013) find a pro-female bias in nutritional status in Ethiopia, India, Peru, and Vietnam. Our findings that girls (compared with boys) have more favorable HAZ-scores are not in line with the findings of few other studies that examined some low and middle income countries (Maitra & Rammohan, 2011; Ndiku et al., 2011). For example, Ndiku et al. (2011) assessed the existence of gender inequality in food intake and nutritional status in rural Eastern Kenya. They find that girls under the age of 5 are more stunted, underweight and wasted than boys at all age categories due to their consistent lower food intake.

While it is less clear why the nutrition bias against girls in the examined countries is not present at the childhood phase contrary to the manifestation of son preference at other phases of child development, several explanations that have been presented in the literature could help explain this pro-girl nutrition bias at early childhood. Sex differences in nutritional status might be explained by biological differences in morbidity between boys and girls in early life that are independent of infant feeding patterns (Wamani et al.,2007). Also, boys generally have higher birth weights than girls and grow faster during infancy, resulting in greater energy needs. Other studies hypothesized that the pro-girl nutrition bias in infancy is explained by premature complementary feeding, and with larger amounts of food, of boys compared with girls (Bork and Diallo,2017). Another explanation is that the rise of maternal education is responsible for reducing gender bias in nutrition (Dasgupta, 2016). Another potential reason is the systematic gender differences in the WHO reference populations. However, several studies find that the findings related to the gender-inequality in nutritional status are not sensitive to the choice of the reference standards. Marcoux (2002) argued that the nutritional disadvantage of boys may reflect the fact that girls better cope with the inadequate food supply than boys from the standpoint of bodily development.

The results also reveal a socioeconomic gradient in child nutritional status, in which children of low income-education families have a lower height than children from the high income-education households. The quantile regression results show that the association between the economic and socio-demographic and child height differ considerably along the conditional HAZ distribution.

The current study is not free from limitation. One limitation is the cross-sectional nature of the DHS which limits the ability to infer causality. Another limitation is that although in the analyses we only focused on mothers' preference for sons, fathers' preference could also have an influence on the child health outcomes (Dasgupta, 2016). We were not able to control for fathers' preference as the DHS lacked information on this variable. However, for the age group that we are focusing on, children under 5 years, we believe that mothers' preference is more important since mothers are their primary car-givers and hence they can act upon to manifest their preference. One more limitation is the dropout of some observations in the regression analyses due to missing anthropometric data or missing covariates which might lead to bias in the results. Yet, we believe that the used samples are quite large which would help reduce the size of any potential bias in our estimates.

Although son preference is manifested in several phases of human development in the MENA region, the current study finds no nutritional bias against girls in the examined countries in the early childhood phase.

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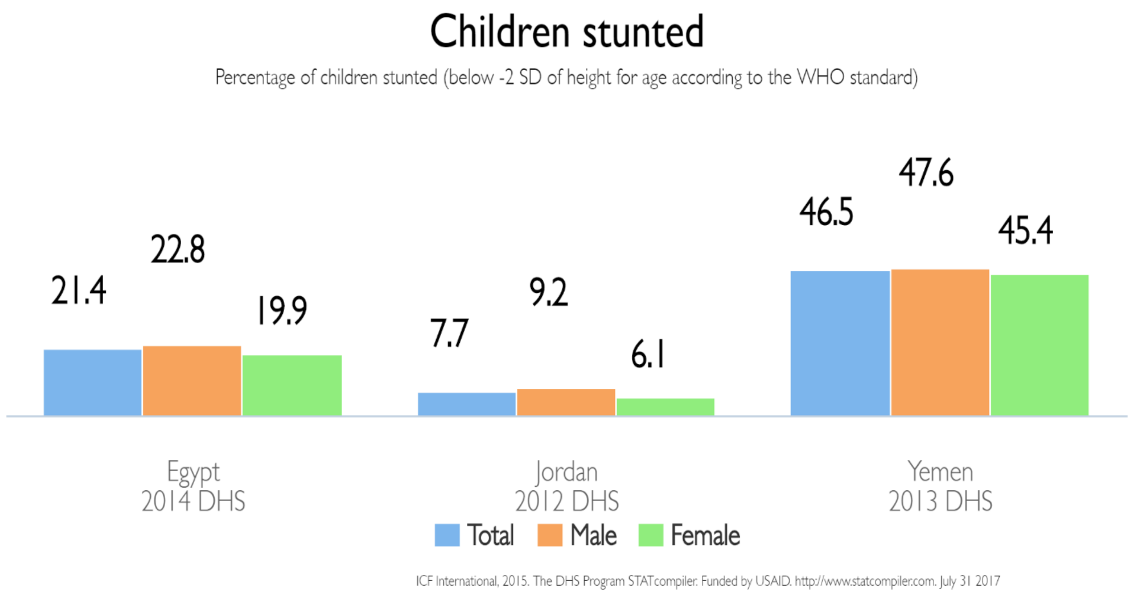
Appendix

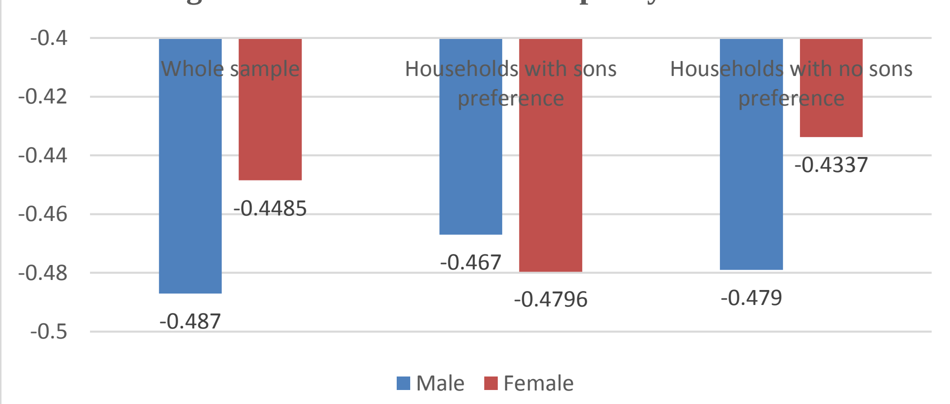
List of Figures

Figure 1: Children stunted by sex



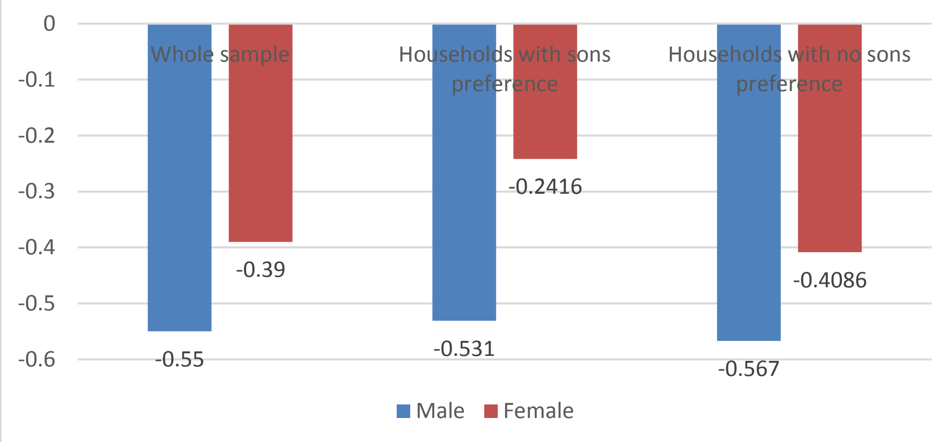
Source: Authors' calculation based on data from DHS

Figure 2 : Gender nutrition disparity in Jordan



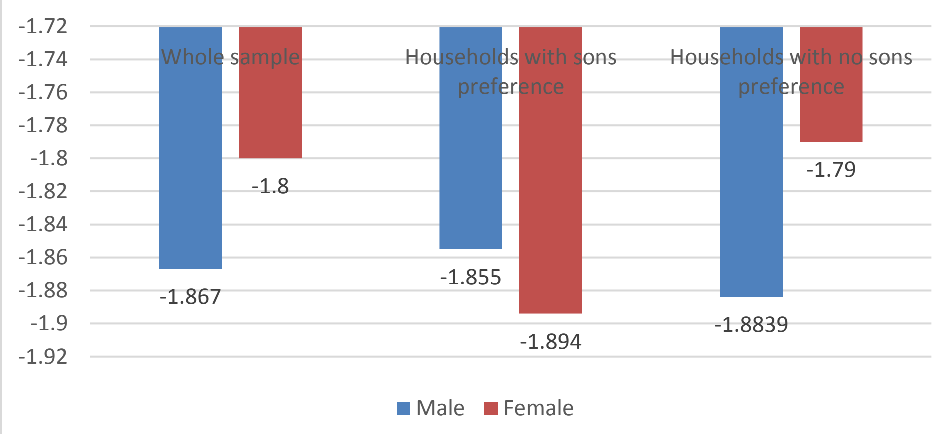
Source: Authors' calculation based on data from DHS

Figure 3: Gender nutrition disparity in Egypt



Source: Authors' calculation based on data from DHS

Figure 4 : Gender nutrition disparity in Yemen



Source: Authors' calculation based on data from DHS

Figure 5: OLS estimate vs quantile estimate in Egypt

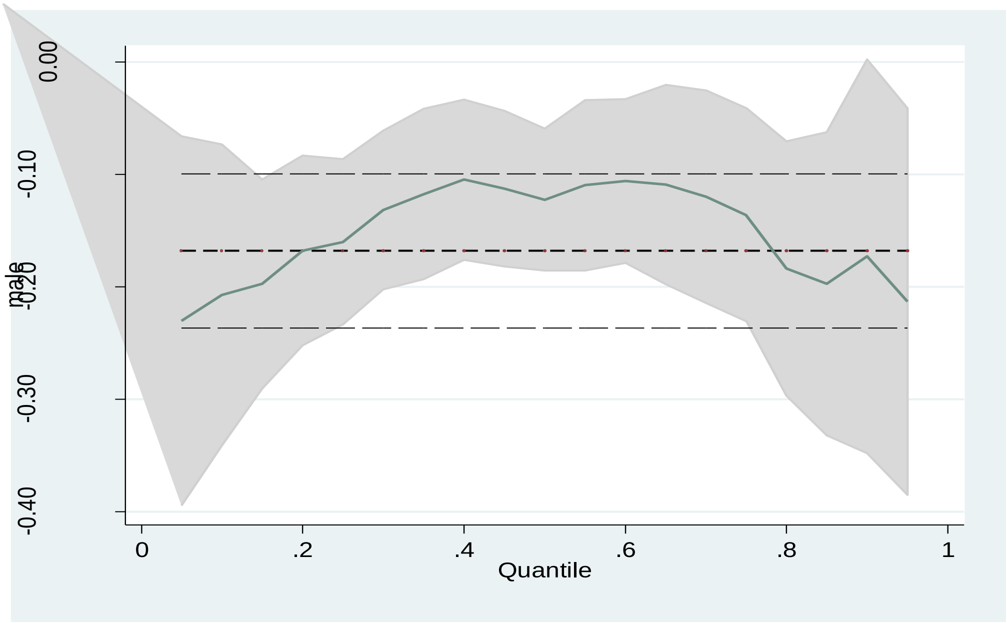


Figure 6: OLS estimate vs quantile estimate in Jordan

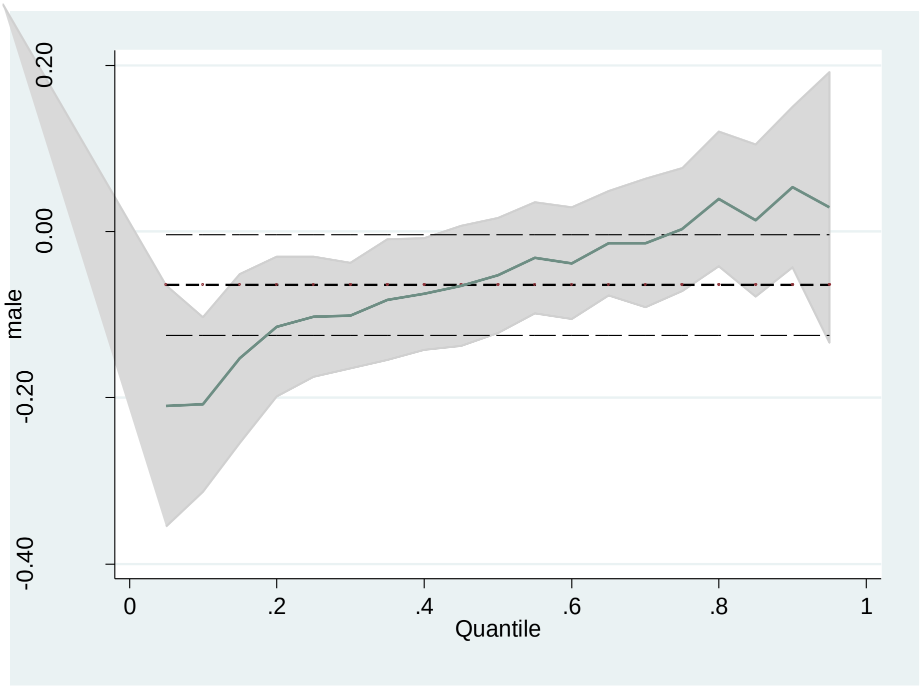


Figure 7: OLS estimate vs quantile estimate in Yemen

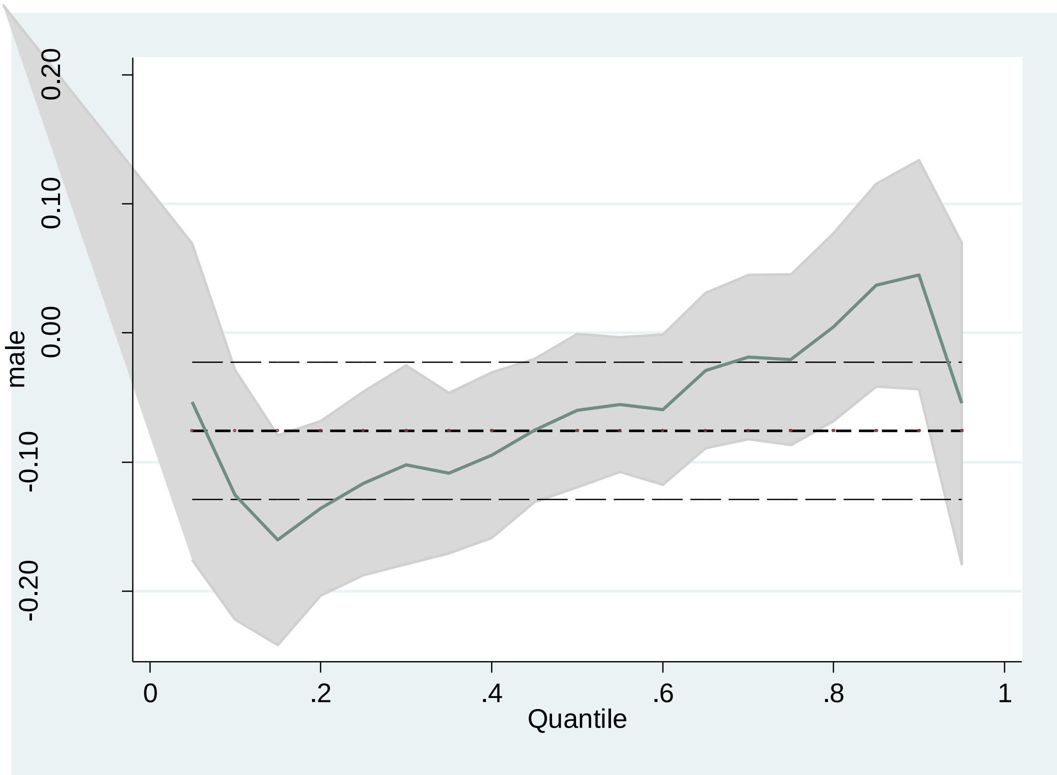


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Table 1. Summary Statistics

Variable	Egypt	Jordan	Yemen	Variable	Egypt	Jordan	Yemen
HAZ	-0.47	-0.468	-1.83	**Mothers' have son preference**			
				Yes	13.26	19.10	21.5
Child sex				No	86.74	80.9	78.5
Males	51.45	51.83	50.76	**Mother is malnourished**			
Females	48.55	48.17	49.24	Yes	0.3	2.2	16
Child age				no	99.7	97.8	84
0	20.36	17.44	20.53	**Access to clean water**			
1	21.69	20.74	20.28	Yes	94.75	56.01	42.92
2	20.85	20.17	20.02	no	5.25	43.99	57.08
3	20.53	20.78	19.43	**Regular healthcare**			
4	16.58	20.87	19.74	Yes	82.66	96.41	50.35
Twin				no	17.34	3.59	49.65
Yes	3.62	3.13	1.54	**Children under 5**			
No	96.38	96.87	98.46	Yes	13.99	24.75	33.68
Size at birth				no	86.01	75.25	66.32
Small	14.73	17.98	30.97	**Risky birth interval**			
Average	82.25	65.44	56.55	Yes	13.40	25.10	22.68
Big	2.74	16.47	11.69	No	86.60	74.90	77.32
Mother's age				**Wealth index**			
15-24	24	14.9	25.48	poorest	18.79	27.01	21.95
25-29	35.85	28.95	30.53	poorer	18.98	26.68	22.50
30-34	23.96	26.76	20.07	middle	20.55	23.36	21.40
35-49	16.19	29.49	23.91	richer	20.43	15.37	19.31
Mother's level of education				richest	21.25	7.58	14.83
No education	17.16	2.76	55.60	**Region of residence**			
Primary	8.45	7.37	32.08	urban	40.11	69.24	22.94
Secondary	58.08	56.68	9.44	rural	59.89	30.76	77.06
Higher	16.31	33.19	2.88	**Mother's employment status**			
				Employed	13.10	16.59	10.83
				Unemployed	86.90	83.41	89.17

All statistics are population weighted using the sampling weights in the DHS.

Table 2. OLS and Quantile regression results for the determinants of child nutritional status (Dependant variable: HAZ) at selected quantiles

	OLS	**Quantile regression estimates**				
		(15)	(25)	(50)	(75)	(90)
	Panel (a) Egypt					
Model (1)						
Male	-0.169***	-0.192***	-0.167***	-0.116***	-0.143***	-0.170*
	(0.0373)	(0.0554)	(0.0412)	(0.0367)	(0.0544)	(0.0905)
Model (2)						
Male	-0.173***	-0.204***	-0.180***	-0.107***	-0.140**	-0.198**
	(0.0396)	(0.0612)	(0.0460)	(0.0400)	(0.0574)	(0.0978)
Male X Son preference	-0.123	-0.0236	-0.0883	-0.153	-0.0948	-0.208
	(0.113)	(0.170)	(0.138)	(0.106)	(0.151)	(0.527)
Model (3)						
Male	-0.213**	-0.359***	-0.250***	-0.181**	-0.134	-0.0617
	(0.0856)	(0.116)	(0.0880)	(0.0768)	(0.123)	(0.216)
Male X Primary	0.0918	0.315	0.140	0.108	0.0396	-0.254
	(0.150)	(0.200)	(0.152)	(0.156)	(0.217)	(0.452)
Male X Secondary	0.0692	0.178	0.0968	0.0780	0.00937	-0.0452
	(0.0956)	(0.138)	(0.100)	(0.0874)	(0.135)	(0.246)
Male X higher	-0.0228	0.160	0.130	0.0580	-0.0951	-0.552*
	(0.126)	(0.176)	(0.153)	(0.124)	(0.172)	(0.306)
	Panel (b) Yemen					
Model (1)						
Male	-0.0742***	-0.161***	-0.113***	-0.0642**	-0.0121	0.0698
	(0.0277)	(0.0455)	(0.0391)	(0.0306)	(0.0344)	(0.0479)
Model (2)						
Male	-0.0984***	-0.175***	-0.156***	-0.0886**	-0.0214	0.0942*
	(0.0322)	(0.0517)	(0.0450)	(0.0345)	(0.0408)	(0.0539)
Male X Son preference	0.0734	0.162	0.226**	0.0258	-0.0672	-0.131
	(0.0728)	(0.117)	(0.0983)	(0.0857)	(0.0918)	(0.142)
Model (3)						
Male	-0.0660*	-0.142**	-0.101*	-0.0757*	-0.00913	0.0728
	(0.0375)	(0.0620)	(0.0530)	(0.0408)	(0.0467)	(0.0722)
Male X Primary	-0.0242	-0.0861	-0.0540	0.0327	-0.0210	0.0239
	(0.0598)	(0.0989)	(0.0829)	(0.0697)	(0.0772)	(0.100)
Male X Secondary	0.0176	0.0729	-0.0360	-0.0106	0.0581	-0.0832
	(0.0920)	(0.127)	(0.132)	(0.0987)	(0.112)	(0.175)
Male X higher	-0.0666	0.0557	0.118	0.0604	-0.153	-0.350
	(0.135)	(0.162)	(0.199)	(0.125)	(0.209)	(0.404)
	Panel (c) Jordan					
Model (1)						

Male	-0.0660**	-0.161***	-0.100**	-0.0511	0.00754	0.0454
	(0.0308)	(0.0474)	(0.0393)	(0.0382)	(0.0402)	(0.0503)
Model (2)						
Male	-0.0765**	-0.178***	-0.115***	-0.0611	-0.0122	0.00953
	(0.0349)	(0.0527)	(0.0422)	(0.0450)	(0.0423)	(0.0521)
Male X Son preference	0.0617	0.0263	0.0473	0.0608	0.0887	0.264*
	(0.0791)	(0.121)	(0.0938)	(0.0921)	(0.0980)	(0.137)
Model (3)						
Male	-0.156	-0.367**	-0.157	-0.116	-0.335	-0.314
	(0.159)	(0.175)	(0.156)	(0.183)	(0.208)	(0.318)
Male X Primary	-0.0751	-0.0772	-0.202	-0.191	0.103	0.282
	(0.199)	(0.255)	(0.245)	(0.227)	(0.267)	(0.379)
Male X Secondary	0.125	0.261	0.110	0.0631	0.362*	0.470
	(0.164)	(0.189)	(0.166)	(0.190)	(0.213)	(0.324)
Male X higher	0.0757	0.210	0.0640	0.117	0.373*	0.232
	(0.167)	(0.190)	(0.169)	(0.195)	(0.218)	(0.329)

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

In all the models, we control for child's age, birth order, size at birth, twin status, mother's age, mother's BMI, mother's employment status, access to clean water, region of residence, risky birth interval, receiving regular health care during pregnancy, household's wealth index, having other children under the age of 5.

Table 3 . OLS and Quantile regression results for the determinants of child nutritional status (Dependant variable: HAZ) at selected quantiles in Egypt (Model 1)

	OLS	Quantile regression estimates				
VARIABLES		(15)	(25)	(50)	(75)	(90)
Male	-0.169***	-0.192***	-0.167***	-0.116***	-0.143***	-0.170*
	(0.0373)	(0.0554)	(0.0412)	(0.0367)	(0.0544)	(0.0905)
Child age	-0.120***	0.0153	-0.0189	-0.0853***	-0.170***	-0.329***
	(0.0152)	(0.0220)	(0.0165)	(0.0151)	(0.0194)	(0.0358)
Birth order	-0.0413**	-0.0392	-0.0330*	-0.0377**	-0.0460*	-0.0682*
	(0.0187)	(0.0251)	(0.0177)	(0.0180)	(0.0268)	(0.0409)
Small	-0.298***	-0.251*	-0.293***	-0.133	-0.403***	-0.329
	(0.110)	(0.145)	(0.111)	(0.0983)	(0.147)	(0.309)
Average	0.0174	0.0803	0.0400	0.181**	-0.0157	-0.172
	(0.102)	(0.137)	(0.108)	(0.0916)	(0.133)	(0.276)
Twin	-0.211*	-0.279**	-0.323***	-0.168	-0.0958	-0.209
	(0.119)	(0.133)	(0.123)	(0.140)	(0.142)	(0.449)
Mother age (15-24)	-0.141**	-0.179**	-0.0843	-0.0862	-0.164**	-0.207
	(0.0553)	(0.0816)	(0.0605)	(0.0572)	(0.0770)	(0.143)
Mother age (30-34)	0.0691	0.143**	0.104*	0.112**	-0.0119	-0.00982
	(0.0512)	(0.0668)	(0.0540)	(0.0499)	(0.0782)	(0.130)
Mother age (35-49)	0.0905	0.100	0.147**	0.0854	0.000410	0.0149
	(0.0692)	(0.0910)	(0.0692)	(0.0650)	(0.0951)	(0.188)
Unemployed	0.174***	0.146	0.161**	0.115*	0.168**	0.295**
	(0.0607)	(0.0971)	(0.0703)	(0.0625)	(0.0757)	(0.126)
Mother’s BMI	0.000139***	0.000188***	0.000167***	0.000151***	7.23e-05	6.43e-05
	(3.77e-05)	(5.23e-05)	(3.91e-05)	(3.90e-05)	(5.22e-05)	(6.46e-05)
Primary	-0.0557	-0.0758	-0.0108	-0.0165	-0.0493	-0.128
	(0.0856)	(0.113)	(0.0926)	(0.0937)	(0.130)	(0.208)
Secondary	0.104	0.242***	0.247***	0.119**	-0.0532	-0.104
	(0.0664)	(0.0828)	(0.0631)	(0.0599)	(0.0976)	(0.153)
Higher	0.224**	0.125	0.236**	0.243***	0.171	0.206
	(0.0918)	(0.110)	(0.0984)	(0.0857)	(0.123)	(0.208)
Risky birth interval	-0.0818	-0.0859	-0.0229	-0.0914*	-0.107	-0.0469
	(0.0512)	(0.0742)	(0.0517)	(0.0523)	(0.0754)	(0.132)
Poorer	0.0186	-0.0154	-0.0506	-0.0200	0.0862	0.259
	(0.0738)	(0.102)	(0.0665)	(0.0672)	(0.0980)	(0.170)
Middle	0.241***	0.142	0.157**	0.192**	0.322***	0.642***
	(0.0832)	(0.112)	(0.0779)	(0.0771)	(0.104)	(0.222)
Richer	0.116	0.0304	0.0361	0.121	0.193	0.478**

	(0.108)	(0.130)	(0.0969)	(0.0993)	(0.136)	(0.239)
Richest	0.00170	0.0270	0.0345	0.0336	0.0214	0.0858
	(0.142)	(0.159)	(0.129)	(0.140)	(0.166)	(0.303)
Rural	-0.0814	0.0853	0.0420	-0.0709	-0.247	-0.231
	(0.115)	(0.115)	(0.107)	(0.111)	(0.152)	(0.206)
Children under 5	0.0662	0.0156	-0.0181	-0.0216	0.107	0.267*
	(0.0672)	(0.0868)	(0.0628)	(0.0660)	(0.0911)	(0.156)
Clean water	-0.102	0.243	0.207	0.00883	-0.369	-0.627**
	(0.173)	(0.150)	(0.128)	(0.239)	(0.258)	(0.278)
Received regular healthcare	0.162***	0.190***	0.190***	0.137**	0.156*	0.214*
	(0.0561)	(0.0736)	(0.0558)	(0.0539)	(0.0809)	(0.126)
Constant	-0.720**	-3.500***	-2.714***	-1.205***	1.153***	3.133***
	(0.297)	(0.316)	(0.261)	(0.353)	(0.443)	(0.479)
Observations	12,980	12,980	12,980	12,980	12,980	12,980

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 4. OLS and Quantile regression results for the determinants of child nutritional status (Dependant variable: HAZ) at selected quantiles in Egypt (Model 2)

	OLS	Quantile regression estimates				
VARIABLES		(15)	(25)	(50)	(75)	(90)
Male	-0.173***	-0.204***	-0.180***	-0.107***	-0.140**	-0.198**
	(0.0396)	(0.0612)	(0.0460)	(0.0400)	(0.0574)	(0.0978)
Son preference	0.212**	0.106	0.174	0.164**	0.198	0.253
	(0.0938)	(0.124)	(0.108)	(0.0789)	(0.131)	(0.508)
Male x son preference	-0.123	-0.0236	-0.0883	-0.153	-0.0948	-0.208
	(0.113)	(0.170)	(0.138)	(0.106)	(0.151)	(0.527)
Child’s age	-0.120***	0.00616	-0.0214	-0.0853***	-0.174***	-0.319***
	(0.0156)	(0.0226)	(0.0172)	(0.0154)	(0.0200)	(0.0415)
Birth order	-0.0370**	-0.0302	-0.0255	-0.0367**	-0.0492*	-0.0780
	(0.0186)	(0.0242)	(0.0190)	(0.0184)	(0.0260)	(0.0479)
Small	-0.295***	-0.335**	-0.338***	-0.127	-0.375***	-0.256
	(0.111)	(0.151)	(0.127)	(0.0966)	(0.143)	(0.331)
Average	0.0251	0.0190	-0.00886	0.180**	0.0103	-0.0782
	(0.101)	(0.137)	(0.125)	(0.0879)	(0.125)	(0.297)
Twin	-0.176	-0.297**	-0.296**	-0.160	-0.0717	0.0157
	(0.124)	(0.147)	(0.125)	(0.150)	(0.126)	(0.355)
a15_24	-0.142**	-0.144*	-0.0847	-0.0957*	-0.207***	-0.237
	(0.0559)	(0.0853)	(0.0635)	(0.0562)	(0.0778)	(0.160)
a30_34	0.0606	0.142**	0.0861	0.108**	0.00115	-0.0142
	(0.0528)	(0.0703)	(0.0581)	(0.0529)	(0.0785)	(0.147)
a35_49	0.0743	0.0780	0.116	0.0679	0.0238	0.0337
	(0.0710)	(0.0872)	(0.0732)	(0.0704)	(0.0953)	(0.207)
Unemployed	0.173***	0.154	0.160**	0.108	0.164**	0.233*
	(0.0624)	(0.103)	(0.0748)	(0.0662)	(0.0814)	(0.123)
Mother’s BMI	0.000161***	0.000217***	0.000182***	0.000169***	8.53e-05**	7.71e-05
	(3.79e-05)	(5.21e-05)	(4.43e-05)	(3.87e-05)	(4.32e-05)	(0.000168)
Primary	-0.0650	-0.0749	-0.00919	-0.0343	-0.0482	-0.193
	(0.0891)	(0.123)	(0.0966)	(0.0907)	(0.140)	(0.217)
Secondary	0.128*	0.277***	0.254***	0.142**	-0.0142	-0.0673
	(0.0665)	(0.0956)	(0.0640)	(0.0601)	(0.102)	(0.153)
Higher	0.240***	0.185	0.238**	0.261***	0.214*	0.178
	(0.0923)	(0.120)	(0.105)	(0.0870)	(0.129)	(0.217)
Risky birth interval	-0.106**	-0.120	-0.0406	-0.128**	-0.136*	-0.0639
	(0.0529)	(0.0771)	(0.0566)	(0.0515)	(0.0731)	(0.159)
Poorer	0.0413	-0.0251	-0.0323	-0.00223	0.102	0.310*
	(0.0755)	(0.114)	(0.0699)	(0.0693)	(0.0970)	(0.182)
Middle	0.263***	0.140	0.146*	0.201***	0.346***	0.676***

	(0.0838)	(0.121)	(0.0779)	(0.0775)	(0.106)	(0.212)
Richer	0.156	0.0231	0.0728	0.135	0.229*	0.545**
	(0.104)	(0.131)	(0.0934)	(0.0947)	(0.131)	(0.241)
Richest	0.0544	0.0174	0.115	0.0589	0.0384	0.171
	(0.136)	(0.164)	(0.130)	(0.133)	(0.163)	(0.279)
Rural	-0.0517	0.0709	0.110	-0.0630	-0.235	-0.165
	(0.113)	(0.111)	(0.110)	(0.105)	(0.152)	(0.201)
Children under 5	0.0438	0.0109	-0.0297	-0.0285	0.102	0.231
	(0.0697)	(0.0970)	(0.0693)	(0.0692)	(0.0948)	(0.192)
Clean water	0.0112	0.369**	0.291*	0.0857	-0.257	-0.517*
	(0.156)	(0.155)	(0.160)	(0.197)	(0.218)	(0.279)
Received regular healthcare	0.174***	0.206***	0.209***	0.135**	0.122	0.261**
	(0.0559)	(0.0778)	(0.0597)	(0.0542)	(0.0793)	(0.131)
Constant	-0.998***	-3.696***	-2.885***	-1.376***	0.954**	2.812***
	(0.275)	(0.325)	(0.288)	(0.313)	(0.372)	(0.639)
Observations	12,396	12,396	12,396	12,396	12,396	12,396

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 5. OLS and Quantile regression results for the determinants of child nutritional status (Dependant variable: HAZ) at selected quantiles in Yemen (Model 1)

	OLS	**Quantile regression estimates**				
VARIABLES		(15)	(25)	(50)	(75)	(90)
Male	-0.0742***	-0.161***	-0.113***	-0.0642**	-0.0121	0.0698
	(0.0277)	(0.0455)	(0.0391)	(0.0306)	(0.0344)	(0.0479)
Age	-0.345***	-0.264***	-0.276***	-0.309***	-0.366***	-0.442***
	(0.0115)	(0.0191)	(0.0155)	(0.0126)	(0.0134)	(0.0187)
Birth order	-0.0398***	-0.0608***	-0.0526***	-0.0379***	-0.0341***	-0.0366**
	(0.00888)	(0.0146)	(0.0117)	(0.00983)	(0.0114)	(0.0152)
Small	-0.402***	-0.400***	-0.390***	-0.386***	-0.359***	-0.339***
	(0.0458)	(0.0632)	(0.0628)	(0.0513)	(0.0642)	(0.0756)
Average	-0.233***	-0.252***	-0.212***	-0.229***	-0.201***	-0.119
	(0.0424)	(0.0588)	(0.0570)	(0.0440)	(0.0586)	(0.0767)
Twin	-0.340**	-0.549***	-0.347	-0.242*	-0.287	-0.204
	(0.147)	(0.168)	(0.260)	(0.135)	(0.184)	(0.127)
a15_24	-0.0853**	-0.154**	-0.135**	-0.0231	-0.0713	-0.0694
	(0.0407)	(0.0699)	(0.0548)	(0.0491)	(0.0487)	(0.0680)
a30_34	0.131***	0.150**	0.133**	0.124***	0.124**	0.155*
	(0.0449)	(0.0646)	(0.0594)	(0.0438)	(0.0613)	(0.0798)
a35_49	0.243***	0.352***	0.280***	0.284***	0.226***	0.205**
	(0.0526)	(0.0788)	(0.0693)	(0.0617)	(0.0664)	(0.0852)
Unemployed	-0.0232	-0.00982	-0.000939	-0.0443	-0.0380	0.0346
	(0.0534)	(0.0829)	(0.0717)	(0.0494)	(0.0630)	(0.0777)
Mother's BMI	0.000118***	3.97e-05	9.28e-05*	8.80e-05***	0.000194***	0.000294***
	(3.66e-05)	(5.56e-05)	(5.45e-05)	(2.88e-05)	(5.38e-05)	(7.15e-05)
Primary	0.120***	0.214***	0.193***	0.112**	0.106**	0.0365
	(0.0389)	(0.0631)	(0.0509)	(0.0443)	(0.0496)	(0.0667)
Secondary	0.189***	0.337***	0.352***	0.175***	0.0862	0.0347
	(0.0543)	(0.0844)	(0.0734)	(0.0563)	(0.0623)	(0.106)
Higher	0.251***	0.515***	0.369***	0.191***	0.0992	0.0642
	(0.0801)	(0.0860)	(0.0999)	(0.0711)	(0.116)	(0.162)
Risky birth interval	-0.256***	-0.285***	-0.326***	-0.263***	-0.242***	-0.205***
	(0.0352)	(0.0493)	(0.0501)	(0.0410)	(0.0458)	(0.0596)
Poorer	0.0377	0.198**	0.0604	0.0588	0.0272	-0.0724
	(0.0542)	(0.0814)	(0.0700)	(0.0620)	(0.0678)	(0.0920)
Middle	0.296***	0.476***	0.329***	0.313***	0.240***	0.133
	(0.0593)	(0.0924)	(0.0768)	(0.0665)	(0.0735)	(0.101)
Richer	0.595***	0.825***	0.706***	0.628***	0.544***	0.404***
	(0.0684)	(0.103)	(0.0829)	(0.0743)	(0.0864)	(0.119)
Richest	0.888***	1.091***	1.005***	0.944***	0.858***	0.702***
	(0.0792)	(0.128)	(0.0962)	(0.0823)	(0.0966)	(0.142)
Rural	0.0582	0.0295	0.100	0.0708	0.0911	0.0984
	(0.0571)	(0.0811)	(0.0668)	(0.0619)	(0.0684)	(0.0980)
Children under	0.0467	0.0387	0.0266	0.0527	0.0703*	0.0583

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	(0.0331)	(0.0500)	(0.0468)	(0.0397)	(0.0425)	(0.0492)
Access to clean water	0.0205	-0.00614	-0.00790	0.0581	0.0285	0.0895
	(0.0389)	(0.0570)	(0.0501)	(0.0421)	(0.0445)	(0.0574)
Received regular healthcare	0.115***	0.139***	0.153***	0.0974***	0.140***	0.0541
	(0.0315)	(0.0508)	(0.0428)	(0.0365)	(0.0419)	(0.0556)
Constant	-1.462***	-2.988***	-2.566***	-1.533***	-0.767***	0.0410
	(0.128)	(0.187)	(0.174)	(0.119)	(0.167)	(0.228)
Observations	12,289	12,289	12,289	12,289	12,289	12,289

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 6. OLS and Quantile regression results for the determinants of child nutritional status (Dependant variable: HAZ) at selected quantiles in Yemen (Model 2)

	OLS	**Quantile regression estimates**				
VARIABLES		(15)	(25)	(50)	(75)	(90)
Male	-0.0984***	-0.175***	-0.156***	-0.0886**	-0.0214	0.0942*
	(0.0322)	(0.0517)	(0.0450)	(0.0345)	(0.0408)	(0.0539)
Son preference	-0.00132	-0.143	-0.115*	0.0177	0.0679	0.156
	(0.0546)	(0.0886)	(0.0674)	(0.0653)	(0.0679)	(0.114)
Male x son preference	0.0734	0.162	0.226**	0.0258	-0.0672	-0.131
	(0.0728)	(0.117)	(0.0983)	(0.0857)	(0.0918)	(0.142)
Child Age	-0.349***	-0.273***	-0.279***	-0.317***	-0.370***	-0.447***
	(0.0118)	(0.0192)	(0.0165)	(0.0134)	(0.0145)	(0.0188)
Birth order	-0.0448***	-0.0640***	-0.0568***	-0.0431***	-0.0358***	-0.0489***
	(0.00930)	(0.0142)	(0.0135)	(0.00992)	(0.0112)	(0.0169)
Small	-0.401***	-0.432***	-0.391***	-0.370***	-0.366***	-0.349***
	(0.0488)	(0.0693)	(0.0658)	(0.0526)	(0.0689)	(0.0858)
Average	-0.223***	-0.254***	-0.183***	-0.218***	-0.208***	-0.137
	(0.0447)	(0.0620)	(0.0594)	(0.0468)	(0.0627)	(0.0848)
Twin	-0.339**	-0.534**	-0.371	-0.227	-0.286	-0.147
	(0.157)	(0.215)	(0.293)	(0.166)	(0.183)	(0.172)
Age (15-24)	-0.0841**	-0.161**	-0.143**	-0.0316	-0.0440	-0.0796
	(0.0422)	(0.0696)	(0.0578)	(0.0502)	(0.0512)	(0.0697)
Age (30-34)	0.135***	0.163**	0.129**	0.131***	0.0941	0.165**
	(0.0468)	(0.0673)	(0.0603)	(0.0462)	(0.0653)	(0.0826)
Age (35-49)	0.241***	0.369***	0.290***	0.278***	0.215***	0.219**
	(0.0544)	(0.0820)	(0.0818)	(0.0663)	(0.0706)	(0.0951)
Unemployed	-0.0579	-0.0137	-0.0430	-0.0862	-0.0903	0.00136
	(0.0569)	(0.0931)	(0.0803)	(0.0539)	(0.0632)	(0.0788)
Mother’s BMI	0.000106***	1.40e-05	8.06e-05	9.76e-05***	0.000182***	0.000273***
	(4.00e-05)	(5.10e-05)	(5.83e-05)	(3.45e-05)	(4.30e-05)	(7.78e-05)
Primary	0.112***	0.202***	0.207***	0.121***	0.0921*	0.00598
	(0.0405)	(0.0654)	(0.0541)	(0.0469)	(0.0532)	(0.0730)
Secondary	0.169***	0.325***	0.347***	0.163***	0.0703	-0.0193
	(0.0565)	(0.0858)	(0.0724)	(0.0593)	(0.0677)	(0.102)
Higher	0.236***	0.524***	0.368***	0.227***	0.0528	0.0245
	(0.0803)	(0.0888)	(0.103)	(0.0766)	(0.112)	(0.180)
Risky birth interval	-0.243***	-0.271***	-0.287***	-0.234***	-0.223***	-0.202***
	(0.0371)	(0.0513)	(0.0540)	(0.0443)	(0.0470)	(0.0626)
Poorer	0.0330	0.197**	0.0883	0.0474	0.00605	-0.103
	(0.0575)	(0.0865)	(0.0741)	(0.0657)	(0.0705)	(0.102)

Middle	0.290***	0.479***	0.339***	0.297***	0.242***	0.134
	(0.0627)	(0.0950)	(0.0826)	(0.0713)	(0.0781)	(0.107)
Richer	0.611***	0.876***	0.740***	0.646***	0.535***	0.408***
	(0.0708)	(0.103)	(0.0899)	(0.0787)	(0.0876)	(0.122)
Richest	0.906***	1.118***	1.015***	0.951***	0.868***	0.719***
	(0.0839)	(0.129)	(0.105)	(0.0887)	(0.103)	(0.152)
Rural	0.0685	0.0607	0.105	0.0890	0.0808	0.108
	(0.0580)	(0.0814)	(0.0712)	(0.0641)	(0.0715)	(0.0996)
Children under 5	0.0396	0.0277	0.0245	0.0391	0.0341	0.0569
	(0.0338)	(0.0522)	(0.0505)	(0.0415)	(0.0423)	(0.0534)
Clean water	0.0128	-0.0209	-0.0185	0.0511	0.0311	0.0613
	(0.0398)	(0.0581)	(0.0512)	(0.0433)	(0.0477)	(0.0594)
Received regular healthcare	0.119***	0.150***	0.164***	0.104***	0.143***	0.0552
	(0.0327)	(0.0504)	(0.0460)	(0.0370)	(0.0446)	(0.0580)
Constant	-1.401***	-2.908***	-2.511***	-1.517***	-0.657***	0.152
	(0.136)	(0.177)	(0.193)	(0.129)	(0.156)	(0.255)
Observations	11,100	11,100	11,100	11,100	11,100	11,100

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 7. OLS and Quantile regression results for the determinants of child nutritional status (Dependant variable: HAZ) at selected quantiles in Jordan (Model 1)

	OLS	Quantile regression estimates				
VARIABLES		(15)	(25)	(50)	(75)	(90)
Male	-0.0660**	-0.161***	-0.100**	-0.0511	0.00754	0.0454
	(0.0308)	(0.0474)	(0.0393)	(0.0382)	(0.0402)	(0.0503)
Child age	-0.110***	-0.00417	-0.0505***	-0.104***	-0.153***	-0.192***
	(0.0113)	(0.0188)	(0.0149)	(0.0139)	(0.0149)	(0.0174)
Birth order	-0.0152	-0.0147	-0.0346**	-0.0357***	-0.0322**	-0.0134
	(0.0118)	(0.0163)	(0.0142)	(0.0136)	(0.0145)	(0.0173)
Small	-0.665***	-0.731***	-0.649***	-0.650***	-0.650***	-0.674***
	(0.0547)	(0.0861)	(0.0714)	(0.0650)	(0.0725)	(0.0996)
Average	-0.237***	-0.207***	-0.195***	-0.279***	-0.232***	-0.268***
	(0.0425)	(0.0578)	(0.0488)	(0.0520)	(0.0519)	(0.0887)
Twin	-0.168	-0.308*	-0.254	-0.0888	0.0230	-0.0318
	(0.136)	(0.164)	(0.322)	(0.169)	(0.140)	(0.183)
a15_24	0.100*	0.0875	0.0559	0.0587	0.0993	0.0823
	(0.0557)	(0.0847)	(0.0790)	(0.0665)	(0.0699)	(0.0801)
a30_34	0.0163	-0.0207	0.0143	0.0135	0.000209	0.0960
	(0.0494)	(0.0706)	(0.0563)	(0.0565)	(0.0598)	(0.0815)
a35_49	0.0950	0.0796	0.172**	0.147**	0.113*	0.103
	(0.0577)	(0.0946)	(0.0714)	(0.0635)	(0.0686)	(0.0912)
Unemployed	0.0273	0.0320	0.0632	0.00639	0.0785	0.0797
	(0.0528)	(0.0686)	(0.0782)	(0.0577)	(0.0625)	(0.0713)
Mother's BMI	-2.60e-06	9.10e-06	2.03e-05	6.60e-06	2.76e-05	7.90e-08
	(3.53e-05)	(4.19e-05)	(4.53e-05)	(3.66e-05)	(3.11e-05)	(4.89e-05)
Primary	0.0114	-0.165	0.0592	0.0898	0.154	0.0561
	(0.109)	(0.143)	(0.121)	(0.107)	(0.164)	(0.260)
Secondary	0.185**	0.0493	0.185**	0.280***	0.272**	0.147
	(0.0901)	(0.115)	(0.0881)	(0.0908)	(0.139)	(0.255)
Higher	0.388***	0.177	0.324***	0.439***	0.522***	0.433*
	(0.0991)	(0.139)	(0.102)	(0.102)	(0.146)	(0.262)
Risky birth interval	-0.147***	-0.122**	-0.0703	-0.0864**	-0.133***	-0.205***
	(0.0359)	(0.0601)	(0.0450)	(0.0405)	(0.0453)	(0.0553)
Poorer	0.172***	0.205***	0.219***	0.0774	0.121*	0.172**
	(0.0492)	(0.0709)	(0.0666)	(0.0528)	(0.0657)	(0.0757)
Middle	0.191***	0.262***	0.264***	0.109*	0.137**	0.145*
	(0.0522)	(0.0765)	(0.0650)	(0.0613)	(0.0655)	(0.0766)
Richer	0.303***	0.396***	0.421***	0.262***	0.198**	0.266**
	(0.0638)	(0.104)	(0.0737)	(0.0693)	(0.0799)	(0.107)
Richest	0.504***	0.574***	0.628***	0.519***	0.410***	0.434***
	(0.0741)	(0.120)	(0.104)	(0.0787)	(0.0933)	(0.157)

Rural	-0.135***	-0.160***	-0.148***	-0.113**	-0.104**	-0.0773
	(0.0413)	(0.0535)	(0.0514)	(0.0479)	(0.0454)	(0.0605)
Children under 5	-0.0346	-0.0566	-0.0236	-0.0381	-0.0530	0.0346
	(0.0444)	(0.0605)	(0.0644)	(0.0485)	(0.0574)	(0.0728)
Clean water	-0.0613*	-0.0933*	-0.0608	-0.0582	-0.00897	-0.0427
	(0.0361)	(0.0523)	(0.0461)	(0.0413)	(0.0463)	(0.0625)
Received regular healthcare	0.182**	0.168	0.121	0.204**	0.322***	0.349*
	(0.0822)	(0.156)	(0.107)	(0.103)	(0.105)	(0.182)
Constant	-0.405**	-1.545***	-1.290***	-0.421**	0.0398	0.824**
	(0.172)	(0.252)	(0.200)	(0.194)	(0.209)	(0.379)
Observations	5,665	5,665	5,665	5,665	5,665	5,665

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 8. OLS and Quantile regression results for the determinants of child nutritional status (Dependant variable: HAZ) at selected quantiles in Jordan (Model 2)

	OLS	Quantile regression estimates				
VARIABLES		(15)	(25)	(50)	(75)	(90)
Male	-0.0765**	-0.178***	-0.115***	-0.0611	-0.0122	0.00953
	(0.0349)	(0.0527)	(0.0422)	(0.0450)	(0.0423)	(0.0521)
Son preference	-0.0286	0.0966	0.0880	-0.0361	-0.0413	-0.134
	(0.0580)	(0.0872)	(0.0699)	(0.0682)	(0.0702)	(0.0943)
Male x son preference	0.0617	0.0263	0.0473	0.0608	0.0887	0.264*
	(0.0791)	(0.121)	(0.0938)	(0.0921)	(0.0980)	(0.137)
Child age	-0.112***	-0.00797	-0.0492***	-0.106***	-0.155***	-0.191***
	(0.0115)	(0.0191)	(0.0150)	(0.0144)	(0.0152)	(0.0174)
Birth order	-0.0175	-0.0163	-0.0313**	-0.0373**	-0.0328**	-0.0248
	(0.0117)	(0.0172)	(0.0129)	(0.0146)	(0.0133)	(0.0176)
Small	-0.669***	-0.717***	-0.646***	-0.657***	-0.671***	-0.686***
	(0.0557)	(0.0883)	(0.0684)	(0.0670)	(0.0712)	(0.0896)
Average	-0.237***	-0.205***	-0.179***	-0.281***	-0.242***	-0.274***
	(0.0430)	(0.0584)	(0.0483)	(0.0526)	(0.0527)	(0.0713)
Twin	-0.154	-0.337**	-0.223	-0.0984	0.0860	0.0495
	(0.139)	(0.152)	(0.279)	(0.153)	(0.112)	(0.165)
a15_24	0.101*	0.103	0.0786	0.0607	0.0917	0.0960
	(0.0556)	(0.0822)	(0.0698)	(0.0662)	(0.0706)	(0.0826)
a30_34	0.0142	-0.0203	0.00773	0.0157	0.0120	0.144*
	(0.0501)	(0.0724)	(0.0554)	(0.0573)	(0.0602)	(0.0737)
a35_49	0.0985*	0.109	0.168**	0.145**	0.104	0.142*
	(0.0577)	(0.0907)	(0.0689)	(0.0667)	(0.0661)	(0.0850)
Unemployed	0.0174	0.000727	0.0393	0.00140	0.0679	0.109
	(0.0534)	(0.0690)	(0.0715)	(0.0592)	(0.0637)	(0.0679)
Mother's BMI	-2.25e-07	-8.09e-06	1.21e-05	1.65e-06	2.62e-05	-1.58e-05
	(3.59e-05)	(4.18e-05)	(4.21e-05)	(3.74e-05)	(3.05e-05)	(4.47e-05)
Primary	0.0230	-0.170	0.0973	0.138	0.254*	0.198
	(0.110)	(0.115)	(0.120)	(0.111)	(0.139)	(0.280)
Secondary	0.184**	0.0405	0.222***	0.289***	0.367***	0.290
	(0.0887)	(0.0979)	(0.0842)	(0.0961)	(0.119)	(0.261)
Higher	0.386***	0.160	0.376***	0.449***	0.609***	0.582**
	(0.0980)	(0.122)	(0.0961)	(0.105)	(0.127)	(0.260)
Risky birth interval	-0.146***	-0.115*	-0.0811*	-0.100**	-0.138***	-0.205***
	(0.0365)	(0.0611)	(0.0429)	(0.0401)	(0.0456)	(0.0498)
Poorer	0.174***	0.211***	0.216***	0.0771	0.128*	0.201***
	(0.0503)	(0.0732)	(0.0646)	(0.0543)	(0.0662)	(0.0766)
Middle	0.191***	0.283***	0.251***	0.102*	0.135**	0.153**

	(0.0527)	(0.0745)	(0.0636)	(0.0610)	(0.0655)	(0.0771)
Richer	0.303***	0.384***	0.405***	0.263***	0.210**	0.264***
	(0.0649)	(0.0985)	(0.0693)	(0.0702)	(0.0824)	(0.100)
Richest	0.492***	0.542***	0.623***	0.495***	0.433***	0.411***
	(0.0757)	(0.132)	(0.101)	(0.0806)	(0.0996)	(0.121)
Rural	-0.128***	-0.155***	-0.150***	-0.104**	-0.0910**	-0.0943*
	(0.0417)	(0.0566)	(0.0489)	(0.0485)	(0.0437)	(0.0546)
Children under 5	-0.0330	-0.0446	-0.00655	-0.0268	-0.0448	0.0373
	(0.0449)	(0.0615)	(0.0594)	(0.0490)	(0.0574)	(0.0682)
Clean water	-0.0526	-0.0992*	-0.0524	-0.0509	0.0102	-0.0265
	(0.0367)	(0.0533)	(0.0466)	(0.0422)	(0.0479)	(0.0608)
Received regular healthcare	0.150*	0.0737	0.136	0.206**	0.276**	0.250
	(0.0796)	(0.0970)	(0.0925)	(0.0989)	(0.117)	(0.162)
Constant	-0.357**	-1.385***	-1.331***	-0.397**	0.0143	0.815**
	(0.168)	(0.202)	(0.186)	(0.202)	(0.198)	(0.368)
Observations	5,513	5,513	5,513	5,513	5,513	5,513

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

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