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Opportunities for Early Childhood Development in Arab Countries: Profile and Evolution of Inequality and its Sources

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Abstract

High inequality of opportunity is a major social challenge in the Arab region. This study evaluates opportunities for early childhood development (ECD) using a number of indicators for mothers' care during pregnancy and child delivery, as well as children's access to minimum nutrition, health, parental care and cognitive developmental activities, in twenty standardized national surveys from fourteen countries. We find that children in most of the included Arab countries receive inadequate access to quality prenatal and delivery care, many fail to be properly vaccinated or receive adequate supply of iodine. In part due to these shortfalls, many children become stunted and underweight, or die before reaching their first birthday. Particularly significant deficiencies exist in children's access to cognitive development, namely enrolment in nurseries and pre-school programs, cognitive stimulation at home, violent disciplining and exploitation of children for housework. Opportunities for children's development are limited in Iraq, Mauritania, Morocco, Somalia and Sudan, with Somalia being a distant outlier. Within countries, disparities exist in children's access to ECD opportunities across households from different wealth strata, regions and educational backgrounds, particularly for mothers' access to qualified physicians, and children's access to nursery and pre-school education.

Over time, children's opportunities are improving across countries and dimensions of ECD, but the improvement is uneven. Immunization, iodine intake and children's stunting have worsened in many countries. Djibouti and Morocco have seen deterioration in many aspects of ECD. Finally, within-country inequality in opportunities is falling across many ECD indicators and countries, but these improvements have also been uneven. Inequality in child mortality, enrolment in preschool programs, engagement in developmental activities at home, violent disciplining of children, and exploitation of children for housework has worsened. Indeed, Algeria, Djibouti, Morocco, Iraq and Palestine have seen deteriorating inequality across many dimensions of ECD.

In light of these findings, local and national policy should target ease of access to health facilities and pre-school programs in order to promote fair access to ECD for everyone. International organizations should further coordinate better targeted support for disadvantaged families and proper investment in medical and educational infrastructure.

Keywords: Equality of opportunity; Early childhood development; Arab region; Middle East and North Africa; Human Opportunity Index

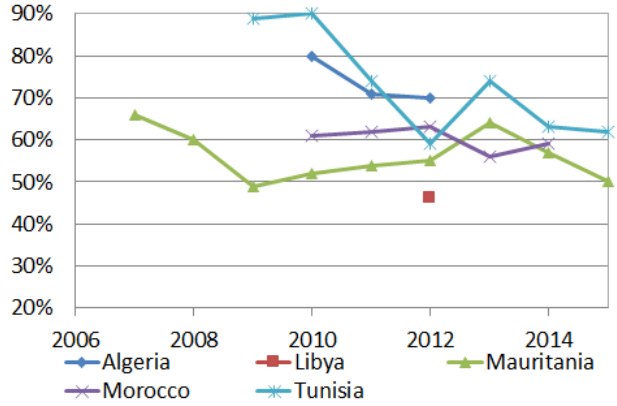
JEL Classification: D63, I14, I24, I32, J13, N35

I. Introduction

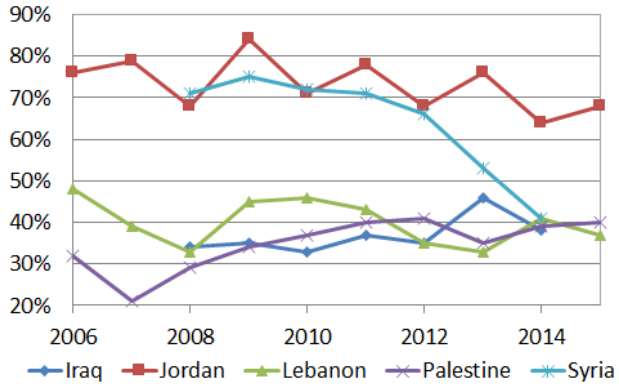
It is well established that the Arab region has been able to attain an unprecedented drop in child mortality rates over the last four decades plausibly due to sizable budget allocation, urbanization, and improvements in education. Moreover, the levels of child undernourishment are relatively low probably due to a widespread system of subsidized food (Iqbal and Kiendrebeogo, 2015).

Despite these remarkable achievements, inequality of opportunity for social mobility in the Arab region has recently received substantial attention from international organizations, particularly after the recent wave of Arab uprisings. For instance, Bibi and Nabli (2009) describe substantial spatial inequality in education and health within Arab countries, and their effects on inequality in economic outcomes.[1] Salehi-Isfahani et al. (2014), Hashemi and Intini (2015), and Peragine et al. (2015) confirmed the existence of high inequality of opportunity in terms of education, particularly due to household and regional differences. Boutayeb and Helmert (2011) identified persisting and even increasing inequality of human development opportunities across regions and across the urban-rural dimension. A number of studies observed that food insecurity and child malnourishment have been falling for decades before ticking up in the early 2000s (Tabutin and Schoumaker 2005; Breisinger et al. 2012; Kuhn 2012). Perception on the ground in most Arab countries is that children do not have adequate opportunities to learn and grow. Fewer than two-thirds of survey respondents, with a notable exception of Jordan, think that most children have adequate opportunities. The situation further deteriorated in 2010 in many countries including Algeria, Egypt, Jordan, Sudan, Syria, Tunisia and Yemen (refer to figure 1).

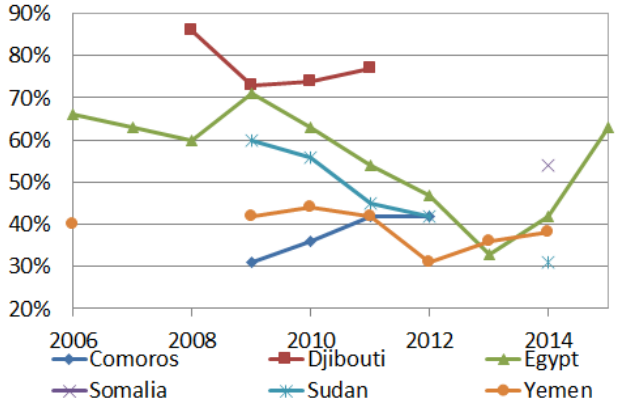
Figure 1. Perception that most children in the area have the opportunity to learn and grow every day, Arab countries 2006–2015 (% of respondents)



i. Maghreb region



ii. Mashreq region



iii. Red Sea region & Southeast Africa

Source: Authors' analysis of Gallup Analytics data.

[1] Studies of inequality in economic outcomes in the Arab region are more numerous. Belhaj-Hassine (2012), using the 2006 wave of the Egyptian panel survey, confirmed the existence of dissimilarity in earnings across households with different educational achievement and occupation of parents, region of birth and gender.

Consequences of entrenched inequality across social groups may be remarkable, as it may lead to poverty traps, social tensions and even open conflict (Stewart and Langer 2007; Kabeer 2010). Ncube and Anyanwu (2012) document the various manifestations of socio-economic inequality in Arab countries that might have contributed to triggering the recent regional uprisings. Looking forward, they emphasize improving access to education and other development opportunities, through regulatory change, non-distortionary redistribution, micro-financing, and improving conditions for entrepreneurship.

Inequality in early childhood development (ECD) has received more attention lately as ECD has been increasingly considered as the most critical stage in today and tomorrow's human development given that ECD directly influences both short- and long-term cognitive, behavioral, emotional, motor, and learning skills, in addition to one's physical and mental health (Grantham-McGregor et al., 2007; Shonkoff and Garner, 2012). "Improvements in basic human development can alter the shape of the human life course, creating entirely new patterns of human capital formation, savings, and time use" (Kuhn 2012:653). In Jordan, Krafft (2015) found that a large share of children's health is determined at the prenatal stage, during the fetal growth and is reinforced in the post-natal stage. In the post-natal stage, public pre-primary education has a large impact in reducing earnings inequality (Checchi and van de Werfhorst, 2014) and can help increase Arab mothers' labor force participation (Schlosser, 2005) as well as secondary enrollment and future income flows (Krafft, 2011). Child stunting is related to a sizable decrease in income in adult stage, while lack of iodized food is the most common cause of mental deficiency worldwide (Grantham-McGregor et al., 2007; Molina, 2012). Indeed, early childhood is probably the only stage in human life when economic efficiency and equity considerations in policy interventions need not be traded off, but actually are mutually reinforcing (Heckman and Masterov, 2007; El-Kogali and Krafft, 2015).

This study evaluates opportunities for ECD in fourteen Arab countries, namely Algeria, Comoros, Djibouti, Egypt, Iraq, Jordan, Mauritania, Morocco, Palestine, Somalia, Sudan, Syria, Tunisia and Yemen. For most countries, information is available for multiple years, allowing evaluation of trends in access rates and inequality over time. Early childhood development is evaluated using a number of indicators for qualified care for mothers during pregnancy and child delivery, as well as children's access to minimum nutrition, health, parental care and developmental activities. These can be broadly classified as related to children's health, nutrition and engagement in cognitive developmental activities, in agreement with the coverage of basic opportunities in the World Bank's Human Opportunity Index (HOI) and a component of the definition of human development in the United Nations' Human Development Index. The evaluation of children's nutrition also falls under the United Nations' mandate of monitoring food security, specifically including access, usage and stability of food supply at the household level.

The state of opportunities for ECD is evaluated across the Arab region as well as across demographic groups within each country. Inequality in access to ECD is measured across households with different socio-economic backgrounds to identify the most advantaged and the least advantaged households according to multiple criteria, and to quantify the degree of inequality in access to developmental opportunities. The overall inequality is decomposed by its

various sources to estimate the role of individual drivers of inequality in ECD opportunities in each country.

The study starts by reviewing prevalence of various ECD opportunities across the Arab countries, to identify countries where children typically have greater or poorer opportunities for healthy growth and development. We then evaluate the prevalence of ECD opportunities among the poorest versus the wealthiest one-fifth of households, taking household wealth as a summary measure of families' socio-economic status thought to affect children's access to ECD opportunities. Next we evaluate multiple determinants of children's access to ECD opportunities using multiple regression analysis. We identify the most advantaged and the least advantaged households according to their values of the various socio-economic variables, and impute the inequality in access to ECD between the most advantaged and the least advantaged households using estimated regression coefficients. Finally, we estimate the degree of *dissimilarity* in the prevalence of various ECD activities across households with different socio-economic characteristics, and decompose this dissimilarity according to the contributions of individual socio-economic factors. This method follows the measurement of the HOI and the dissimilarity index, which measure children's access to basic health, nutrition and developmental services, and penalize it by unequal opportunities in that access across households in different circumstance groups. Reliance on the dissimilarity index will serve to verify to what extent household wealth is an appropriate summary measure of children's access to ECD opportunities.

This report aims to expand on the geographic and historical coverage of a study of ECD opportunities in a recent book by El-Kogali and Krafft (2015), and to comment on development in children's access to ECD over time.[2] El-Kogali & Krafft found that the state of ECD opportunities is low in the Arab region relative to most world regions across all dimensions measured. Poor access to health, nutrition deficiency and low engagement in preschool developmental activities are significant components of that problem. This report follows the definition and selection of variables, estimation method, as well as presentation of results in El-Kogali and Krafft's book in order to facilitate comparison of results across the two studies. The evaluation of a larger updated set of surveys, the application of El-Kogali and Krafft's methods to them, and the derivation of additional detailed ECD indicators represent the original contributions of our study. Moreover, whereas El-Kogali and Krafft described the state of ECD opportunities across the region vis-à-vis that in the rest of the world, we place emphasis on inequality in ECD opportunities within countries. Finally, by combining country-level results across multiple survey waves, including waves evaluated by El-Kogali and Krafft, this study identifies additional patterns regarding evolution of ECD opportunities in the Arab region across recent years.

The study is organized as follows. Section II summarizes the available data and contrasts the collection of national surveys to that in El-Kogali and Krafft's book. Section III briefly outlines methods used in estimation. Sections IV and V report, in turn, on the comparison of results across countries and across socio-economic groups, and on intertemporal comparison for individual countries. Finally, section VI concludes with major findings and their policy implications.

[2] We have benefited from receiving access to El-Kogali and Krafft's statistical programs, for which we are grateful.

II. Description of Data

This study relies on a set of twenty standardized population and health surveys from fourteen Arab countries, namely: Algeria (2006), Comoros (2012), Djibouti (2006), Egypt (2005 and 2014), Iraq (2006), Jordan (2007 and 2009), Mauritania (2007), Morocco (2006 and 2011), Palestine (2004, 2006, 2010 and 2014), Somalia (2006), Sudan (2006), Syria (2006), Tunisia (2006) and Yemen (2013). Compared to El-Kogali and Krafft (2015), these surveys add up to a wider dataset, across both space and time (refer to Appendix 1, Table A1), giving us an opportunity to study differences in detailed ECD indicators over time as well as across the Arab region both before and after the upheavals of the Arab Spring.

These surveys are taken from the UNICEF-coordinated Multiple Indicator Cluster Surveys (MICS), the USAID-coordinated Demographic and Health Surveys (DHS) and the Pan-Arab Project for Family Health (PAPFAM) Surveys. These surveys are partially harmonized among themselves, and in fact surveys in some countries have been conducted by MICS and PAPFAM jointly. The surveys cover a variety of indicators of the living conditions, education, health, nutrition and some time-use of national population, with emphasis on the living conditions of children and their mothers. These surveys are thus ideal for the study of physical and cognitive development of newborns and young children. The following section describes in detail the variables utilized.

Variables of interest

ECD indicators evaluated in this report fall under three broad categories: children's access to health, nutrition and a variety of pre-school cognitive-development activities. These indicators are selected in agreement with the principles underlying the HOI that essential health services, sufficient nutrition and adequate-quality primary education are basic human rights that should be available to all children without exception.

Health indicators include mothers' prenatal care and child delivery by a trained attendant; adequate health-center visits during pregnancy; full immunization by age one, and neonatal and infant mortality. Nutrition indicators include children's access to iodized salt at home, and children's anthropometric status. Iodine is a fundamental element, adequate doses of which are important for the development and functioning of children's nervous system. Children's anthropometric status including stunting (low height for age), underweight (low weight for age) and wastage (low weight for height) are important outputs of food supply in early childhood. These are commonly used indicators of children's nutrition and balanced diet, and are available in many household demographic surveys. Children's height for age, weight for age, and weight for height can be analyzed across cohorts of children, at different ages, to gauge stability of food supply. Access to cognitive-development activities in the early childhood is viewed as crucial to leading children to higher education and lifetime achievement. It is measured using children's enrolment in institutional pre-primary education; parental rearing and engagement in a variety of developmental interactions with family members; suffering of violent disciplining at home; and forced engagement in domestic chores or other work.

Specifically, for prenatal and child-delivery care, only health checkups performed by doctors, trained nurses or qualified midwives are accepted as adequate. Four or more visits to a qualified physician or health care center during pregnancy is taken as an adequate rate of prenatal visits. This is evaluated among women who gave birth in the past two years, ensuring accurate recollection. Full immunization entails vaccination for all six preventable child diseases, namely tuberculosis, diphtheria, whooping cough, tetanus, polio and measles. These are covered by vaccinations for Bacillus Calmette-Guérin (BCG), three subsequent vaccinations for diphtheria, pertussis and tetanus (DPT), three subsequent vaccinations for polio, and vaccination for measles. These vaccinations must be undertaken in the first year of children's life. To ensure accurate recollection by mothers, this variable is evaluated only among children between the ages of 12 and 24 months.

Neonatal mortality is death rate within the first month of life, while infant mortality is death rate within the first year of life. Stunting (underweight and wastage, respectively) are the conditions of having a height-for-age (weight-for-age and weight-for-height) ratio lower than the median in the reference healthy population by two standard deviations or more. Stunting, underweight and wastage, as well as the corresponding *anthropometric* ratios – in *z*-scores or standard deviations relative to the reference healthy population – are evaluated over time to track children's development from birth to five years of age. Iodization of household salt of fifteen parts per million or more (15+ ppm) is taken as adequate in households with children aged four years or less.

This study follows El-Kogali and Krafft (2015) at distinguishing children's attendance of pre-school educational programs at the ages of 3–4 years (early childhood care and education, ECCE), and at the ages of 5–6 (early childhood education, ECE). Among developmental activities at home, various interactive and play activities are considered. Specifically, this study includes the engagement of parents or other persons in the household in reading books, singing or telling stories to children, playing indoors or outside, looking at picture books and naming objects, or spending time with children in other ways. These activities all help children's cognitive growth and learning. The engagement in four or more of these activities in the past three days is taken as adequate for 3–4 year-old children.

Violent disciplining entails ever abusing a 2–5 year old child verbally or physically, causing emotional or physical harm.[3] Finally, child labor is taken here to entail work for a family member or someone outside the home regardless whether for pay or not, fetching of wood or water, or other business and domestic household chores within the past week (regardless of the number of hours involved). To ensure comparability across children, this variable is evaluated only among five-year old children.

Among explanatory variables, we account for households' wealth, achievement of various levels of education by mothers, by their partners (or children's fathers) or by household heads,

[3] An affirmative response to any of the following statements is taken as evidence of violent disciplining: shaking a child; shouting, yelling or screaming at a child; spanking, hitting or slapping a child on bottom with bare hand; hitting a child on the bottom or elsewhere with a belt, brush, stick, or another instrument; calling a child dumb, lazy or another name; hitting or slapping a child on the face, head or ears; hitting or slapping a child on the hand, arm or leg; beating a child up as hard as one could.

household's residence in rural versus urban areas, residence in individual administrative regions (typically governorates), and sex of the child and of the household head. Wealth is defined by the quintile among the universe of all households into which a household falls in terms of the asset index of durable goods. In most of the included surveys, household wealth and the corresponding quintile are already imputed by survey administrators; only in the case of Djibouti we had to perform the imputation ourselves using principal component analysis of households' ownership of durable goods (McKenzie, 2005).

All explanatory variables are transformed into sets of mutually-exclusive binary variables. These variables, in their binary form, are used to clearly distinguish children and households living in different circumstances. These variables also help to demarcate the least versus the most advantaged households in regard to each ECD indicator. The corresponding coefficients estimated in probit regressions are used to quantify the contribution of each explanatory variable to the prevalence of ECD opportunities at different types of households, and to quantify the cumulative degree of inequality in ECD opportunities between the least and the most advantaged households.

In particular, the least advantaged households are those where the woman and her partner have received no formal education, in the bottom wealth quintile, in rural areas and in the country's most impoverished administrative region. Additionally, in models explaining ECD opportunities of live children, female children are taken to be less advantaged, due to possible discrimination by family members or others.[4] Finally, in addition, in models explaining iodization of salt, households with female heads are taken to be less advantaged. In models explaining other ECD opportunities, sex of the household head is accounted for but is not used as a criterion for demarcating the least and the most advantaged households. Women who are household heads are arguably more in control of their prenatal-health and child-health activities, even if they are less economically empowered and less able to purchase higher-quality food products such as iodized salt.[5]

III. Note on Methodology

Applying a method initially proposed by Roemer (1998), and following the approach taken by El-Kogali and Krafft (2015), we use multivariate regressions to estimate the effects of various household circumstances on children's opportunity for early childhood development. Child *i*'s access to a particular dimension of early childhood development y_i can be written as $E(y_i|x_i) = f(x_i, \beta)$, where $f(\cdot)$ is an appropriate parametric function. For continuous outcome variables (anthropometric ratios), linear functional form is used, $y_i = x_i\beta+\varepsilon_i$, which is estimable by the ordinary least squares method. Here ε_i accounts for latent factors including the child caretakers' efforts and luck. For binary outcome variables (the remaining indicators), this linear functional

[4] According to Hoyos and Narayan (2012), using a DHS database for 47 countries, the average contribution of children's gender to inequality of opportunity is low and much less than that of household characteristics and location. However, the average access to opportunities in the Arab countries included in the study – Egypt, Jordan and Morocco – tends to be higher than the global average, particularly for immunization in Jordan.

[5] The small group of women who head their own households is made up of women who are widowed, self-employed, reliant on remittances from relatives abroad, or divorced. As a result of this heterogeneity of circumstances of female household heads, estimates of the effects of household-head gender should be viewed with caution (Belhaj Hassine 2014).

form is assumed for an underlying latent variable that is related to the observed dependent variable $\dot{y}_i$ as follows: $\dot{y}_i = 1[y_i > 0] = 1[\varepsilon_i > -x_i\beta]$. Under the assumption that ε_i is distributed as normal, probit regression model is appropriate for estimating $\dot{y}_i$ and $\Pr(\dot{y}_i=1|\, x_i)$.The following reduced-form equation was estimated by probit:

$$\dot{y} = f(mother\ edu, father\ edu, wealth, rural, region, sex, female\ hhd),$$

where all explanatory variables are in binary form – binary for each possible category – to allow nonlinear effects of categorical variables and to facilitate comparison of households with least-advantaged vs. most-advantaged sets of circumstances. Probit models account for population sampling weights, and coefficient standard errors are corrected for heteroskedasticity and autocorrelation within sampling clusters of households.

Estimated probit coefficients are used to predict access to the various dimensions of ECD (those in binary form) for children in least advantaged versus most advantaged circumstances, by evaluating $\Pr(\dot{y}=1|x)$ for x fixed at the respective extreme counterfactual values. Setting all explanatory variables at their extreme values simultaneously is appropriate, as it accounts for the likely positive correlation among factors used to describe household circumstances. For example, poor households are likely to be rural and to reside in less developed administrative regions.

To measure inequality of opportunity for ECD, a dissimilarity index for binary-outcome variables is used (Barros et al. 2008, 2009), defined as follows:

$$D = \frac{1}{2\bar{p}} \sum_{i=1}^{K} w_i |p_i - \bar{p}|$$

where p_i is the prevalence of the particular dimension of ECD in a group possessing a particular set of circumstances (aka, circumstance group) i, K is the number of such groups, $\bar{p}$ is the prevalence in the overall population, and w_i is a population sampling weight of each group i. D ranges from 0 (perfect between-group equality) to 1 (perfect inequality), and can be interpreted as the fraction of the overall access to ECD opportunities that would have to be reallocated to obtain equality of opportunities.

Human Opportunity Index for each dimension of ECD could then be computed as $HOI = (1 - D)\bar{p}$. For indicators of lack of ECD opportunity (including child mortality, inadequate physical growth, violent disciplining and child labor), we compute HOI by accounting for unequal access to the corresponding opportunity (i.e., survival rate, healthy physical growth, childhood free of disciplining or forced labor) as follows: $HOI = 1 - \left(1 - \widetilde{D}\right)\bar{\tilde{p}}$ where characters with tildes are for the corresponding positive ECD opportunities.

Empirically, p_i and $\bar{p}$ are estimated using a logistic regression of the ECD indicator in question on a set of household characteristics that define circumstance groups. This regression is at the level of individuals (children or mothers). For each individual i, probability of access to that ECD opportunity is predicted as $\hat{p}_i$. Overall coverage is computed from across all individuals as $\hat{\bar{p}} = \sum_i w_i \hat{p}_i$, where w_i is individuals' sampling weight. The dissimilarity index is estimated as

$$\widehat{D} = {}^{1}\!/_{2\hat{\bar{p}}} \sum_i w_i |\hat{p}_i - \hat{\bar{p}}|$$

where the summation is over all individuals. To understand the impact of each household characteristic on children's access to ECD, Shorrocks-Shapley decomposition is used and Shapley values are estimated. The individual marginal impact of a characteristic *j* is estimated as the average of all changes that occur to *D* when *j* is added to all possible subsets of circumstances that exclude from consideration characteristic *j* (subset *S* of *K* household characteristics, each subset drawn, *s*, numbering n_s characteristics) among the set of all *K* existing circumstances (Shorrocks 1982, 2013):

$$D_j = \sum_{s \in S} \frac{n_s!\,(K - n_s - 1)!}{K!} [D(s, j) - D(s)]$$

Here *D(s)* is the dissimilarity index without the consideration of characteristic *j*, and *D(s,j)* is the index with *j* considered in the delineation of circumstance groups. The summation is over all *s* possible subsets of characteristics. Normalized Shapley values in percentage form are reported, computed as: $M_j = D_j / D$. These normalized Shapley values are interpreted as fractions of inequality explainable by observable household characteristics that is due to characteristic *j*. By design, they sum up to unity across all considered characteristics.[6, 7]

Standardization of anthropometric measurements

For children between 0 and 60 months of age, this study evaluates their physical growth compared to standards for healthy growth in any given month. Children's measurements are converted into standard deviations from the reference population with a healthy median and variance. This conversion is done using the *zscore06* automatic do-file program in Stata. *zscore06* takes children's height and weight, age in months, sex, and an indicator for whether the children were recumbent or standing while measurement was taken, and compares the measurements to World Health Organization's (WHO) 2006 global child growth standards (de Onis *et al.* 2006; Leroy 2011).

[6] More intuitively, the *D* index can be interpreted as the amount of slots available in access to a given basic opportunity that have to be reallocated across the groups, defined by the child's background. This measurement becomes relevant when basic opportunities are constrained by public budget and modality of service delivery. For instance, if vaccination is publicly provided by the healthcare system, and the budget is fixed, establishing fair access to this resource means creating priorities on the bases of the status of the family of origin. But if vaccination is both publicly and privately supplied, it can be argued that wealthy families will buy services on the private healthcare market. Then one should probably value an improvement in access to a basic opportunity as a mixture between exclusion of some wealthy families from getting public vaccination (inexpensive) and increasing vaccinations among poor families. Underlying, there is the idea that wealthy families will buy the service in the private sector, while more access to poor families is granted. This leads to increase p and decrease D. This double effect is captured by the definition of the HOI index.

[7] Estimation was performed in Stata program. Dissimilarity index was computed using the *hoi* automatic do-file program (Azevedo et al. 2010). *hoi* computes the coverage of an economic opportunity in an overall population, dissimilarity index of the coverage across population groups as well as the Human Opportunity Index itself (Barros et al. 2008). Among the many alternatives for computing these statistics in Stata, *hoi* is used to facilitate comparison with El-Kogali and Krafft (2015). Shorrocks-Shapley decomposition (Shorrocks 1982, 2013) and estimation of Shapley values was performed using the *shapley2* automatic do-file program (Chavez-Juarez 2014), customized by Caroline Krafft as *shapley3*, Version 1.0 3.21.13.

IV. Results for All ECD Indicators across Arab countries

The following subsections report in turn on the status of children's access to ECD opportunities across Arab countries, inequality in access to ECD opportunities within individual countries, and decomposition of inequality according to the contributions by households' various socio-economic characteristics.

1. Status of ECD in the Arab Region

Table 1 shows the distribution of selected ECD indicators across twenty surveys from fourteen Arab countries. Two waves of Jordanian DHS, Moroccan PAPFAM and Palestinian MICS surveys are included to facilitate intertemporal comparisons, as well as to mitigate the problem of missing values of various indicators in each wave. Table 1 shows that among Arab countries, access to ECD opportunities is generally poor, with an average of only 61 percent of women benefiting from adequate prenatal doctor visits, 48 percent of children being fully vaccinated, and 54 percent of children having access to iodized salt.[8] Children's health outcomes correspond to these inadequate opportunities: 3.7 percent die before their first birthday, 21 percent are stunted, and 12 percent are significantly underweight. Moreover, only 51 percent of children engage in adequate developmental activities at home, and only 31 percent of 3–4 year-olds and 21 percent of 5–6 year-olds attend formal preschool programs. This reflects public under-spending on pre-primary education, which increases the burden on families with young children, and affects disproportionally harshly children from poor socio-economic backgrounds. Finally, 90 percent of children are subject to violent disciplining, and 30 percent are asked to perform work within or outside of home, detracting them from formal education. Refer to the bottom of table 1 for sample summary statistics.

2. Inequality in ECD Opportunities across Arab Countries

The most striking result in table 1 is that the values of ECD indicators are vastly different across individual rows. Measures of women's care during pregnancy and child delivery, as well as children's physical growth potential and access to health, parental care and developmental activities vary significantly across the fourteen countries. Access to prenatal and delivery care varies from being available to circa one half of all women in Morocco, Sudan, Tunisia and Yemen to a near universal coverage in Jordan and Palestine. Vaccination coverage varies from one tenth of all children in Somalia to nine tenths in Algeria, Jordan and Palestine. Mortality within the first year of children's life varies from 2 percent in Jordan and Palestine to over 8 percent in Somalia. Prevalence of stunting varies from less than 8 percent in Jordan (2009), Palestine and Tunisia to over 30 percent in Djibouti and Somalia, and 44 percent in Yemen. Access to iodized salt ranges from covering 1.5 percent of children in Somalia to 91 percent in Comoros.

[8] Because the indicator of children's immunization takes into account a number of vaccinations, the low rates in Table 1 are often due to the absence of a single shot, such as the third shot of polio vaccination in Syria '06 (received by only 42% of children), and measles vaccination in Egypt '14 (37% of children).

Regarding engagement in cognitive developmental activities at home, the prevalence ranges from mere 27 percent in Djibouti to 79 percent in Palestine. Attendance of formal pre-school programs varies from 2 to 59 percent among 3–4 year-olds and from 4 to 94 percent among 5–6 year-olds across countries for which data are available, the lowest attendance rates occurring in Djibouti, Iraq, Mauritania and Somalia, and the highest rates occurring in Morocco and Palestine. Finally, prevalence rates of violent disciplining and child labor are high across all included countries, with Djibouti, Iraq and Syria on the lower end, and Egypt, Morocco, Palestine and Tunisia on the higher end. The bottom row of table 1 shows that the ECD access rates presented in table 1 fall for the most part within the ranges identified by El-Kogali and Krafft (2015), with only handful of exceptions where the ranges in this study exceed those in El-Kogali and Krafft's sample.

As already identified by El-Kogali and Krafft (2015) using 2006 PAPFAM data,[9] Palestine has the highest rates of women's care, among the lowest rates of adverse health outcomes among children in terms of mortality and under-growth, and best infrastructure for child development in terms of preschool education programs. Access to vaccination and iodized salt for Palestinian children is among the highest in the Arab region. These trends had been true since the 2006 wave of the PAPFAM survey and further improved by 2010. Between 2010 and 2014, a number of ECD indicators further improved in Palestine, specifically prenatal and delivery care, and child mortality, while some indicators stagnated or regressed, such as access to iodized salt, early childhood education and violent disciplining.

On the other end of the spectrum of access to ECD opportunities across the Arab region, Somalia and Yemen have some of the lowest rates of women's care, and the highest rates of child mortality, stunting and underweight. Somali children have the poorest access to iodized salt and vaccination in the region.[10] Somalia also has one of the poorest availability of formal preschool education, and very high prevalence of child labor. These facts, combined with one of the poorest availability of primary and higher education (Cummings and van Tonningen 2003) suggest that Somali children face dismal opportunities related to their cognitive development.

3. Inequality in ECD Opportunities within Countries

Table 2 supplements the findings in table 1 by evaluating within-country inequality in ECD opportunities. ECD opportunities between the poorest one-fifth and the wealthiest one-fifth of households within each country are reported. Household wealth is used as a summary measure of families' socio-economic status thought to affect children's access to ECD opportunities. Across the vast majority of results in table 2 – for most countries and most ECD indicators – ECD opportunities improve significantly with household wealth, validating the choice of household wealth as an indicator of families' socio-economic background. The disparity between the poorest and the richest households appears to be largest for ECD activities facilitated by markets or local governments such as nursery and preschool attendance (ECCE and ECE), while they are

[9] The 2006 National Health Survey for Palestine (specifically, West Bank & Gaza) was based on a combination of 2006 PAPFAM, MICS and 2006–2007 Palestinian Family Health Survey (El-Kogali & Krafft 2015).

[10] This contrasts with the findings by Kassim et al. (2014), who report that Somali women and children have sufficient or even excessive access to iodine, mostly through water. Poor access to adequately iodized salt may therefore not be worrying on its own.

relatively low for non-market activities such as child disciplining and the recruitment of children for household or non-household chores. This suggests that household and community resources affect significantly children's access to formal opportunities for healthy growth. These effects can be remedied with appropriate interventions by state governments or non-governmental organizations.

Table 3 adds to this analysis of within-country inequality of opportunities by considering jointly several potential drivers of children's access to ECD opportunities. The table presents the predicted values of children's propensities to have access to each ECD opportunity from probability models where the values of socio-economic explanatory variables are fixed at the least-advantaged or the most-advantaged levels, while the values of other explanatory values are fixed at zero.[11] As Section II explained, the least advantaged households are taken to be those in the bottom wealth quintile, in rural areas of least-advantaged administrative regions, where the mother and her partner (or child's father, or household head, depending on availability) have received no formal education. In models explaining ECD opportunities of live children, female children are taken to be less advantaged, due to potential discriminatory norms between boys and girls. In models explaining iodization of salt, households with female heads are taken to be less advantaged, because they are thought to be economically disadvantaged, regardless of values of other household characteristics. In models explaining other ECD opportunities, sex of the household head is controlled for, but is not used as a criterion for demarcating the least and the most advantaged households (and is thus included among $z=0$).

Values of other explanatory variables[12] are jointly fixed at zero. Because the imposed combinations of variable values may be rare among real-world households, the absolute sizes of numbers in table 3 may not be meaningful on their own, and are not exactly comparable to numbers in table 2. However, differences between the least-advantaged and the most-advantaged groups' outcomes have the interpretation as the cumulative disparities in ECD opportunities between households facing the least-advantaged set of circumstances versus those facing the most-advantaged set. These differences are for the most part of the expected signs implying that children in the poorest, least educated, rural households in impoverished regions (as well as female children, in female-led households, for relevant models) have the least adequate access to developmental opportunities.

[11] The propensity of a child to engage in ECD opportunity of type j, y_j, can be expressed as: $\Pr(y_j=1 \mid x,z)=\Pr(\beta_{j1}x+\beta_{j2}z+u_j>0 \mid x,z)=\Phi(x,z,\beta)$ where $\Phi(\cdot)$ is a cumulative distribution function of the standard normal distribution, β_{j1} and β_{j2} are vectors of population parameters associated with sets of variables x and z, and u_j are model errors. Suppose variables x are on a support $[a;b]$ where a corresponds with the least-advantaged individuals, while b corresponds with the most advantaged individuals. Without any information on the joint distribution of x and z, the estimated propensity of a child in most advantaged circumstances can thus be written as $\Pr(y_j=1 \mid x=b, z=0)$ while the propensity of a least-advantaged child can be written as $\Pr(y_j=1 \mid x=a, z=0)$. Under regularity conditions on model errors u_j, parameters estimated using maximum likelihood methods are consistent for the population parameters, and the estimated propensities are consistent for the counterfactual propensities of households with circumstances $x=a$, $z=0$, and $x=b$, $z=0$. Because all explanatory variables are binary, setting $z=0$ is more appropriate than setting z at their mean or other values.

[12] Other explanatory variables include indicators for unknown education, unknown wealth quintile, parent not living in household, and sex of the household head (in all but the salt-iodization models). When available, an indicator for whether distance to hospital represents a problem for the mother in seeking prenatal care is added as a control in models with the respective dependent variables.

As a byproduct, the finding of expected relations between the least-advantaged and the most-advantaged rates of access to ECD opportunities serves to validate our choice of indicators for households' socio-economic background. The differences in ECD prevalence rates between the least-advantaged and the most-advantaged households within each country are larger than the differences in table 2, suggesting that household's contemporaneous wealth is just one contributing factor in the overall inequality in children's access to ECD in each country. Households' background, composition, and wealth in the past contribute too.

Comparing the ranges of values in table 2 to those in table 3 suggests that household wealth accounts for about two-thirds of the disparity in ECD opportunities between the least advantaged and the most advantaged households within countries. On average, across all countries and ECD opportunities, the ranges of values in table 2 are two-thirds as wide as those in table 3. For infant mortality, stunting, and violent disciplining, the ranges are as wide or wider, suggesting that differences in household wealth are driving the entire disparity directly without much contribution from – or indirect impacts through – other socio-economic or community factors. Other socio-economic factors may even act to dampen some of the disparity in ECD due to differences in household wealth. On the other hand, for the rate of underweight, salt iodization, preschool enrollment and child labor, the ranges in table 2 are less than half as wide as those in table 3, suggesting that household wealth is less significant at explaining the disparity in opportunities within countries.

The following section and table 4 evaluate the disparity in opportunities for ECD that should be bridged to achieve equal opportunities across demographic groups in each country. Table 5 then returns to the question of individual contribution of wealth differences to the disparity in opportunities, in view of the presence of other sets of circumstances across households that affect ECD opportunities and that are themselves correlated with wealth.

4. Quantifying Inequality: Opportunities to Be Redistributed

Table 4 reports on an exercise quantifying the within-country *dissimilarity* in prevalence rates of various ECD activities across households with different socio-economic backgrounds. This table shows that, for most ECD indicators, between 5 and 30 percent of relevant ECD opportunities (and between 0.15% and 59% across all indicators and countries) should be redistributed across socio-economic classes from more-advantaged to less-advantaged groups, if inter-group equality of opportunities were desired.[13] The numbers in table 4 are quite large – simple average being 15% – and many are highly statistically significant, suggesting that current distribution within Arab countries is quite unequal. The fraction to be redistributed is lowest for violent disciplining (0.7–7.1% across countries), followed by parental development activities and prenatal care (3.9–22.2% and 0.2–20.4%, respectively). These are apparently of similar prevalence across the evaluated socio-economic groups. The fraction to be redistributed is greatest for preschool programs followed by neonatal and infant mortality (1.5–59.1% and 5.9–39.0%, respectively), which vary systematically and significantly across socio-economic classes.

[13] Clearly, redistribution of opportunities is a second-best option compared to providing those with less opportunity more of it without taking someone else's opportunity away. However, the method helps us measure the extent of inequality, and informs about present and possibly future social program allocation under budgetary constraints.

Table 4 indicates that Arab countries differ significantly in the degree of inequality in ECD opportunities and the portion of ECD opportunities that could be redistributed across socio-economic groups to achieve inter-group equality domestically. Algeria, Egypt, Jordan, Palestine and Syria have the lowest degree of dissimilarity across most ECD indicators that could be redistributed (9–12 percent); Mauritania, Morocco, Tunisia and Yemen have a median degree (16–20 percent); and Somalia and Sudan have the highest degree (23–30 percent), among surveys with available data.

5. Decomposition of Inequality in ECD Opportunities by Contributing Background Characteristics

Table 5 decomposes the *dissimilarity* in prevalence rates of ECD opportunities according to the contributions of individual socio-economic characteristics. Results in table 5 can be interpreted as fractions of the dissimilarity in ECD opportunities across population that can be attributed to particular household characteristics. Table 5 reports the contributions of household wealth, mother's education, father's education, rural vs. urban residence, and region.

Heterogeneity in household wealth is found to account for 20–35 percent of inequality in ECD opportunities across most countries and ECD indicators (overall range is 1–65% with mean 24% in table 5). Mother's education accounts for 15–25 percent across most countries and ECD indicators (overall range is 2–87% with mean 19%). Father's education accounts for a somewhat lower fraction of 10–20 percent of inequality (overall range is 0–57% with mean 15%). Rural vs. urban residence distinction accounts for 5–15 percent (overall range is 0–60% with mean 10%). Finally, systematic differences across administrative regions account for 15–35 percent of the inequality (overall range is 0–85% with mean 29%). Consistently with El-Kogali and Krafft's findings, this serves to verify that household wealth plays a significant role – but by no means an all-important role – in driving the inequality in children's access to ECD opportunities within Arab countries. To what extent these contributions can be viewed as direct and causal is also unclear, since most evaluated characteristics are significantly correlated with one another and many other relevant variables were omitted as unavailable. These issues have likely confounded the estimation of individual contributions.

Contribution of wealth and other socio-economic background characteristics differs substantially across countries and types of ECD opportunities. In Djibouti, Mauritania, Palestine and Yemen, more than a third of the disparity in several ECD opportunities was estimated to be due to wealth (27–33% across all ECD opportunities in these 4 countries), while in other countries – Jordan and Syria – less than a sixth of the disparity in most ECD opportunities can be attributed to household wealth differences (15–18% across all ECD opportunities in these countries). Availability of prenatal care, iodized salt, and developmental activities with parents or in preschool programs appears to be highly associated with household wealth (28–30% of disparity in these ECD opportunities, on average across countries), while child mortality is not. Only 13–17% of the disparity in neonatal and infant mortality, averaged across countries, is estimated to be driven directly by household wealth differences.

For other socio-economic determinants, the trends are different. Mother's education appears to affect ECD opportunities most significantly in Palestine, where it drives particularly the disparity

in child mortality and stunting (66–87% for child mortality, 43% for stunting), while it is far less influential in Somalia, Djibouti, Iraq, Mauritania and Morocco (each 11–17% overall). Across ECD opportunities, mother's education seems to explain well the disparities in prenatal and delivery care, child mortality, stunting and preschool attendance during 3–4 years of age (19–44% across these indicators, averaged across countries), but not access to iodized salt and subjection to violent disciplining and child labor (only 9–14% across the three indicators, averaged across countries).

Father's education has a high influence on most ECD opportunities in Palestine (26% across all ECD opportunities in 2014), followed by Algeria and Djibouti (19–20%), and a low influence in Mauritania and Morocco (6–7%). Whether it affects some ECD opportunities more than others is unclear. Rural nature of residence appears to affect ECD opportunities noticeably in Iraq and Morocco, where it contributes 20–23% of the dissimilarity across social groups (averaged across all ECD indicators). It contributes much less in Jordan, Palestine, Sudan and Syria (4–6% of the dissimilarity acrossall ECD indicators). Across ECD opportunities, whether households reside in rural areas affects particularly the disparities in women's prenatal and delivery care, and preschool attendance (14–17% across the relevant ECD indicators, averaged across countries), suggesting that access to healthcare centers and schools is poor in rural areas. Surprisingly, rural nature of residence does not appear to contribute to children's mortality or physical stature, suggesting adequate access to medications and nutrition. Rural nature of residence also does not affect the propensity for violent disciplining, suggesting that cultural factors within households are similar in cities and the countryside (rural/urban distinction contributes only 3–5% of the intergroup disparities in the mortality, physical stature and violent disciplining indicators, averaged across countries).

Finally, region of residence appears to exert the greatest influence over ECD opportunities (in relative terms) in Egypt, Jordan, Morocco, Sudan and Syria (34–39% of dissimilarity in ECD opportunities, averaged over all ECD indicators in a country), but much less so in Iraq and Palestine (12–19%). In Palestine, the estimated contribution ranked very high in 2010, at 36%, but receded in 2014 to 19%, when additional ECD indicators became available for analysis. Across ECD indicators, regional differences appear to have significant bearing on the prevalence of stunting and wasting, violent disciplining, as well as access to iodized salt (38–44% across these ECD opportunities, averaged across countries), and less so on child mortality (17% and 16% for neonatal and infant mortality).

5. Status and Inequality of ECD Opportunities over Time

Availability of multiple survey waves for several countries allows us to comment on the evolution in children's access to ECD opportunities across recent years.

Tables 1–5 facilitate intertemporal comparison of selected ECD indicators for Egypt (2005, 2014), Jordan (2007, 2009), Morocco (2006 and 2011) and Palestine (2004–2014). Additional comparison is possible using El-Kogali and Krafft's (2015) sample of surveys.[14] The snapshot results in our study can be contrasted with El-Kogali and Krafft's results for Algeria (2006 vs. 2002), Djibouti (2006 vs. 2012), Iraq (2006 vs. 2011), Syria (2006 vs. 2009), Tunisia (2006 vs.

[14] Figures 1–25 in the following section and figures A1-A14 in the appendix are also informative in this respect.

2011), and Yemen (2013 vs. 2003 & 2006). For Egypt, Jordan, Morocco and Palestine, the book provides another wave to compare our intertemporal results to – 2008 in the case of Egypt, 2012 for Jordan, 2003/2004 for Morocco, and 2006 for Palestine.

Table 6 reports changes in ECD indicators in each country over time. Across the majority of ECD indicators for which data are available, access of the general population to ECD has been improving. Most systematic exceptions are for Djibouti, where one half of all indicators deteriorated, Syria (5 out of 11 deteriorated), Morocco (3 out of 5 deteriorated), Egypt (5 out of 13 deteriorated), and Iraq and Palestine (4 out of 15 deteriorated). A bulk of worsening occurs among indicators of medical care for children (immunization) and access to nutrition necessary for growth (stunting; wasting; salt iodization). These trends could be stopped and reversed by targeted governmental or NGO programs.

For countries and indicators with three or four data points – a number of indicators for Egypt, Jordan and Palestine – the improvement is also for the most part monotonic. Notable exceptions are access to skilled delivery care, children's anthropometrics and access to nurseries in Palestine, which dipped for the worse in 2010. This may be explained by escalations in the Israeli-Palestinian conflict and Israel's blockade in years preceding 2010, or by high item non-response in the 2010 survey wave.

On the other hand, concerning reports that neonatal and infant mortality in Palestine rose recently, from 1.20% to 2.03% and from 2.02% to 2.24%, respectively, during 2008–2013, Table 6 shows a different trend, namely that both forms of mortality dropped sharply after 2006 and slid further down after 2010.

Table 7 reports changes in within-country intergroup inequality – in the dissimilarity index – for each ECD indicator over time. Across more than a half of all countries and ECD indicators for which intertemporal data are available, within-country inequality in access to ECD fell. This is particularly true for women's adequate access to physicians during pregnancy and delivery, rate of wasting among children, and access to iodized salt. On the other hand, the evolution was uneven in regard to children's access to immunization, and cognitive development at home and in preschool programs, as well as children's stunting, underweight and mortality rates. For these measures of ECD, intergroup inequality fell in some countries but rose in others. Across most Arab countries evaluated here, intergroup inequality increased in regard to violent disciplining of children.

Intergroup inequality in access to most forms of ECD fell in Egypt and Tunisia. In Iraq, Jordan and Yemen, inequality fell for the majority of ECD indicators, but rose for a substantial number of indicators, too. Algeria, Djibouti, Morocco and Syria, at the end of the spectrum, saw increases in inequality for one half or more of the evaluated ECD indicators. It should be noted that these changes in inequality cannot be explained by differences in the starting levels of inequality across countries and ECD indicators. Measures of ECD with high starting values of intergroup inequality – including child mortality, salt iodization, and admission to nurseries and pre-school programs – saw only slightly better results in terms of improved equality of access than other forms of ECD. Countries with high starting levels of inequality fare no better than countries with low initial inequality in terms of improvement over time.

Table 1. Comparison of ECD Indicators across Arab countries (Children or Women with Access to ECD, %)

	Prenatal care	Prenatal visits: 4+	Skilled delivery	Full immun.	Neonatal mortality	Infant mort.	Stunted	Under-weight	Wasted	Iodized salt	4+ dvlp. activities	ECCE 3-4yrs	ECE 5-6yrs	Violent discipl.	Child labor
Algeria '06	89.4	55.8	95.2	89.2	.	.	12.4	4.1	3.9	58.4	61.7	8.9	23.9	86.2	22.2
Comoros '12	92.4	57.4	83.8	63.7	2.1	3.3	29.6	15.6	11.1	91.0	.	.	.	.	25.0
Djibouti '06	92.3	.	92.9	45.7	.	.	32.6	30.3	30.1	.	26.5	14.1	6.4	69.6	18.6
Egypt '05	69.8	59.2	74.6	81.7	1.9	3.1	17.6	6.1	3.8	72.6	.	31.6	10.7	97.0	24.3
Egypt '14	90.2	82.7	91.6	34.2	1.4	2.3	17.6	6.8	7.6	88.3	.	58.6	.	94.9	45.5
Iraq '06	78.9	67.8	59.8	50.6	2.2	3.3	23.8	8.2	6.0	24.9	44.4	2.5	4.1	86.2	13.4
Jordan '07	98.8	94.2	99.0	86.7	1.5	2.1	14.4	5.3	7.2	.	.	.	.	.	.
Jordan '09	.	.	.	.	1.4	2.1	8.0	1.8	1.5	.	.	.	.	.	.
Mauritania '07	73.9	.	57.9	36.5	.	.	26.9	30.4	13.3	1.6	36.1	7.2	.	.	.
Morocco '06	.	.	.	.	.	.	.	.	.	19.6	58.0	40.2	42.4	95.8	19.4
Morocco '11	77.6	41.8	23.3	51.9	.	.	.	.	.	.	34.8	.	.	.	.
Palestine '04	98.4	86.4	91.6	94.5	2.3	4.0	11.0	6.1	3.4	68.2	.	.	71.1	.	.
Palestine '06	98.5	90.4	97.7	85.9	.	.	11.9	2.3	2.0	87.7	68.3	34.1	.	95.4	15.3
Palestine '10	98.6	94.2	68.2	92.7	1.3	2.0	10.9	3.7	3.3	79.5	66.6	17.7	94.3	92.3	31.4
Palestine '14	99.4	96.0	99.6	87.3	1.0	1.7	7.4	1.4	1.2	73.8	79.0	26.9	90.0	94.1	.
Somalia '06	--	--	--	9.7	3.8	8.4	38.1	36.3	11.8	1.5	65.0	2.3	13.6	.	52.1
Sudan '06	60.0	38.9	62.1	27.9	.	.	.	.	.	11.4	.	.	.	.	.
Syria '06	83.3	.	91.4	34.9	.	.	25.1	11.0	10.4	.	59.8	7.4	44.1	85.7	12.3
Tunisia '06	53.0	65.2	--	85.5	.	.	6.4	3.4	2.8	.	53.8	27.3	--	98.5	.
Yemen '13	61.0	25.3	43.6	43.5	2.5	4.0	46.3	38.9	16.4	49.0	.	.	.	80.0	.
Weighted avg.[c]	79.5	60.9	79.3	47.6	2.2	3.7	21.4	11.6	7.8	54.1	51.1	31.0	20.8	90.4	30.2
Range (min–max)	53.0–99.4	25.3–96.0	23.3–99.0	9.7–89.2	1.0–3.8	1.7–8.4	7.4–46.3	1.4–38.9	1.2–16.4	1.5–91.0	26.5–79.0	2.3–58.6	4.1–94.3	69.6–98.5	12.3–52.1
El-Kogali & Krafft sample (min–max)	47.0–99.1	30.6–94.5[a]	35.7–99.6	30.7–93.0	1.0–4.0	1.5–7.1	7.6–53.1	6.9–45.6[a]	6.4–22.3[a]	0.4–87.7	25.5–81.6	2.7–40.2[b]	6.0–89.0[a]	36.2–95.5	7.0–24.0

Notes: This table is comparable to table 2A.1 in El-Kogali & Krafft (2015:44). "." Unavailable due to missing data. "—" non-representative due to estimation issues such as small sample sizes.

Access to prenatal and delivery care is evaluated among women who gave birth in the past 2 years; the rest of indicators are evaluated among children.

[a] in a subsample of 5–6 countries where the indicator is available.

[b] For Egypt, Libya and Syria, El-Kogali & Krafft report ECCE attendance for children 3–5 years of age.

[c] Average of countries' most recent waves for which indicator is available, weighted by estimated 2015 population size (UN-DESA, 2015) to represent approximately the ECD access rates across the Arab region.

Table 2. Access to ECD among Bottom vs. Top Wealth Quintile Households (Children or Women with Access to ECD, Bottom–Top %)

	Prenatal care	Prenatal visits: 4+	Skilled delivery	Full immun.	Neonatal mortality	Infant mort.	Stunted	Under-weight	Wasted	Iodized salt	4+ dvlp. Activities	ECCE 3-4yrs	ECE 5-6yrs	Violent discipl.	Child labor
Algeria ‘06	76.0–97.9	36.7–77.0	87.7–98.5	81.8–95.7	.	.	17.0–8.9	5.6–2.7	3.8–4.9	40.2–79.9	48.5–74.7	3.2–20.8	6.2–48.1	82.6–88.2	19.0–25.8
Comoros ‘12	87.5–95.1	43.4–69.5	67.8–95.2	42.8–72.2	1.4–3.2	2.6–5.2	37.5–22.1	20.0–10.2	13.3–10.4	97.0–86.9	.	.	.	.	28.3–11.1
Djibouti ‘06	86.3–94.2	.	83.6–93.3	44.5–53.6	.	.	43.2–25.4	38.8–22.8	33.1–24.7	.	22.4–40.1	5.8–23.3	1.7–16.1	71.8–58.0	22.6–7.4
Egypt ‘05	46.8–92.3	31.3–87.9	50.8–96.9	77.4–83.4	2.3–1.5	4.2–1.7	23.6–14.4	7.7–6.3	3.6–6.2	52.2–96.3	.	10.8–54.3	2.8–28.3	97.0–93.8	20.3–20.5
Egypt ‘14	83.5–96.2	71.6–93.6	82.4–99.0	26.9–34.2	2.0–1.0	3.2–1.5	19.7–19.3	7.0–5.9	6.5–6.5	76.8–97.7	.	41.9–62.7	.	94.8–92.2	60.6–30.3
Iraq ‘06	64.9–90.9	46.0–87.1	48.7–70.8	36.4–62.8	2.4–1.9	3.7–2.8	24.9–19.8	8.8–8.2	5.2–5.9	18.7–34.8	30.2–57.6	0.3–7.8	0.6–10.1	89.2–100.0	14.6–14.9
Jordan ‘07	96.8–99.9	90.1–98.4	98.0–100.0	82.2–89.4	1.7–2.3	2.4–2.8	18.0–9.0	8.1–4.1	7.2–8.1	.	.	.	.	.	.
Jordan ‘09	.	.	.	.	2.0–0.3	3.1–1.2	12.7–1.3	2.4–0.1	1.6–0.2	.	.	.	.	.	.
Mauritania ‘07	52.2–93.9	.	19.6–96.5	26.9–38.5	.	.	33.0–17.3	39.9–14.1	16.3–6.6	1.5–3.2	27.6–46.5	2.5–18.7	.	.	.
Morocco ‘06	.	.	.	.	.	.	.	.	.	6.8–34.0	38.6–83.6	6.3–82.8	7.7–75.3	97.4–93.0	12.1–20.4
Morocco ‘11	50.3–98.8	12.2–75.7	13.3–37.3	44.0–54.9	.	.	.	.	.	.	15.8–59.4	.	.	.	.
Palestine ‘04	97.9–98.8	86.6–87.4	91.6–90.9	95.9–92.4	2.7–1.5	4.9–2.8	13.0–9.9	7.5–4.7	3.9–3.5	63.5–65.7	.	.	60.2–79.4	.	.
Palestine ‘06	97.2–99.1	83.5–94.4	97.3–97.3	89.7–83.7	.	.	15.8–10.0	2.2–2.4	2.2–2.4	87.6–88.6	61.9–80.0	24.0–48.1	.	96.5–93.4	11.8–18.3
Palestine ‘10	97.9–98.5	90.8–95.6	70.2–61.2	93.2–86.9	1.6–1.0	2.7–1.2	14.5–8.4	4.6–2.9	3.3–3.4	80.5–76.2	57.3–78.3	11.0–29.0	92.2–92.0	90.6–91.9	26.6–41.2
Palestine ‘14	99.5–98.8	95.9–97.3	99.6–99.3	93.6–73.1	0.9–0.6	1.8–1.2	7.6–7.0	1.6–1.6	0.9–1.8	78.5–71.6	70.1–88.5	21.2–39.9	92.4–93.5	96.5–90.8	.
Somalia ‘06	--	--	--	4.2–20.1	2.9–3.4	7.7–8.5	48.0–21.6	48.9–16.1	15.4–4.9	1.8–2.2	63.0–69.9	0.5–6.0	0.0–18.5	.	59.6–52.9
Sudan ‘06	29.7–95.3	14.3–72.7	38.3–94.3	3.8–5.8	.	.	.	.	.	25.6–3.5	.	.	.	.	.
Syria ‘06	66.8–93.9	.	74.9–98.6	27.6–36.5	.	.	32.2–23.1	14.6–9.3	12.7–10.7	.	42.5–70.6	1.9–14.5	23.3–58.9	79.1–84.7	11.0–13.2
Tunisia ‘06	26.4–81.7	40.7–78.0	--	79.6–83.9	.	.	13.1–3.6	5.9–1.5	2.4–2.2	.	23.8–72.5	4.8–53.2	--	98.6–99.2	.

Yemen '13	40.0–87.6	8.2–55.7	18.2–79.3	24.7–62.6	2.0–2.4	3.2–3.3	59.0–25.7	54.0–21.6	20.9–12.3	27.3–71.6	.	.	.	76.3–74.5	.
Wghtd. Avg. bottom–top[a]	63.5–94.7	42.7–81.6	59.2–86.2	36.8–49.2	2.1–1.5	3.5–2.5	25.9–17.3	14.8–7.8	8.1–6.6	40.7–58.9	35.9–66.1	17.4–43.3	7.0–38.8	89.7–90.6	34.8–25.5

Notes: This table is comparable to table 2A.1 (El-Kogali & Krafft 2015:44). Reported numbers are the differences in average access rates between the bottom and the top wealth quintile.
"." Unavailable due to missing data. "—" non-representative due to estimation issues such as small sample sizes.
Access to prenatal and delivery care is evaluated among women who gave birth in the past 2 years; the rest of indicators are evaluated among children.
[a] Average of countries' most recent waves for which indicator is available, weighted by estimated 2015 population size (UN-DESA, 2015).

Table 3. Access to ECD across Least vs. Most Advantaged Households (Children or Women with Access to ECD, Least–Most %)

	Prenatal care	Prenatal visits: 4+	Skilled delivery	Full immun.	Neonatal mortality	Infant mort.	Stunted	Under-weight	Wasted	Iodized salt	4+ dvlp. Activities	ECCE 3-4yrs	ECE 5-6yrs	Violent discipl.	Child labor
Algeria ‘06	60.0–99.5	17.6–91.9	60.6–98.8	75.4–96.7	.	.	26.9–6.8	13.5–1.3	5.8–4.4	14.0–93.4	34.0–82.7	3.3–36.9	4.4–60.6	86.2–82.1	15.9–25.4
Comoros ‘12	76.7–97.4	43.4–88.0	57.2–99.9	66.6–94.0	2.3–5.7	4.1–5.6	21.3–10.3	17.2–4.3	13.2–10.6	98.9–86.8	.	.	.	.	32.2–7.7
Djibouti ‘06	40.8–99.1	.	37.0–96.9	30.7–52.7	.	.	41.8–33.7	44.1–25.3	47.0–26.2	.	11.8–42.5	5.6–28.4	0.2–27.6	59.6–58.3	26.6–10.7
Egypt ‘05	34.0–94.9	21.8–92.0	40.1–97.8	77.2–79.5	1.9–1.5	4.8–1.2	24.0–15.5	8.0–9.0	3.5–8.4	47.7–98.7	.	4.3–62.0	1.6–40.2	97.8–89.5	16.8–19.2
Egypt ‘14	68.5–98.9	53.5–97.1	66.4–99.4	25.0–42.9	2.2–0.9	4.1–1.1	21.9–17.1	9.3–4.6	7.3–6.9	75.5–98.9	.	22.0–63.8	.	95.5–94.2	56.2–22.6
Iraq ‘06	50.2–88.2	25.5–84.6	37.3–93.5	14.8–89.1	3.1–2.2	5.0–2.6	30.6–8.4	9.7–6.6	5.2–4.5	9.0–77.1	22.5–64.8	0.1–21.3	0.1–31.2	92.4–56.6	18.4–15.2
Jordan ‘07	73.5–100.0	57.9–98.7	96.2–99.9	52.4–90.0	0.0–0.7	0.2–1.2	32.0–9.0	19.2–4.6	16.3–8.2	.	.	.	.	.	.
Jordan ‘09	.	.	.	.	1.3–0.2	1.7–1.2	24.9–1.0	5.4–0.0	3.0–0.2	.	.	.	.	.	.
Mauritania ‘07	57.2–93.7	.	16.3–96.9	24.0–14.8	.	.	32.8–11.8	40.0–13.3	16.3–10.6	1.0–3.0	25.0–58.6	1.6–67.6	.	.	.
Morocco ‘06	.	.	.	.	.	.	.	.	.	20.2–54.7	41.3–84.1	3.0–90.5	2.6–93.3	95.9–94.1	14.5–27.3
Morocco ‘11	66.11–100.0	11.8–94.4	25.2–32.8	52.6–56.2	.	.	.	.	.	.	13.0–76.5	.	.	.	.
Palestine ‘04	100.0–98.1	86.2–84.0	96.0–90.6	90.2–91.0	4.6–1.0	7.7–1.2	17.2–6.9	7.9–3.4	1.1–2.8	82.2–61.8	.	.	30.4–85.5	.	.
Palestine ‘06	83.9–98.8	79.5–93.1	95.6–97.7	78.4–78.4	.	.	15.3–5.9	3.2–1.7	4.2–2.5	83.8–89.8	49.2–85.7	12.2–57.6	.	96.1–94.8	9.0–14.6
Palestine ‘10	93.9–99.1	75.4–92.7	81.4–39.6	90.4–94.8	1.6–1.2	2.8–1.4	17.2–8.1	5.0–2.8	1.4–3.9	79.2–92.7	54.3–73.0	4.4–28.9	78.2–96.9	92.6–88.0	30.2–23.5
Palestine ‘14	100.0–99.6	93.2–98.6	100.0–99.4	100.0–79.8	1.0–0.8	1.6–1.5	45.3–4.7	0.0–1.0	0.0–0.5	71.8–90.0	49.5–86.0	16.9–60.9	43.6–98.7	100.0–92.8	.
Somalia ‘06	--	--	--	2.9–13.7	3.4–5.4	8.4–7.2	52.5–10.0	49.4–7.5	12.2–8.1	0.5–4.6	0.3–16.1	60.9–82.5	0.02–20.0	.	59.5–47.9
Sudan ‘06	20.4–99.9	7.9–82.6	35.0–99.7	0.2–70.8	.	.	.	.	.	30.7–2.8	.	.	.	.	.
Syria ‘06	63.5–99.9	.	58.9–99.9	23.6–37.2	.	.	32.7–7.7	20.1–4.7	19.4–8.9	.	35.3–80.8	0.3–39.9	0.0–96.2	72.2–88.3	0.0–65.2
Tunisia ‘06	29.9–94.5	44.7–86.3	--	77.7–85.8	.	.	5.4–2.9	1.5–4.2	1.2–4.1	.	25.8–81.7	1.6–80.8	--	100.0–93.3	.

Yemen '13	29.0–97.0	6.5–80.6	14.5–90.6	24.1–70.3	1.4–0.9	2.5–0.9	61.7–19.4	59.0–15.3	21.7–13.6	21.2–74.2	.	.	.	67.2–69.0	.
Wghtd. Avg. bottom–top[a]	54.3–97.7	30.1–90.7	48.9–90.4	32.6–63.2	2.3–1.4	4.1–1.8	30.3–12.1	17.8–5.6	9.2–6.8	37.0–69.5	24.3–71.8	12.0–56.8	2.6–54.5	89.4–84.0	32.7–27.0

Notes: This table is comparable to figures 2.23–2.28 (El-Kogali & Krafft 2015:39–43). "." Unavailable due to missing data. "—" unavailable due to estimation issues such as small sample sizes, missing variables, or perfect collinearity or perfect prediction of outcomes among explanatory variables.

Access to prenatal and delivery care is evaluated among women who gave birth in the past 2 years; the rest of indicators are evaluated among children.

Reported numbers are the differences in predicted access rates between the least-advantaged and the most-advantaged groups, estimated from probit models, with explanatory variables fixed at counterfactual 'least advantaged' and 'most advantaged' values. Least vs. most advantaged households are identified as those in the bottom vs. top quintile of income distribution, in rural vs. urban areas, in disadvantaged vs. most advantaged region within the country, with mother and household head with no vs. higher education (with female vs. male child, in all cases but prenatal care and skilled delivery; and with female vs. male household head, in case of iodized salt).

[a] Average of countries' most recent waves for which indicator is available, weighted by estimated 2015 population size (UN-DESA, 2015).

Table 4. Quantifying of Inequality: Opportunities to Be Redistributed (*Dissimilarity Index*, %)

	Prenatal care	Prenatal visits: 4+	Skilled delivery	Full immun.	Neonatal mortality	Infant mort.	Stunted	Under-weight	Wasted	Iodized salt	4+ dvlp. Activities	ECCE 3-4yrs	ECE 5-6yrs	Violent discipl.	Child labor
Algeria '06	4.62***	13.95***	2.57*	2.79*			14.84***	20.94**	15.26	13.20***	7.15***	33.43***	30.08***	2.94	6.51
	(1.21)	(2.28)	(1.05)	(1.41)	.	.	(4.31)	(6.77)	(7.83)	(1.34)	(1.28)	(7.78)	(4.08)	(1.59)	(6.84)
Comoros	2.30	11.63*	6.81***	14.03*	37.36	30.61	15.01*	19.30*	13.22	1.91					14.57
'12	(1.40)	(4.61)	(1.98)	(6.63)	(25.46)	(18.72)	(6.07)	(9.32)	(11.34)	(1.11)	.	.	.	.	(15.05)
Djibouti	2.49		3.04	8.16			12.74	12.10	8.51		15.72	35.09	38.21	7.12	23.28
'06	(1.93)	.	(1.84)	(10.93)	.	.	(6.53)	(6.49)	(6.30)	.	(8.85)	(28.10)	(25.50)	(6.02)	(15.56)
Egypt '05	12.07***	16.58***	10.87***	2.59	18.07	20.33*	12.20	15.25*	17.13	10.69***		25.70***	34.31**	0.73	12.10
	(1.17)	(1.42)	(1.09)	(1.75)	(13.88)	(9.65)	(3.90)	(6.92)	(11.19)	(1.18)	.	(3.81)	(11.08)	(0.51)	(6.92)
Egypt '14	3.27***	5.36***	3.43***	7.23	21.21	17.90	11.51***	14.20*	8.42	4.11***		15.20***		0.98	10.82**
	(0.57)	(0.75)	(0.59)	(4.54)	(13.54)	(10.97)	(3.98)	(6.66)	(5.38)	(1.22)	.	(2.31)	.	(0.59)	(4.13)
Iraq '06	6.43***	11.85***	7.37***	13.38***	10.99	8.20	9.07**	6.83	7.61	21.86***	10.45***	41.22**	42.23***	4.93	12.92
	(1.01)	(1.63)	(1.47)	(3.40)	(9.94)	(7.54)	(3.00)	(5.38)	(5.64)	(2.31)	(1.82)	(15.39)	(9.17)	(7.48)	(6.65)
Jordan '07	0.63	1.48*	0.39	3.92	33.60	27.79	18.85*	26.26	18.84						
	(0.55)	(0.72)	(0.43)	(2.19)	(19.11)	(15.83)	(7.87)	(15.07)	(11.32)	.	.	.	.	.	.
Jordan '09					37.76	28.39	19.64	30.38	34.26						
	.	.	.	.	(21.55)	(15.87)	(11.75)	(22.86)	(30.04)	.	.	.	.	.	.
Mauritania	9.45***		25.62***	12.27			11.26**	16.59***	16.33**	29.58	11.96***	35.53*			
'07	(2.47)	.	(3.17)	(6.72)	.	.	(3.85)	(3.37)	(5.47)	(15.89)	(3.00)	(14.81)	.	.	.
Morocco										32.17***	14.98***	36.65***	32.56***	1.89	24.62*
'06	.	.	.	.	.	.	.	.	.	(4.88)	(2.80)	(4.24)	(4.28)	(1.74)	(11.49)
Morocco	11.38***	25.69***	22.58**	7.40							22.21***				
'11	(2.79)	(4.40)	(7.45)	(3.85)	.	.	.	.	.	.	(3.59)	.	.	.	.
Palestine	0.49	4.35**	3.15*	1.44	12.40	13.41*	9.33	11.68	18.19	8.47***			5.73*		
'04	(0.56)	(1.61)	(1.20)	(1.78)	(7.19)	(5.91)	(6.90)	(9.47)	(13.27)	(1.98)	.	.	(2.64)	.	.
Palestine	0.48	2.35*	0.75*	2.63			13.42**	11.35	14.39	1.05	4.68	12.16**		0.89	15.68
'06	(0.33)	(1.09)	(0.35)	(1.72)	.	.	(4.93)	(10.75)	(12.64)	(0.66)	(1.82)	(3.88)	.	(0.89)	(8.65)
Palestine	0.33	1.39	4.32*	2.22	11.18	11.36	9.83	9.86	10.78	7.11***	6.16**	15.24*	1.53	1.34	16.40**
'10	(0.37)	(0.83)	(1.90)	(1.33)	(15.55)	(11.21)	(5.16)	(8.64)	(9.54)	(1.02)	(2.02)	(6.01)	(0.84)	(1.10)	(6.20)
Palestine	0.22	0.76	0.15	3.26	39.03	33.77	11.26	19.87	23.21	5.03***	4.03*	14.77**	2.65*	1.37	
'14	(0.38)	(0.75)	(0.28)	(1.87)	(22.83)	(17.09)	(7.98)	(16.37)	(19.81)	(1.25)	(1.70)	(5.04)	(1.26)	(1.21)	.
Somalia				45.23*	12.20	5.87	16.51***	16.63***	16.74**	29.38	3.86*	46.41*	59.09		9.58
'06	--	--	--	(21.49)	(11.24)	(7.95)	(2.95)	(3.01)	(5.79)	(18.23)	(1.75)	(19.93)	(35.16)	.	(4.94)
Sudan '06	20.35***	24.40***	16.10***	33.81***						58.12***					
	(1.52)	(2.74)	(1.68)	(2.83)	.	.	.	.	.	(3.58)	.	.	.	.	.
Syria '06	6.77***		4.30**	7.60			12.53***	15.03***	15.16**		10.29***	37.71*	17.20*	2.06	11.98
	(1.42)	.	(1.33)	(5.15)	.	.	(2.92)	(4.38)	(4.78)	.	(2.38)	(15.96)	(6.98)	(1.71)	(8.51)
Tunisia '06	18.67***	10.22***		4.75			26.01	38.48*	29.01		17.75***	34.33***		0.87	
	(3.53)	(2.80)	--	(5.48)	.	.	(15.90)	(16.51)	(21.18)	.	(4.66)	(7.56)	--	(1.55)	.

Yemen '13	14.50***	32.04***	22.86***	14.38***	19.33	16.18	12.27***	13.67***	12.24**	17.42***				4.25*	
	(1.68)	(3.65)	(2.03)	(4.16)	(11.60)	(8.35)	(1.93)	(2.19)	(4.15)	(1.73)	.	.	.	(1.95)	.
Wght. avg.[a]	8.52	14.79	9.55	12.38	19.54	15.85	12.94	16.02	12.74	20.98	12.08	28.98	33.75	2.37	12.62

This table is comparable to table 2.1 in El-Kogali & Krafft (2015:37). "." unavailable due to missing data. "--" unavailable due to estimation issues such as small sample sizes, missing variables, or perfect collinearity or perfect prediction of outcomes among selected explanatory variables.

Access to prenatal and delivery care is evaluated among women who gave birth in the past 2 years; the rest of indicators are evaluated among children.

Reported numbers are the percentages of the levels of access to ECD opportunities that should be redistributed to achieve equality of access across evaluated socio-economic groups.

Analytical standard errors in parentheses. Significant at * 5%, ** 1%, *** 0.1% level, two-sided t-test.

[a] Average of countries' most recent waves for which indicator is available, weighted by estimated 2015 population size (UN-DESA, 2015).

Table 5. Decomposition of Inequality in ECD Opportunities: Contribution of Selected Background Characteristics – Wealth (Normalized Shapley value, %)

	Prenatal care	Prenatal visits: 4+	Skilled delivery	Full immun.	Neonatal mortality	Infant mort.	Stunted	Under-weight	Wasted	Iodized salt	4+ dvlp. activities	ECCE 3-4yrs	ECE 5-6yrs	Violent discipl.	Child labor
Algeria '06	25.81	24.11	22.08	28.06	.	.	32.12	18.92	22.26	26.90	34.34	32.36	31.77	2.76	23.76
Comoros '12	21.27	16.67	26.41	21.60	3.50	3.20	19.14	12.56	13.68	64.50	.	.	.	.	33.11
Djibouti '06	22.27	.	30.42	30.64	.	.	36.83	20.33	10.01	.	44.01	21.26	30.52	34.13	35.35
Egypt '05	26.81	31.77	8.93	18.90	10.43	11.69	20.69	13.43	23.57	38.85	.	38.79	43.10	33.20	32.69
Egypt '14	25.31	27.89	8.76	11.18	13.51	20.85	4.92	16.93	26.02	39.29	.	16.80	.	32.26	20.10
Iraq '06	37.24	37.28	43.11	18.38	18.60	16.10	19.69	31.30	22.00	19.47	40.89	35.28	32.64	36.17	11.83
Jordan '07	16.85	14.35	9.96	5.56	19.15	12.58	6.74	41.80	3.54	.	.	.	.	.	.
Jordan '09	.	.	.	.	6.95	5.43	32.36	16.36	13.18	.	.	.	.	.	.
Mauritania '07	46.10	.	37.24	28.66	.	.	28.90	32.09	45.01	34.95	18.28	27.49	.	.	.
Morocco '06	.	.	.	.	.	.	.	.	.	22.15	29.18	34.81	31.94	20.68	15.45
Morocco '11	30.60	34.49	14.39	26.17	.	.	.	.	.	.	25.62	.	.	.	.
Palestine '04	19.04	5.10	1.34	13.76	29.87	19.03	11.29	26.21	16.08	3.94	.	.	38.44	.	.
Palestine '06	21.47	31.81	6.11	22.38	.	.	17.80	32.43	29.03	4.60	53.73	31.99	.	23.22	7.95
Palestine '10	24.67	24.58	10.21	13.32	30.58	46.84	51.03	41.64	29.54	2.96	40.30	52.59	28.37	10.63	13.05
Palestine '14	42.78	23.18	32.61	52.51	13.48	5.91	8.31	14.35	27.43	18.18	41.05	36.66	23.09	30.30	.
Somalia '06	--	--	--	19.38	43.47	27.56	27.22	40.14	21.82	39.96	11.08	22.72	32.99	.	16.48
Sudan '06	23.49	31.46	29.86	32.52	.	.	.	.	.	16.96	.	.	.	.	.
Syria '06	18.47	.	34.46	33.19	.	.	10.29	15.94	11.52	.	15.06	24.39	9.25	20.01	9.08
Tunisia '06	31.43	25.77	--	26.99	.	.	20.91	29.25	13.97	.	21.79	25.48	--	14.33	.
Yemen '13	30.63	39.56	36.38	29.19	17.05	36.74	36.69	41.73	24.55	29.95	.	.	.	22.64	.
Wght. avg.[a]	27.66	30.34	22.86	22.50	16.56	21.55	18.16	23.58	22.77	28.78	29.13	26.13	34.43	24.23	17.71

Notes: Access to prenatal and delivery care is evaluated among women who gave birth in the past 2 years; the rest of indicators are evaluated among children.
Reported numbers are the Shapley decomposition values in percentage form – percentages of the differences in access to ECD opportunities across socio-economic groups that can be attributed to individual socio-economic characteristics – normalized to add up to 100% across the evaluated characteristics. Sex of children and of household heads is omitted from this table even though they serve as criteria in selected models. "." unavailable due to missing data. "--" unavailable due to estimation issues such as small sample sizes, missing variables, or perfect collinearity or perfect prediction of outcomes among selected explanatory variables.
[a] Average of countries' most recent waves for which indicator is available, weighted by estimated 2015 population size (UN-DESA, 2015).

Table 5 (cont.). Contribution of Selected Background Characteristics to Inequality in ECD Opportunities – Mother's Education (%)

	Prenatal care	Prenatal visits: 4+	Skilled delivery	Full immun.	Neonatal mortality	Infant mort.	Stunted	Under-weight	Wasted	Iodized salt	4+ dvlp. activities	ECCE 3-4yrs	ECE 5-6yrs	Violent discipl.	Child labor
Algeria '06	32.26	35.80	23.59	32.55	.	.	24.93	17.81	4.92	25.80	19.58	26.06	28.26	2.64	15.87
Comoros '12	32.81	24.79	23.99	12.75	18.72	21.90	19.99	29.70	31.72	--	.	.	.	.	--
Djibouti '06	6.67	.	3.79	19.32	.	.	10.51	5.06	2.35	.	12.73	21.31	24.98	33.18	6.07
Egypt '05	32.58	27.54	36.14	22.56	24.89	37.66	10.24	13.23	24.19	7.93	.	4.82	5.13	9.71	8.78
Egypt '14	31.91	31.50	36.50	11.61	28.94	29.20	16.87	18.02	5.94	6.48	.	12.92	.	7.52	16.38
Iraq '06	6.00	6.94	7.96	23.13	13.54	37.18	20.93	38.42	26.40	9.45	20.15	21.95	15.43	11.82	3.36
Jordan '07	31.14	30.01	45.19	13.64	24.30	27.78	14.31	16.54	11.07	.	.	.	.	.	.
Jordan '09	.	.	.	.	39.27	34.49	28.81	49.03	26.12	.	.	.	.	.	.
Mauritania '07	8.72	.	9.33	14.98	.	.	12.62	12.68	11.51	18.38	12.74	25.45	.	.	.
Morocco '06	.	.	.	.	.	.	.	.	.	4.61	9.18	8.09	9.00	6.79	16.28
Morocco '11	19.82	18.72	7.95	10.48	.	.	.	.	.	.	19.83	.	.	.	.
Palestine '04	14.82	6.49	6.48	43.42	26.91	43.60	30.31	17.69	13.17	1.86	.	.	23.11	.	.
Palestine '06	23.85	13.77	5.21	3.79	.	.	11.16	11.73	7.18	5.14	27.10	41.75	.	16.24	8.80
Palestine '10	23.87	29.82	10.76	1.96	3.09	8.19	19.46	7.57	9.40	2.58	14.33	26.95	9.37	6.87	6.22
Palestine '14	4.26	15.04	5.14	3.65	81.23	88.20	42.72	44.87	2.47	5.84	13.81	26.33	24.39	3.62	.
Somalia '06	--	--	--	2.71	18.57	26.51	7.47	7.82	2.57	12.54	3.72	7.80	12.89	.	17.76
Sudan '06	13.85	22.96	29.61	13.43	.	.	.	.	.	3.51	.	.	.	.	.
Syria '06	29.51	.	21.10	32.37	.	.	23.59	19.80	12.02	.	22.55	29.49	26.69	14.98	15.21
Tunisia '06	19.88	24.69	--	5.85	.	.	18.09	18.06	11.62	.	17.12	20.86	--	12.07	.
Yemen '13	19.60	18.93	22.43	10.88	19.39	13.71	16.75	14.94	5.08	10.96	.	.	.	13.25	.
Wght. avg.[a]	22.97	24.63	24.38	16.15	24.85	29.76	19.17	20.65	9.44	9.67	18.49	17.46	13.64	8.60	14.01

Notes: Access to prenatal and delivery care is evaluated among women who gave birth in the past 2 years; the rest of indicators are evaluated among children.
Reported numbers are the Shapley decomposition values in percentage form – percentages of the differences in access to ECD opportunities across socio-economic groups that can be attributed to individual socio-economic characteristics – normalized to add up to 100% across the evaluated characteristics. Sex of children and of household heads is omitted from this table even though they serve as criteria in selected models. "." unavailable due to missing data. "--" unavailable due to estimation issues such as small sample sizes, missing variables, or perfect collinearity or perfect prediction of outcomes among selected explanatory variables.
[a] Average of countries' most recent waves for which indicator is available, weighted by estimated 2015 population size (UN-DESA, 2015).

Table 5 (cont.). Contribution of Selected Background Characteristics to Inequality in ECD Opportunities – Father's Education (%)

	Prenatal care	Prenatal visits: 4+	Skilled delivery	Full immun.	Neonatal mortality	Infant mort.	Stunted	Under-weight	Wasted	Iodized salt	4+ dvlp. activities	ECCE 3-4yrs	ECE 5-6yrs	Violent discipl.	Child labor
Algeria '06	25.30	18.78	22.74	24.13	.	.	22.99	16.02	12.98	13.54	16.40	16.15	18.43	16.75	33.32
Comoros '12	27.04	13.60	8.27	11.00	24.01	23.50	16.47	10.37	24.93	--	.	.	.	.	--
Djibouti '06	10.98	.	11.39	16.10	.	.	22.43	8.51	9.27	.	24.56	32.45	27.51	18.62	22.39
Egypt '05	9.77	9.38	13.25	11.74	20.55	25.99	4.55	12.61	14.50	10.40	.	3.85	5.43	31.93	7.24
Egypt '14	13.14	12.09	10.96	18.15	27.88	15.28	9.50	40.66	9.32	15.38	.	3.63	.	7.73	17.15
Iraq '06	15.84	14.95	8.13	15.42	10.96	12.81	3.71	12.06	13.55	2.45	16.64	19.72	5.90	28.88	2.00
Jordan '07	24.34	18.45	22.33	10.00	16.48	9.05	8.40	9.05	5.18	.	.	.	.	.	.
Mauritania '07	7.17	.	4.29	2.13	.	.	7.01	8.66	5.46	7.15	4.12	10.17	.	.	.
Morocco '06	.	.	.	.	.	.	.	.	.	2.41	9.30	3.68	7.28	10.69	10.30
Morocco '11	14.64	15.74	5.73	11.25	.	.	.	.	.	.	13.79	.	.	.	.
Palestine '04	11.53	10.70	2.99	29.60	19.80	22.04	40.95	31.12	9.98	1.56	.	.	7.60	.	.
Palestine '06	17.54	6.54	6.85	9.62	.	.	5.17	24.45	3.82	38.73	16.00	20.94	.	8.91	10.80
Palestine '10	35.52	19.61	9.37	0.59	--	--	6.21	36.74	24.12	9.33	5.03	13.46	3.76	20.84	1.25
Palestine '14	41.16	39.01	57.22	6.31	--	--	28.33	25.61	14.17	10.94	9.03	22.88	28.04	27.23	.
Somalia '06	--	--	--	7.34	--	--	7.18	10.47	14.35	33.04	11.19	24.30	15.08	.	25.43
Sudan '06	10.72	17.67	15.21	10.05	.	.	.	.	.	0.04	.	.	.	.	.
Syria '06	6.15	.	6.79	9.71	.	.	11.23	10.29	9.96	.	20.38	25.11	12.15	14.70	14.83
Tunisia '06	9.92	11.35	--	28.00	.	.	20.02	19.38	9.43	.	13.46	8.22	--	24.33	.
Yemen '13	8.25	6.66	6.53	22.92	14.41	13.49	6.46	7.99	7.45	4.76	.	.	.	13.32	.
Wght. avg.[a]	14.52	14.61	12.38	16.16	21.30	14.40	11.28	22.81	10.52	9.30	15.32	11.15	9.43	14.11	16.43

Notes: Access to prenatal and delivery care is evaluated among women who gave birth in the past 2 years; the rest of indicators are evaluated among children.
Reported numbers are the Shapley decomposition values in percentage form – percentages of the differences in access to ECD opportunities across socio-economic groups that can be attributed to individual socio-economic characteristics – normalized to add up to 100% across the evaluated characteristics. Sex of children and of household heads is omitted from this table even though they serve as criteria in selected models. "." unavailable due to missing data. "--" unavailable due to estimation issues such as small sample sizes, missing variables, or perfect collinearity or perfect prediction of outcomes among selected explanatory variables.
In models of prenatal and delivery care, and child mortality, partner's education is used. In models of immunization, stunting, salt-iodization, child development, education, disciplining and child labor, father's education is used. When partner's or father's education is unavailable, education of the household head (regardless of that person's sex) is used. In Jordan '09, father's/partner's/household-head's education is unavailable.
[a] Average of countries' most recent waves for which indicator is available, weighted by estimated 2015 population size (UN-DESA, 2015).

Table 5 (cont.). Contribution of Selected Background Characteristics to Inequality in ECD Opportunities – Rural/Urban Residence (%)

	Prenatal care	Prenatal visits: 4+	Skilled delivery	Full immun.	Neonatal mortality	Infant mort.	Stunted	Under-weight	Wasted	Iodized salt	4+ dvlp. activities	ECCE 3-4yrs	ECE 5-6yrs	Violent discipl.	Child labor
Algeria '06	14.54	12.60	15.44	8.35	.	.	4.91	4.79	6.85	7.64	12.39	9.46	15.98	0.27	7.01
Comoros '12	7.37	1.13	13.13	0.65	13.38	17.04	2.70	5.38	9.83	0.94	.	.	.	.	16.38
Djibouti '06	31.43	.	30.44	4.85	.	.	2.24	5.13	9.18	.	4.26	3.53	3.07	6.06	0.74
Egypt '05	9.68	10.91	15.80	3.69	3.69	1.43	3.11	1.36	8.47	20.80	.	11.04	13.13	1.60	9.20
Egypt '14	4.33	5.57	12.50	23.36	1.13	6.12	0.41	1.32	3.90	15.12	.	0.76	.	12.68	16.38
Iraq '06	38.84	39.87	37.57	15.44	8.76	8.04	16.98	14.47	1.57	14.08	21.55	19.58	25.16	3.41	44.94
Jordan '07	1.55	7.08	2.65	14.58	0.40	0.61	6.32	1.72	0.98	.	.	.	.	.	.
Jordan '09	.	.	.	.	0.32	0.22	4.11	1.45	1.55	.	.	.	.	.	.
Mauritania '07	18.41	.	27.25	8.15	.	.	19.89	17.94	12.35	2.28	13.47	17.56	.	.	.
Morocco '06	.	.	.	.	.	.	.	.	.	25.49	22.31	41.07	37.69	3.46	5.95
Morocco '11	22.19	18.10	17.98	16.00	.	.	.	.	.	.	27.17	.	.	.	.
Palestine '04	13.34	10.60	12.38	2.32	4.31	4.50	6.84	12.73	4.51	12.90	.	.	9.04	.	.
Palestine '06	21.57	14.47	5.70	60.47	.	.	10.61	6.68	29.74	46.86	1.06	1.48	.	4.04	3.91
Palestine '10	1.00	6.51	1.03	8.98	0.47	0.68	1.76	1.05	12.36	0.05	4.34	1.58	7.67	7.54	4.23
Palestine '14	6.45	18.60	3.38	5.16	4.52	4.85	0.85	0.89	2.29	9.20	0.43	4.36	0.25	2.58	.
Somalia '06	--	--	--	35.49	--	--	10.47	22.50	27.50	8.96	3.23	26.20	13.75	.	2.79
Sudan '06	1.80	10.81	3.93	2.04	.	.	.	.	.	7.32	.	.	.	.	.
Syria '06	11.52	.	15.34	6.63	.	.	0.98	2.96	1.00	.	3.85	2.53	2.79	5.20	6.17
Tunisia '06	8.91	17.35	--	2.10	.	.	10.68	9.57	4.53	.	21.64	32.43	--	1.42	.
Yemen '13	10.93	17.82	15.96	10.60	3.01	2.85	7.23	6.23	3.01	17.16	.	.	.	1.19	.
Wght. avg.[a]	12.56	14.77	15.70	14.19	3.20	3.21	5.60	5.96	4.83	13.76	16.31	13.32	17.95	5.95	15.98

Notes: Access to prenatal and delivery care is evaluated among women who gave birth in the past 2 years; the rest of indicators are evaluated among children.
Reported numbers are the Shapley decomposition values in percentage form – percentages of the differences in access to ECD opportunities across socio-economic groups that can be attributed to individual socio-economic characteristics – normalized to add up to 100% across the evaluated characteristics. Sex of children and of household heads is omitted from this table even though they serve as criteria in selected models. "." unavailable due to missing data. "--" unavailable due to estimation issues such as small sample sizes, missing variables, or perfect collinearity or perfect prediction of outcomes among selected explanatory variables.
In Palestine '06, urban, rural and refugee-camp residences are distinguished.
[a] Average of countries' most recent waves for which indicator is available, weighted by estimated 2015 population size (UN-DESA, 2015).

Table 5 (cont.). Contribution of Selected Background Characteristics to Inequality in ECD Opportunities – Administrative Region (%)

	Prenatal care	Prenatal visits: 4+	Skilled delivery	Full immun.	Neonatal mortality	Infant mort.	Stunted	Under-weight	Wasted	Iodized salt	4+ dvlp. activities	ECCE 3-4yrs	ECE 5-6yrs	Violent discipl.	Child labor
Algeria '06	2.02	8.63	16.02	6.02	.	.	13.16	42.07	51.45	25.85	16.97	14.71	5.34	75.42	0.13
Comoros '12	1.54	42.07	27.58	45.87	22.46	4.47	35.19	33.53	8.18	33.67	.	.	.	.	40.69
Djibouti '06	28.66	.	23.96	26.69	.	.	20.40	52.92	69.09	.	14.11	20.92	12.12	0.98	31.67
Egypt '05	21.15	20.41	25.89	41.95	9.04	15.97	57.29	41.21	20.63	21.82	.	41.37	32.52	23.53	41.90
Egypt '14	25.31	22.95	31.29	35.30	22.50	27.65	64.46	18.95	54.57	23.60	.	65.86	.	37.28	29.94
Iraq '06	2.08	0.97	3.23	27.59	1.79	0.92	38.28	2.28	1.06	54.36	0.76	2.02	20.78	17.18	6.86
Jordan '07	19.00	25.83	14.68	55.95	36.59	45.01	61.94	29.37	75.32	.	.	.	.	.	.
Jordan '09	.	.	.	.	30.34	35.53	27.33	32.60	51.89	.	.	.	.	.	.
Mauritania '07	18.65	.	20.84	41.12	.	.	29.93	27.87	24.67	28.35	50.42	18.40	.	.	.
Morocco '06	.	.	.	.	.	.	.	.	.	43.70	29.17	11.81	13.32	56.54	46.44
Morocco '11	12.58	12.69	53.43	35.47	.	.	.	.	.	.	13.43	.	.	.	.
Palestine '04	41.28	67.11	76.80	10.31	19.11	10.83	7.62	9.24	56.10	79.68	.	.	21.71	.	.
Palestine '06	15.57	33.41	76.13	1.65	.	.	51.66	22.04	30.20	1.11	1.68	3.74	.	46.09	25.22
Palestine '10	14.95	19.48	68.63	71.43	0.76	3.80	6.12	4.25	19.52	84.91	35.69	5.08	50.51	52.39	75.08
Palestine '14	5.35	4.18	1.64	32.35	0.17	0.43	9.48	5.93	53.64	55.73	35.55	9.11	23.23	34.31	.
Somalia '06	--	--	--	32.12	26.90	12.93	47.46	18.41	29.97	0.16	70.29	18.78	25.12	.	31.30
Sudan '06	48.63	16.10	20.66	40.19	.	.	.	.	.	70.56	.	.	.	.	.
Syria '06	34.35	.	22.31	13.90	.	.	52.32	36.64	57.54	.	38.09	17.94	48.68	45.11	42.58
Tunisia '06	29.24	20.40	--	35.63	.	.	27.50	21.28	58.90	.	24.23	11.61	--	37.56	.
Yemen '13	30.59	17.02	18.70	15.64	14.57	26.89	31.86	28.48	43.80	37.12	.	.	.	47.40	.
Wght. avg.[a]	21.84	15.33	24.37	29.10	17.10	20.72	43.00	23.04	43.92	37.69	20.42	31.29	24.04	44.34	25.79

Notes: Access to prenatal and delivery care is evaluated among women who gave birth in the past 2 years; the rest of indicators are evaluated among children.
Reported numbers are the Shapley decomposition values in percentage form – percentages of the differences in access to ECD opportunities across socio-economic groups that can be attributed to individual socio-economic characteristics – normalized to add up to 100% across the evaluated characteristics. Sex of children and of household heads is omitted from this table even though they serve as criteria in selected models. "." unavailable due to missing data. "--" unavailable due to estimation issues such as small sample sizes, missing variables, or perfect collinearity or perfect prediction of outcomes among selected explanatory variables.
Region is an administrative area such as a state, or a group of areas. Specifically, the following regions are accounted for. Algeria: Centre, North and South; Comoros: Moheli, Ndzouani and Ngazidja; Djibouti: Djibouti proper and rest of country; Egypt: six urban/rural Upper/Lower/Frontier regions; Iraq: Kurdistan and rest of country; Jordan: 12 governorates; Mauritania: Coastal, Saharan and Sahelian; Morocco: 15 governorates; Palestine: Gaza and West Bank (West Jerusalem excluded); Somalia: South and rest of country; Sudan: 9 state-groups; Syria: Coastal, Eastern, Middle, Northern and Southern regions; Tunisia: 9 regions.
[a] Average of countries' most recent waves for which indicator is available, weighted by estimated 2015 population size (UN-DESA, 2015).

Table 6. Intertemporal Comparison of ECD Indicators (Children or Women with Access to ECD, Initial–Final Wave %)

	Prenatal care	Prenatal visits: 4+	Skilled delivery	Full immun.	Neonatal mortality	Infant mort.	Stunted	Under-weight	Wasted	Iodized salt	4+ dvlp. activities	ECCE 3-4yrs	ECE 5-6yrs	Violent discipl.	Child labor
Algeria ‘02–‘06	79.2–89.4	.–55.8	94.4–95.2	92.6–89.2	.	.	19.3–12.4	10.5–4.1	7.6–3.9	61.0–58.4	.–61.7	.–8.9	.–23.9	.–86.2	.–22.2
Djibouti ‘06–‘12	92.3–87.9	.	92.9–87.4	45.7–30.7	.–3.6	.–6.0	32.6–33.5	30.3–29.9	30.1–22.3	.	26.5–36.6	14.1–.	6.4–.	69.6–36.2	18.6–.
Egypt ‘05–‘08–‘14	69.8–73.6–90.2	59.2–67.0–82.7	74.6–79.0–91.6	81.7–91.7–34.2	1.9–1.6–1.4	3.1–2.4–2.3	17.6–28.9–17.6	6.1–6.0–6.8	3.8–7.3–7.6	72.6–76.7–88.3	.	31.6–40.2[c]–58.6	10.7–.–.	97.0–.–94.9	24.3–.–45.5
Iraq ‘06–‘11	78.9–77.7	67.8–50.8	59.8–90.8	50.6–64.3	2.2–2.0	3.3–3.1	23.8–21.7	8.2–6.9	6.0–6.4	24.9–24.4	44.4–53.5	2.5–3.8	4.1–7.0[a]	86.2–77.2	13.4–10.1
Jordan ‘07–‘09–‘12	98.8–.–99.1	94.2–.–94.5	99.0–.–99.6	86.7–.–93.0	1.5–1.4–1.5	2.1–2.1–1.8	14.4–8.0–7.6	5.3–1.8–.	7.2–1.5–.	.	.–.–81.6	.–.–21.7	.	.–.–91.3	.
Morocco ‘04–‘06–‘11	67.9–.–77.6	30.6–.–41.8	62.9–.–23.3	89.6–.–51.9	.	.	.	.	.	.–19.6–.	.–58.0–34.8	.–40.2–.	.–42.4–.	.–95.8–.	.–19.4–.
Palestine ‘04–‘06–‘10–‘14	98.4–98.5–98.6–99.4	86.4–90.4–94.2–96.0	91.6–97.7–68.2–99.6	94.5–85.9–92.7–87.3	2.3–2.1–1.3–1.0	4.0–3.0–2.0–1.7	11.0–11.9–10.9–7.4	6.1–2.3–3.7–1.4	3.4–2.0–3.3–1.2	68.2–87.7–79.5–73.8	.–68.3–66.6–79.0	.–34.1–17.7–26.9	71.1–.–94.3–90.0	.–95.4–92.3–94.1	.–15.3–31.4–.
Syria ‘06–‘09	83.3–87.7	.–69.2	91.4–96.3	34.9–77.9	.–1.2	.–1.7	25.1–25.8	11.0–11.2	10.4–11.8	.–30.4	59.8–55.0	7.4–17.2[c]	44.1–32.9	85.7–58.1	12.3–3.3
Tunisia ‘06–‘11	53.0–98.1	65.2–85.5	.	85.5–89.6	.	.	6.4–10.1	3.4–.	2.8–.	.	53.8–71.1	27.3–44.5	.	98.5–94.9	.–24.0
Yemen ‘03–‘06–‘13	.–47.0–61.0	.– .–25.3	.–35.7–43.6	.–40.7–43.5	.–4.0–2.5	.–7.1–4.0	53.1–.–46.3	45.6–.–38.9	12.4–.–16.4	.– .–49.0	.–25.5–.	.–2.7–.	.	.–93.2–80.0	.–15.8–.

Legend: Light green background indicates improvement of values over time; darker red color indicates worsening. When information from three waves shows a non-monotonic trend, comparison of the first wave and the third wave is used.

Notes: Values are comparable to those in table 2 above and table 2A.1 in El-Kogali & Krafft (2015:44). For clarity, only indicators available in multiple waves for a country are reported. “.” Unavailable due to missing data in all or all-but-one waves. For Jordan, Morocco and Palestine, values from three waves are reported: Initial–Intermediate–Final.

Access to prenatal and delivery care is evaluated among women who gave birth in the past 2 years; the rest of indicators are evaluated among children.

[a] Source: The Central Statistics Organization and the Kurdistan Regional Statistics Office (2012), as cited in El-Kogali & Krafft (2015:134).

[c] For Egypt and Syria, El-Kogali & Krafft report ECCE attendance for children 3–5 years of age.

Table 7. Intertemporal Comparison of Inequality in ECD Opportunities: Opportunities to Be Redistributed (*Dissimilarity Index*, Initial–Final Wave %)

	Prenatal care	Prenatal visits: 4+	Skilled delivery	Full immun.	Neonatal mortality	Infant mort.	Stunted	Under-weight	Wasted	Iodized salt	4+ dvlp. activities	ECCE 3-4yrs	ECE 5-6yrs	Violent discipl.	Child labor
Algeria '02–'06	7.7–4.6	. –14.0	2.4–2.6	2.2–2.8	13.9–.	14.7–.	9.9–14.8	.–20.9	.–15.3	. –13.2	. –7.2	. –33.4	. –30.1	. –2.9	. –6.5
Djibouti '06–'12	2.5–6.4	.	3.0–9.6	8.2–22.2	.	.	12.7–9.6	12.1–.	8.5–.	.	15.7–13.9	35.1–34.6	38.2–.	7.1–11.6	23.3–23.2
Egypt '05–'08–'14	12.1–9.0–3.3	16.6–12.1–5.4	10.9–9.0–3.4	2.6–1.7–7.2	18.1–24.9–21.2	20.3–20.3–17.9	12.2–9.0–11.5	15.2–12.1–14.2	17.1–12.4–8.4	10.7–7.2–4.1	.	25.7–21.8–15.2	34.3–.–.	0.7–.–1.0	12.1–.–10.8
Iraq '06–'11	6.4–20.9	11.9–10.1	7.4–2.9	13.4–8.6	11.0–9.7	8.2–6.1	9.1–7.1	6.8–8.5	7.6–7.0	21.9–20.3	10.5–12.6	41.2–43.5	42.2–44.9	4.9–2.6	12.9–17.0
Jordan '07–'09–'12	0.6–.–0.5	1.5–.–1.8	0.4–.–0.2	3.9–.–2.3	33.6–37.8–19.7	27.8–28.4–20.3	18.9–19.6–24.1	26.3–30.4–27.8	18.8–34.3–24.2	.	.–.–3.4	.–. –24.4	.	.–.–4.5	.
Morocco '04–'06–'11	14.3–.–11.4	.–.–25.7	19.6–.–22.6	3.6–.–7.4	19.5–.–.	19.8–.–.	16.1–.–.	.	.	.–32.2–.	.–15.0–22.2	.–36.7–.	.–32.6–.	.–1.9–.	.–24.6–.
Palestine '04–'06–'10–'14	0.5–0.5–0.3–0.2	4.3–2.3–1.4–0.8	3.1–0.8–4.3–0.2	1.4–2.6–2.2–3.3	12.4–.–11.2–39.0	13.4–.–11.4–33.8	9.3–13.4–9.8–11.3	11.7–11.4–9.9–19.9	18.2–14.4–10.8–23.2	8.5–1.0–7.1–5.0	.–4.7–6.2–4.0	.–12.2–15.2–14.8	5.7–.–1.5–2.7	.–0.9–1.3–1.4	.–15.7–16.4–.
Syria '06–'09	6.8–5.1	.–8.1	4.3–2.2	7.6–8.6	.	.	12.5–13.0	15.0–13.4	15.2–11.9	.–32.2	10.3–14.0	37.7–41.1	17.2–10.6	2.1–16.4	12.0–31.5
Tunisia '06–'11	18.7–0.8	10.2–3.5	.	4.8–4.4	. –40.0	. –33.4	26.0–19.8	38.5–28.0	29.0–22.9	.	17.8–11.8	34.3–25.5	.	0.9–1.3	.–21.7
Yemen '03–'06–'13	.–16.8–14.5	.–.–32.0	.–26.1–22.9	.–20.6–14.4	.–.–19.3	.–15.5–16.2	4.9–.–12.3	.–.–13.7	.–.–12.2	.–.–17.4	.–19.3–.	.	.	.–.–4.3	.–25.1–.

Legend: Light green background indicates improvement of values over time; darker red color indicates worsening. When information from three waves shows a non-monotonic trend, comparison of the first wave and the third wave is used.

Values are comparable to those in table 4 above and table 2.1 in El-Kogali & Krafft (2015:37). Reported numbers are the percentages of the levels of access to ECD opportunities that should be redistributed to achieve equality of access across evaluated socio-economic groups. For clarity, only dissimilarity indices available in multiple waves for a country are reported.

"." Unavailable due to missing data in all or all-but-one waves. For Jordan, Morocco and Palestine, values from three waves are reported: Initial–Intermediate–Final.

Access to prenatal and delivery care is evaluated among women who gave birth in the past 2 years; the rest of indicators are evaluated among children.

Because statistical models in this and in El-Kogali & Krafft's study use different samples and account for different sets of variables, caution must be taken when comparing predicted values.

[c] For Egypt and Syria, El-Kogali & Krafft report ECCE attendance for children 3–5 years of age.

V. Within-Country Results for Anthropometric Indicators

To evaluate children's physical development within each country and across the Arab region more carefully, we next consider the entire distribution of health outcomes across all children covered by the household surveys. We restrict our attention to children's anthropometric status – their height for age, weight for age and weight for height as well as the corresponding stunting, underweight and wasting rates – and provide snapshots across all children 0–59 months old, as well as dynamic pictures of the evolution of children's physical stature across years. The entire distribution of children's anthropometric measurements is presented for each country sample and compared with the reference population with a healthy median and variance. This allows us to see the severity of nutritional deficiency across the entire children's sample. In addition, children's anthropometric measurements relative to a healthy population are shown by children's age in months. This allows us to identify crucial points in time when children's growth is impeded most severely, and when a targeted institutional intervention should be a humanitarian priority.

Compared to other ECD indicators evaluated above, anthropometric indicators can change from year to year in children's lives, and do not necessarily reflect cumulative conditions of children's upbringing. On the other hand, their status in each year has repercussions for individuals' lifetime outcomes. For these reasons it is appropriate to study these variables over time, across the first five years (60 months) of children's lives. Anthropometric information is unavailable in our data for Morocco (2006 and 2011) and Sudan (2006). These country surveys are omitted from the following sections.

It should be noted that in the study of anthropometric indicators across children's ages, we do not follow individual children over time, but we make use of the various month-by-month cohorts of children covered in the surveys. Hence, one-month old children had been born shortly before the survey was administered, while 59-month old children had been born five years previously. This timing difference can have serious consequences for any identified trends and their interpretation. Armed conflicts, famine or demographic change may affect long-term health outcomes of a single cohort of children rather than cause a mere short-term dip in the health of all cohorts (at different ages). The following sections report the interpretation as if children are followed over time, but events that may have caused differentials across child cohorts are noted.

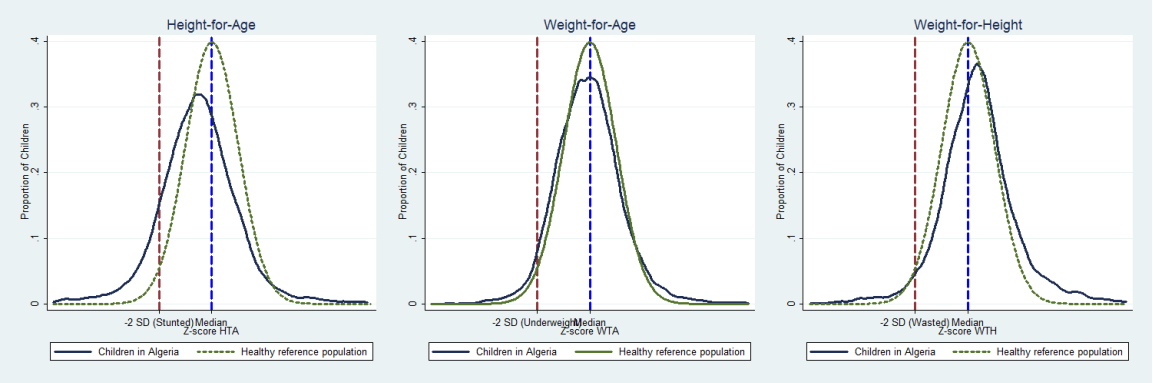
1. Algeria 2006

Figures 2 and 3 show that across households surveyed in Algeria in 2006, one can identify a central trend in children's nutritional status over children's first five years of life. Children's height for age is distributed markedly lower than that of reference healthy population. Weight for age is also distributed slightly lower, while weight for height is distributed higher than the reference population. These trends jointly suggest that the distribution of height and to some degree weight among Algerian children is low. The height-for-age ratio falls dramatically in the first year of life among children in the lowest wealth-quintile households. It also falls significantly, now across all wealth groups, in the fourth and fifth years. Correspondingly, as many as 20 percent of children in the lowest-wealth group are classified as stunted at the ages of 18 months and 54 months.

Children's weight for age starts above that in reference healthy population at the time of children's birth, but falls throughout children's first five years of life, particularly among lowest-wealth households during children's first year. Eight percent of children in the lowest quintile are classified as underweight at the age of 54 months, similar to the number expected in a reference healthy population (2.3%). Finally, weight for height hover above the reference healthy levels, suggesting that stunting is a greater concern to Algerian children than underweight.

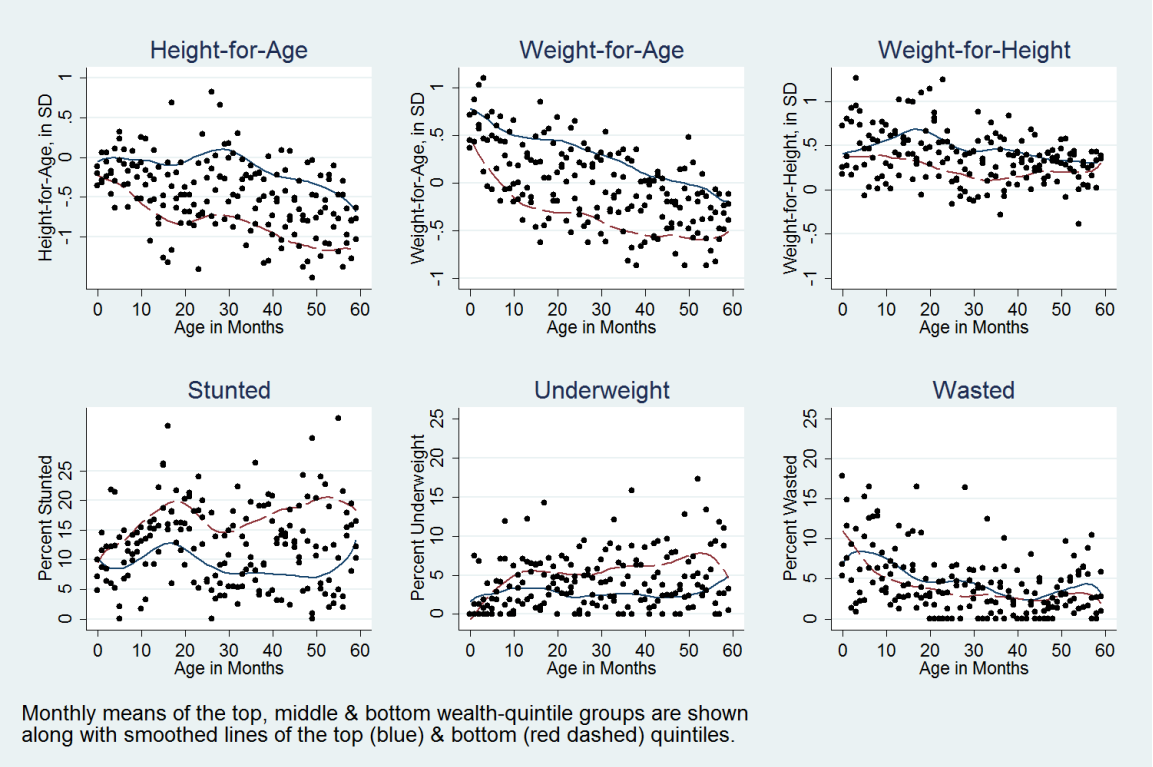
Finally, results in figure 3 can be compared to year 2002 numbers in El-Kogali and Krafft's (2015:69) figure 4.3. These figures confirm the finding in table 6 that substantial progress occurred during the four years. The rate of stunting fell from 19.3 to 12.4 percent among all children, and the occurrence of underweight fell from 10.5 to 4.1 percent.

Figure 2. Anthropometric Indicators of Child Development for Children Aged 0–59 Months vis-à-vis Reference Healthy Population, Algeria 2006 (*z*-score deviations from reference distrib.)



The blue vertical line on the right shows the median (also the mean) of the reference healthy population, the standard normal distribution, while the red vertical line on the left shows the median less two standard deviations, serving as the official cutoff point for stunted, underweight and wasted population.

Figure 3. Anthropometric Indicators of Child Development by Children's Age, Algeria 2006



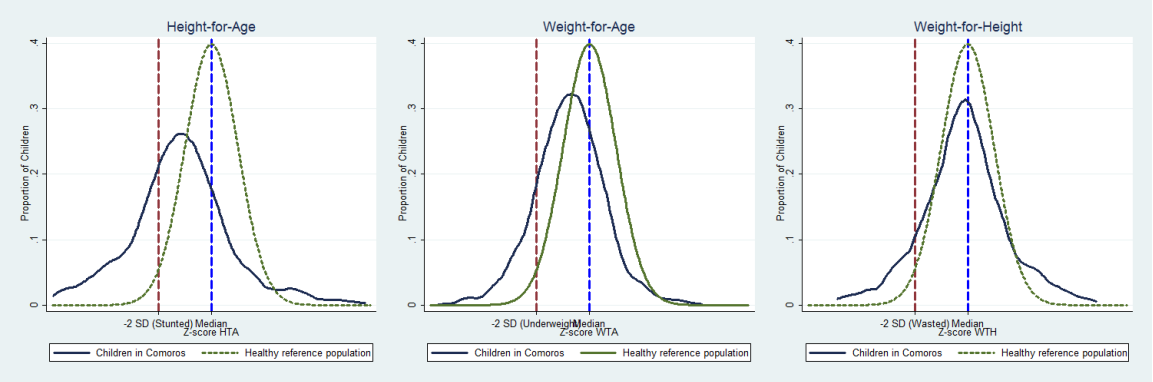
This figure is comparable to figure 4.3 for 2002 Algerian PAPFAM in El-Kogali & Krafft (2015:69). Each point represents the mean of values in a wealth-quintile group for a particular month. Fitted lines for the top and bottom wealth-quintiles are lowess-smoothed using a locally-weighted running-line least-squares method.

2. Comoros 2012

In Comoros, children's height for age and weight for age are distributed significantly below the reference healthy population, while weight for height is distributed as highly as the reference population. All these three distributions for Comoros are notably wider than the reference, suggesting the presence of outliers (or measurement errors in the survey) on both tails, particularly the lower tails of the distributions. As with Algeria, we conclude that the distribution of height and weight among Comorian children is low, but here both height and weight are of similar concern. Large fractions of children have height and weight at levels two or more standard deviations below the mean of the reference healthy distribution.

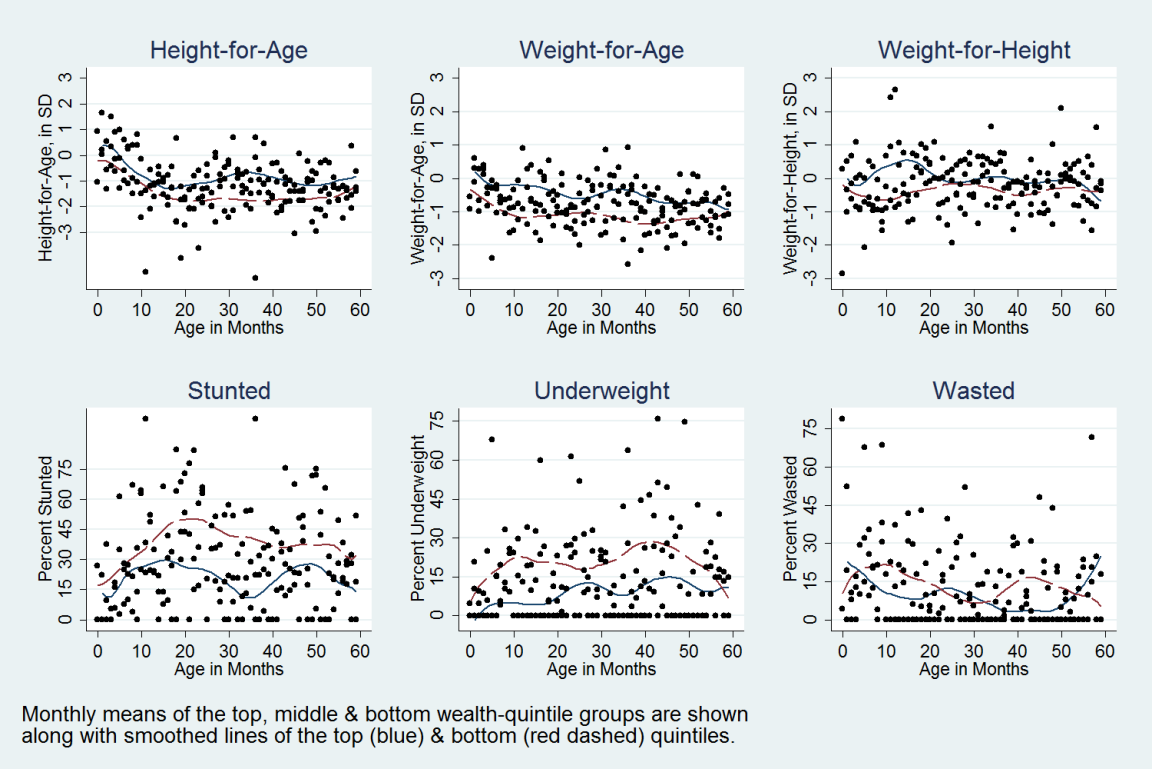
Across wealth quintiles of the population, children's height and weight fall significantly in the first year of their life. By the age of 18 months, as many as 50 percent of children in the lowest-wealth group (30% in the highest quintile) are classified as stunted, and the rate remains around 40 percent (30% in the highest quintile) for the following 36 months. Similarly, as many as 30 percent of children among the poorest fifth of households (15% in the highest quintile) are officially underweight at 42 months of age. These high prevalence rates of stunting and underweight indicate that a greater portion of Comorian children face inadequate nutrition compared to a reference healthy population.

Figure 4. Anthropometric Indicators for Children Aged 0–59 Months vis-à-vis Reference Population, Comoros 2012 (*z*-score deviations from reference distrib.)



The blue vertical line on the right shows the median of the reference healthy population, the standard normal distribution, while the red vertical line on the left shows the median less two standard deviations, serving as the official cutoff point for stunted, underweight and wasted population.

Figure 5. Anthropometric Indicators by Children's Age, Comoros 2012



Each point represents the mean of values in a wealth-quintile group for a particular month. Fitted lines for the top and bottom wealth-quintiles are lowess-smoothed using a locally-weighted running-line least-squares method.

3. Djibouti 2006

In Djibouti, children's height for age, weight for age and weight for height are all distributed well below the reference healthy distributions, and are significantly wider than the reference. Clearly height and weight are much more dispersed on both tails among Djiboutian children – as reported in the MICS survey – than in reference healthy population. Inadequate height and especially inadequate weight are a concern among Djiboutian children. Distribution of weight for height is dispersed particularly widely, with a notable concentration of cases at 5 standard

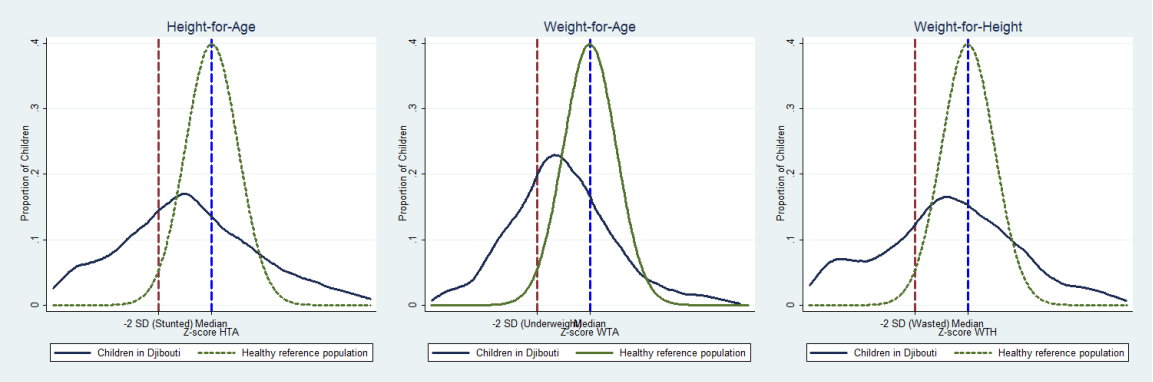
deviations below the healthy-population median. This suggests that children suffering stunting are different from those who are underweight, and there is a large number of children who are significantly underweight whose height is not itself worrying. However, the combination of being underweight and tall gives rise to the problem of having critically low body mass and wasting. This occurs for one third of all children in the bottom wealth quintile, and for a quarter in the upper quintile.

Decomposing the distribution by children's age, we find that height falls significantly in the first 18 months of children's life among the poorest fifth of households, while it falls only modestly among the richest group. By the 18th month of life, 55 percent of poorest-quintile children and 30 percent of richest-quintile children are stunted. The numbers then slightly improve, and the rates of stunting fall off to 20–30 percent for both wealth groups by the age of five years.

The pattern followed by children's typical weight is equally worrying. Children's weight falls dramatically by 2.5 standard deviations of the reference distribution in the first year, for both the poorest and the richest wealth quintile. In the following four years the numbers deteriorate further by a small amount. In terms of children being officially underweight, these numbers translate into 55 percent of children being classified as underweight at the age of 18 months among the poorest households and nearly 30 percent among the richest households. By the 54th month, the difference between wealth quintiles nearly disappears, and children in both groups exhibit a rate of underweight of nearly 40 percent. Finally, the results for weight-for-height indicate that the ratio is well-balanced among the richest quintile group, with the expected line nearly horizontal at zero (top right panel in figure 7) and just over 20 percent of children officially in a state of wasting (bottom right panel, blue line averaged across ages). Among the poorest quintile, children are typically one half of a standard deviation below the health distribution mean, and over a third of them are in a state of wasting.

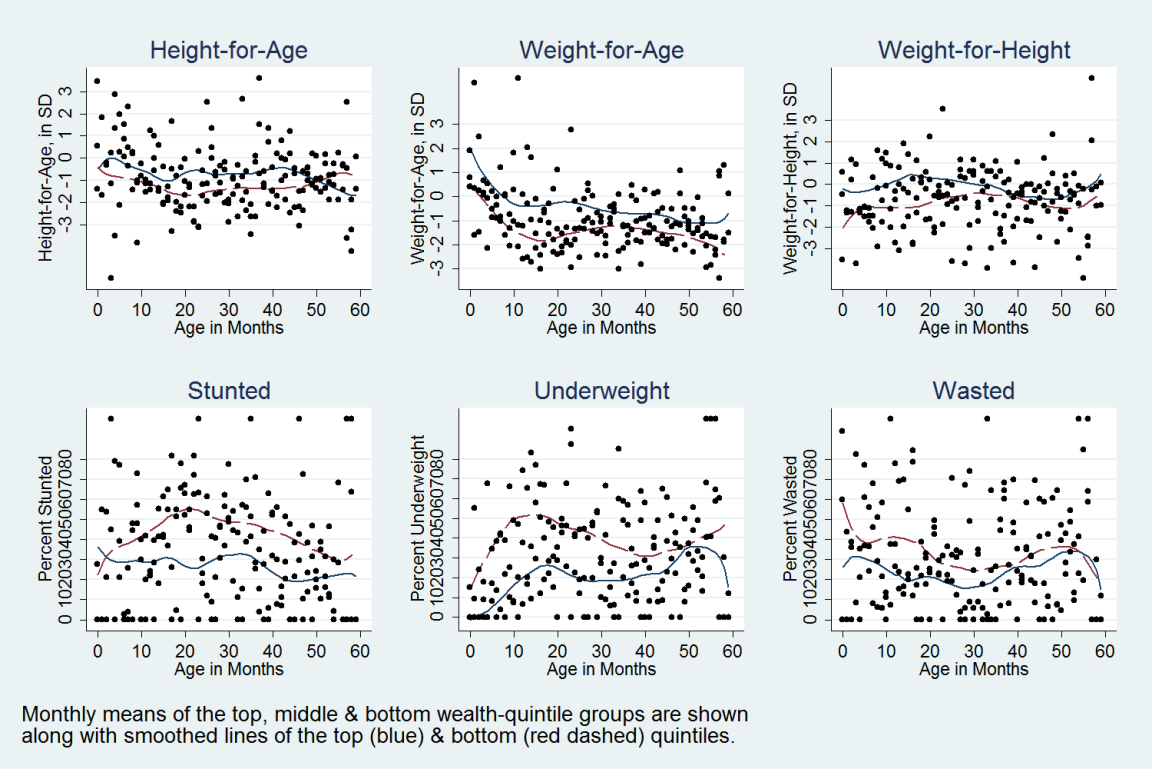
Finally, results in figure 7 can be compared to year 2012 numbers in El-Kogali and Krafft's (2015:89) figure 5.3. The results turn out to be surprisingly similar, suggesting that children's access to nutrition and medical care necessary for healthy physical growth did not improve. While the rate of wasting slightly decreased from 25 percent across all wealth quintiles to 20 percent, rates of stunting and underweight remained unchanged near 30 percent. These results suggest that an intervention into conditions affecting Djiboutian children's height and weight is urgently needed in children's first two years, and a follow-up monitoring of children's weight may need to be conducted between the children's third and fifth year of life.

Figure 6. Anthropometric Indicators for Children Aged 0–59 Months vis-à-vis Reference Population, Djibouti 2006 (*z*-score deviations from reference distrib.)



The blue vertical line on the right shows the median of the reference healthy population, the standard normal distribution, while the red vertical line on the left shows the median less two standard deviations, serving as the official cutoff point for stunted, underweight and wasted population.

Figure 7. Anthropometric Indicators by Children's Age, Djibouti 2006



This figure is comparable to figure 5.3 for 2012 Djiboutian PAPFAM in El-Kogali & Krafft (2015:89).
Each point represents the mean of values in a wealth-quintile group for a particular month. Fitted lines for the top and bottom wealth-quintiles are lowess-smoothed using a locally-weighted running-line least-squares method.

4. Egypt 2005 and 2014

In the 2005 wave of the Egyptian survey, similar to Comoros, children's height for age and weight for age are distributed below what would be expected in reference healthy population, while weight for height is distributed similarly to the reference population. This suggests that the distribution of height and weight among Egyptian children is low, but their ratio does not give rise to major concern.

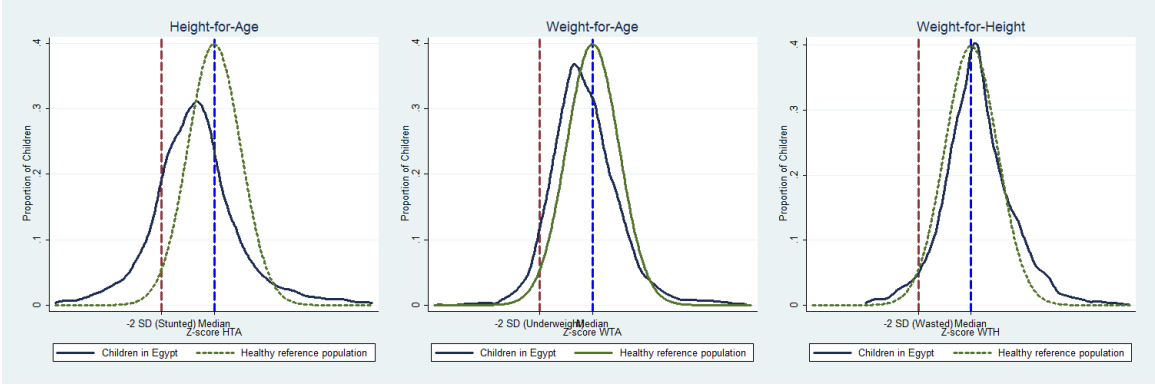
Across children's ages and across wealth quintiles of the population, the average height for age and weight for age (as well as weight for height) held steady. The typical height for age was roughly 0.3 and 1.1 standard deviations below the reference healthy mean for the richest and the poorest quintile, respectively, and were stable across children's ages. The typical weight for age was roughly 0.1 and 0.5 standard deviations below the reference healthy mean for the richest and the poorest quintile, respectively. The rate of stunting jumped up over the first year of children's lives, to 30 percent for the bottom quintile and 20 percent for the top quintile, and then fell to 20 and 8 percent, respectively. Similarly, for the fraction of children who are underweight, the rate jumped to some 11 percent for both quintile groups, and then fell to under 6 percent for both groups.

These results can be compared to those for years 2008 (refer to the Appendix, figures A1–A2) and 2014. This comparison reveals that the development was mixed. While the distribution of weight for age improved, to the extent that the 2008 and 2014 distributions was just off center to the left of the reference healthy distribution, the distribution of height for age deteriorated. In 2008 and 2014 there were more children in the left tail of the height-for-age distribution. The rate of official stunting among children was as high as 38 percent in the bottom wealth quintile in 2008 (35% in the upper quintile), compared to 30 percent in 2005 (20% in the upper quintile). By 2014, the rate of stunting fell to just over 20 percent for both the poorest and the richest quintiles, representing an improvement among poor households but a deterioration among rich households. This corroborates the findings in tables 1 and 2 that the nationwide rate of stunting stagnated between 2005 and 2014 (at 17.6%), but the inter-quintile range of stunting shrank significantly (from 23.6–14.4 to 19.7–19.4). This suggests that a drastic improvement took place in regard to access to nutrition among the poorest, but deterioration in access to nutrition in not so poor households.

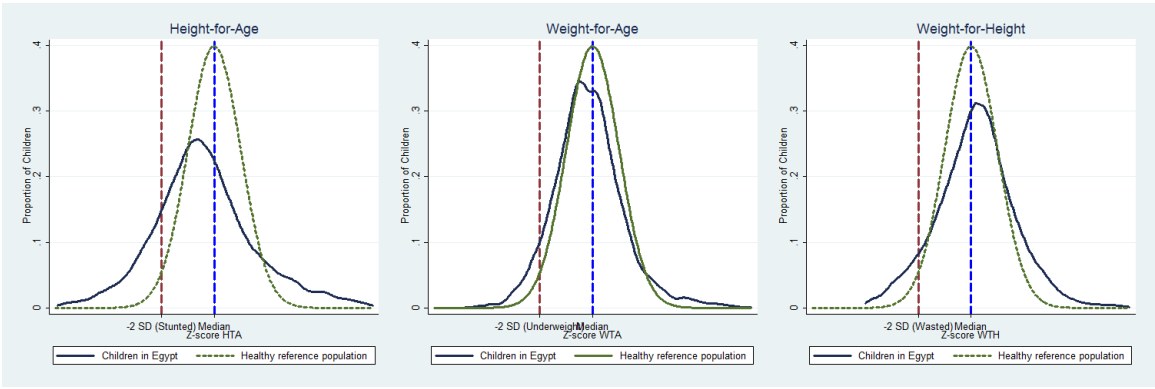
Evaluating children's stature across their ages, we find another surprising difference between year 2005 and subsequent years. In 2005, children's growth deteriorated rapidly in the first year of life – particularly in the bottom wealth quintile – and the rate of stunting peaked around the twelfth month, before they improved slightly in the following four years. In 2008 and 2014, on the other hand, children's growth was deteriorating nearly monotonically during the first three years of life – in both the bottom and the top wealth quintile – before stabilizing in the fourth and fifth years. This indicates that nutritional deficiency became a more protracted and more widespread problem among Egyptian children after 2005. The fact that the 2005 and 2008 survey waves may cover some of the same children, with the same characteristics and backgrounds, does not appear to explain the phenomenon. Since children who were one year old in 2005 – the age when the rate of stunting was highest in that year – became four years old in 2008, we would expect a peak of stunting around age four in 2008. Instead, we observe stagnation or even a slight dip in the rate of stunting among 42–54 month-old children.

Figure 8. Anthropometric Indicators of Child Development for Children Aged 0–59 Months vis-à-vis Reference Population, Egypt 2005 & 2014 (*z*-score deviations from reference distrib.)

2005:



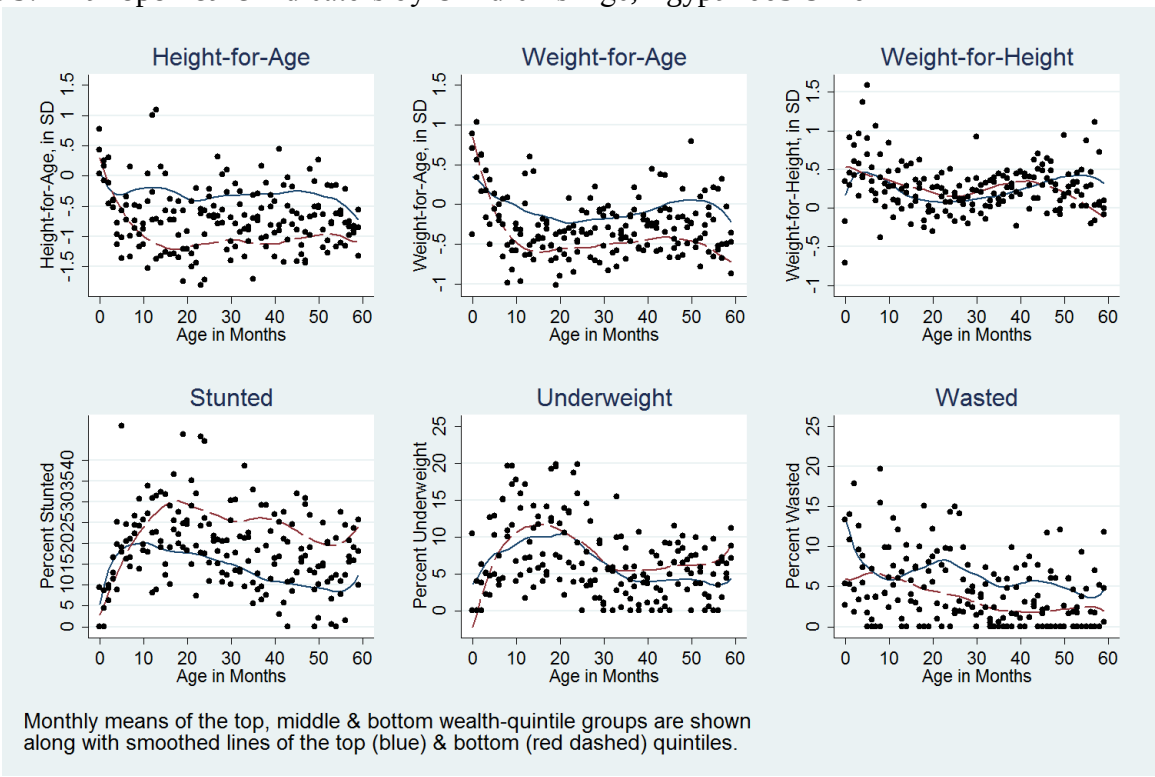
2014:

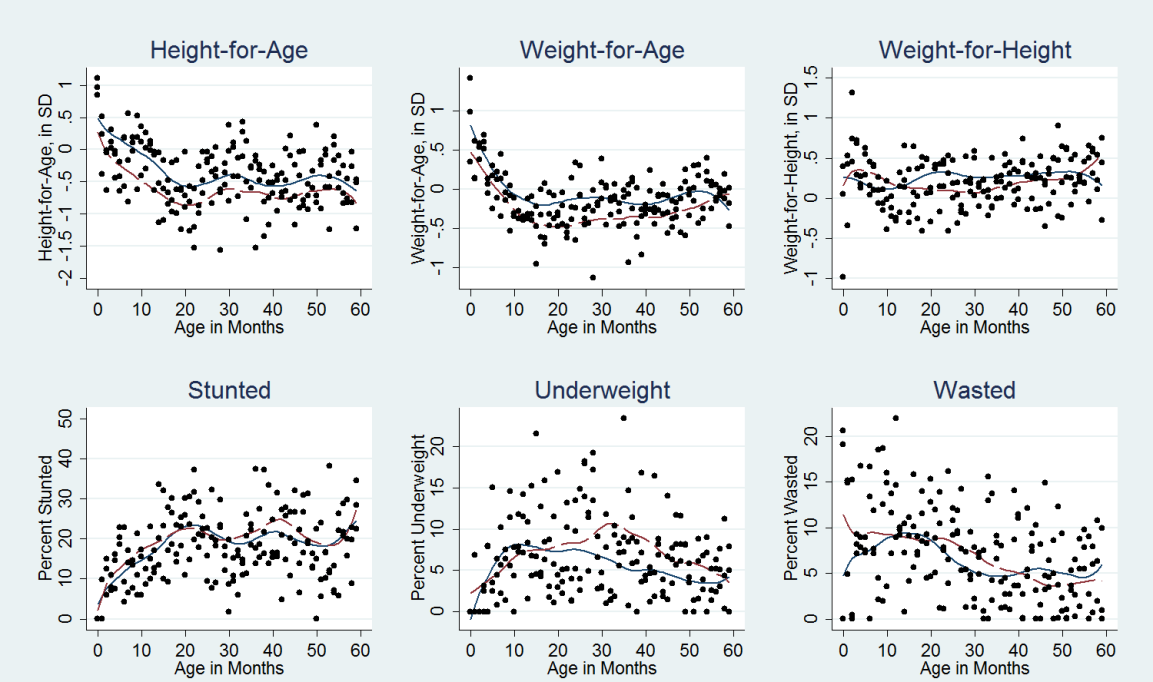


The blue vertical line on the right shows the median of the reference healthy population, the standard normal distribution, while the red vertical line on the left shows the median less two standard deviations, serving as the official cutoff point for stunted, underweight and wasted population.

Figure 9. Anthropometric Indicators by Children's Age, Egypt 2005 & 2014

2005:





2014:

This figure is comparable to figure 6.2 for the 2008 Egyptian DHS in El-Kogali & Krafft (2015:108).
Each point represents the mean of values in a wealth-quintile group for a particular month. Fitted lines for the top and bottom wealth-quintiles are lowess-smoothed using a locally-weighted running-line least-squares method.

5. Iraq 2006

In Iraq, once again, children's height for age and to a lesser degree weight for age are distributed below what would be expected in reference healthy population, while the distribution of weight for height overlays well with the reference distribution. This suggests that the distribution of height and weight among Iraqi children is low, but their ratio does not reveal any shortcomings.

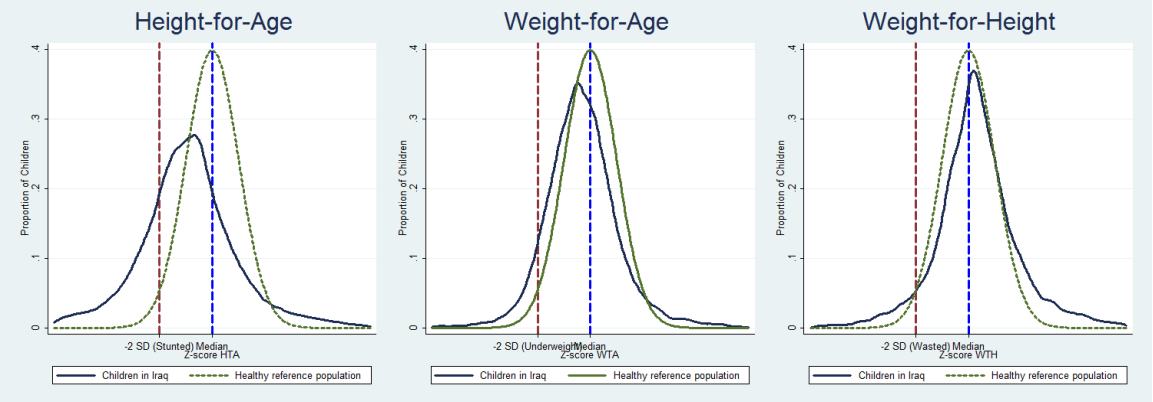
Across children's ages and across wealth quintiles of the population, the average height for age and weight for age (as well as weight for height) are quite steady, as we saw in Egypt in 2005. Regarding stunting, its prevalence among the highest wealth quintile households falls nearly monotonically from some 25 percent right after children's birth to 15 percent by the end of year four. Among the poorest households, the rate jumps in the second year from 20 to 30 percent, and then retreats to near 20 again by the middle of the fifth year.

For the fraction of children who are underweight, the rate jumps from 5 to 12 percent in the first 18 months for both the poorest and the richest quintile groups. Then it retreats to 5-8 percent by the end of the fifth year for both wealth groups. The rate of wasting is similar to a reference healthy population, at 5-7 percent of children across all age groups and wealth quintiles.

Figures 9 and 10 do not reveal any long-term consequences of the political turmoil following the 2003 toppling of Saddam Hussein. There is no noticeable difference between children older than three years and younger cohorts.

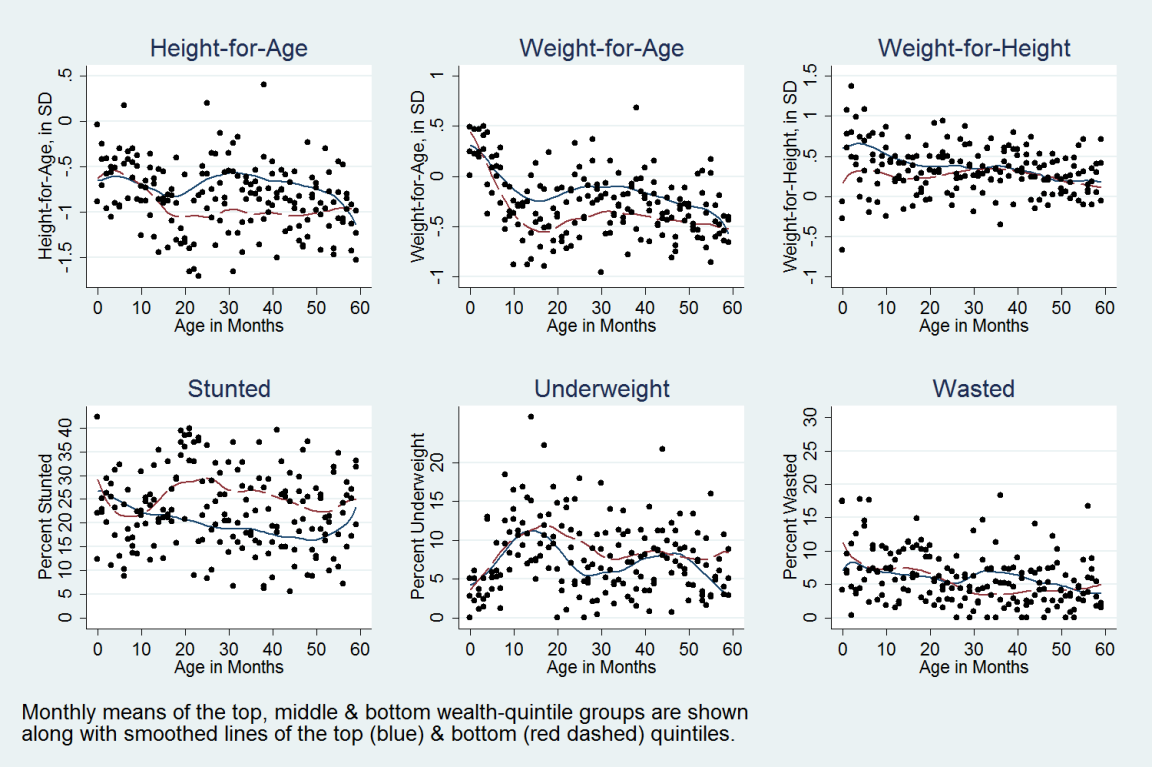
Figures 9 and 10 can be compared to those for year 2011 in the Appendix figures A3 and A4. This reveals that the distribution of children's height slightly improved during the five years, in the sense that some children from poor households escaped the lower tail. This is confirmed by a modest improvement in the rate of stunting in the poorest quintile. Distribution of children's height in higher quintile groups and distribution of weight remained essentially unchanged.

Figure 10. Anthropometric Indicators of Child Development for Children Aged 0–59 Months vis-à-vis Reference Population, Iraq 2006 (*z*-score deviations from reference distrib.)



The blue vertical line on the right shows the median of the reference healthy population, the standard normal distribution, while the red vertical line on the left shows the median less two standard deviations, serving as the official cutoff point for stunted, underweight and wasted population.

Figure 11. Anthropometric Indicators by Children's Age, Iraq 2006



This figure is comparable to figure 7.3 for the 2011 Iraqi MICS in El-Kogali & Krafft (2015:132).

Each point represents the mean of values in a wealth-quintile group for a particular month. Fitted lines for the top and bottom wealth-quintiles are lowess-smoothed using a locally-weighted running-line least-squares method.

6. Jordan 2007 and 2009[15]

In Jordan in 2007, children's height for age is distributed below what would be expected in a reference healthy population, while the distribution of weight for age is just slightly off center to the left of the reference distribution (refer to figures 12 and 13). Children's weight for height overlays well with the reference distribution, with the exception that the Jordanian distribution has thicker tails. That is due to the thickness of tails in the distribution of height for age, containing many outliers with unusually low or great heights. This is potentially due in part to recollection or measurement issues in the Demographic and Health Survey. Across different ages, approximately 10 percent of children are stunted among the richest quintile of households, and 20 percent among the poorest quintile. Regarding prevalence of children who are underweight or wasting, the rates are only slightly above what they would be under the reference distribution – below 10 percent of children across all ages (compared to 2.3% under the reference distribution).

In 2007, physical health of Jordanian children deteriorated slightly between the third and fifth year of their lives, as the average height for age and weight for age fell below the levels among the reference healthy population. The distribution of weight for height was above that of the reference healthy population, but also deteriorated toward the reference level during the fourth and fifth years of children's lives.

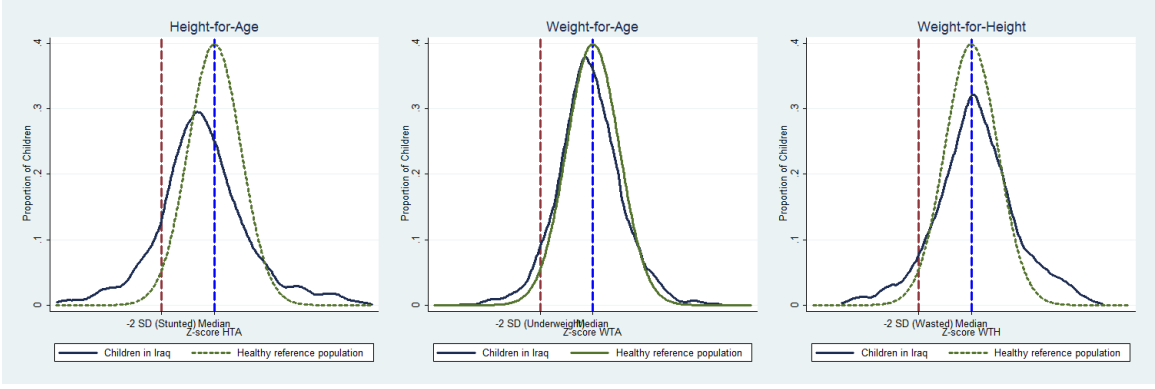
In the 2009 wave of Jordanian data, distributions of anthropometric indicators are quite a bit different from those in the 2007 wave (refer to footnote 15). Height for age is distributed more narrowly, with fewer outliers, and not as much to the left of the reference distribution as the 2007 variable. Weight for age follows the reference distribution quite closely. As a result of these trends, weight for height is distributed higher than the reference distribution.

For both height for age and weight for age, the status of children in the bottom wealth quintile worsens in the second and third years of life. Both of these indicators fall, and the rates of stunting and underweight rise. In the top wealth quintile, on the other hand, height for age and weight for age fall noticeably in the first year of children's lives, from relatively high levels, to levels similar in reference healthy population. This fall may imply problems with maternal nutrition or with quality of complimentary feeding of babies (Krafft, 2015). Comparing figures for years 2007 and 2009 as well as 2012 (in the Appendix figures A5 and A6), reveals that the distribution of children's height and weight, as well as the rates of stunting and underweight, improved modestly from 2007 to 2009 and remained stagnant until 2012.

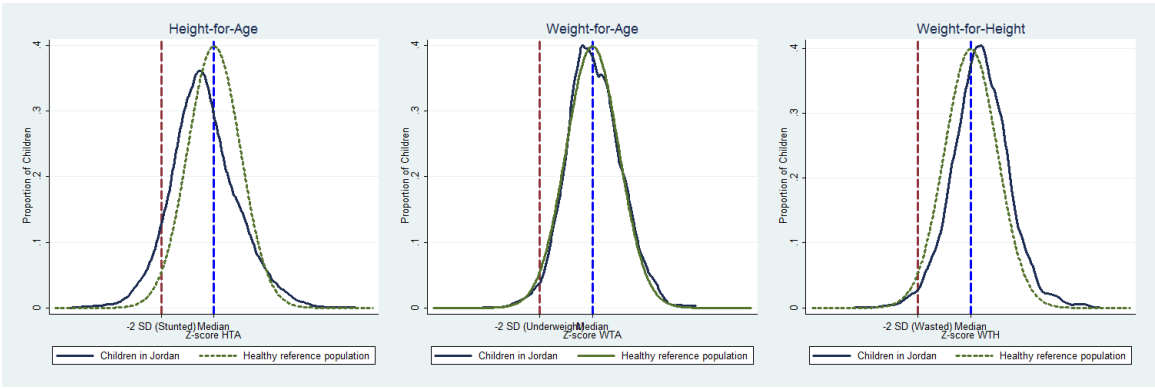
Figure 12. Anthropometric Indicators of Child Development for Children Aged 0–59 Months vis-à-vis Reference Population, Jordan 2007 & 2009 (*z*-score deviations from reference distrib.)

[15] The collection of anthropometric measurements in the 2007 Jordanian DHS was marred by important problems that call into question the use of these data or their comparison to other survey waves (Department of Statistics, Jordan, and ICF International 2008). Results in this section should thus be viewed with caution.

2007:



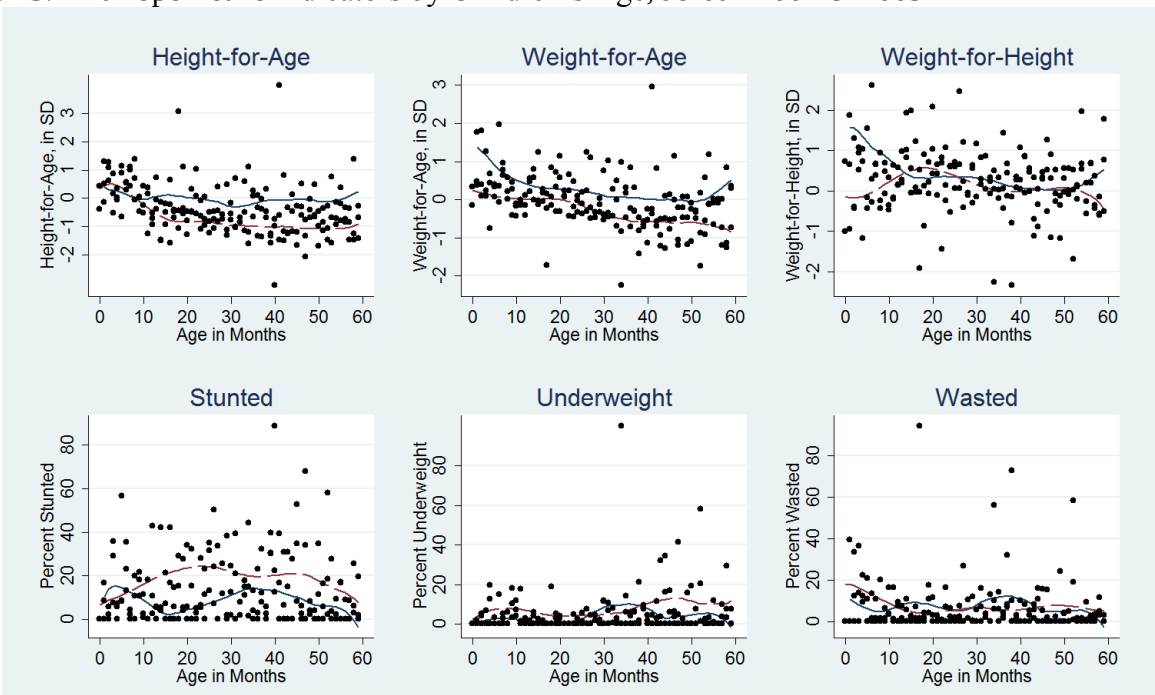
2009:

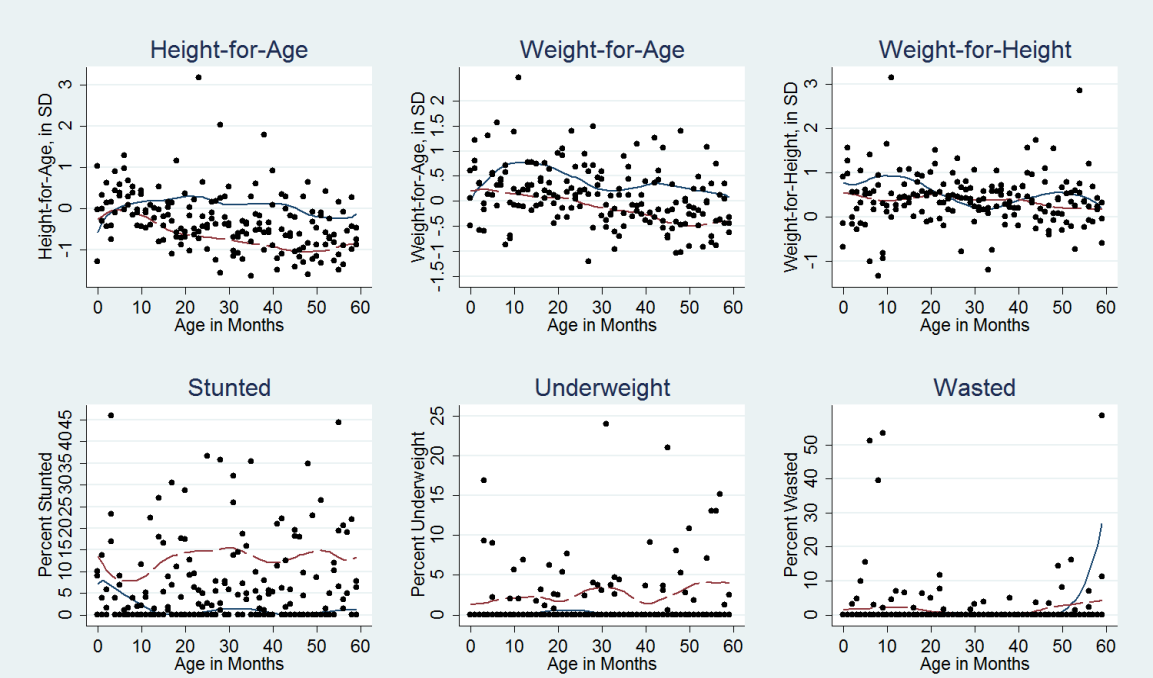


The blue vertical line on the right shows the median of the reference healthy population, the standard normal distribution, while the red vertical line on the left shows the median less two standard deviations, serving as the official cutoff point for stunted, underweight and wasted population.

Figure 13. Anthropometric Indicators by Children's Age, Jordan 2007 & 2009

2007:





2009:

This figure is comparable to figure 8.3 for the 2012 Jordanian DHS in El-Kogali & Krafft (2015:156). Each point represents the mean of values in a wealth-quintile group for a particular month. Fitted lines for the top and bottom wealth-quintiles are lowess-smoothed using a locally-weighted running-line least-squares method.

7. Mauritania 2007

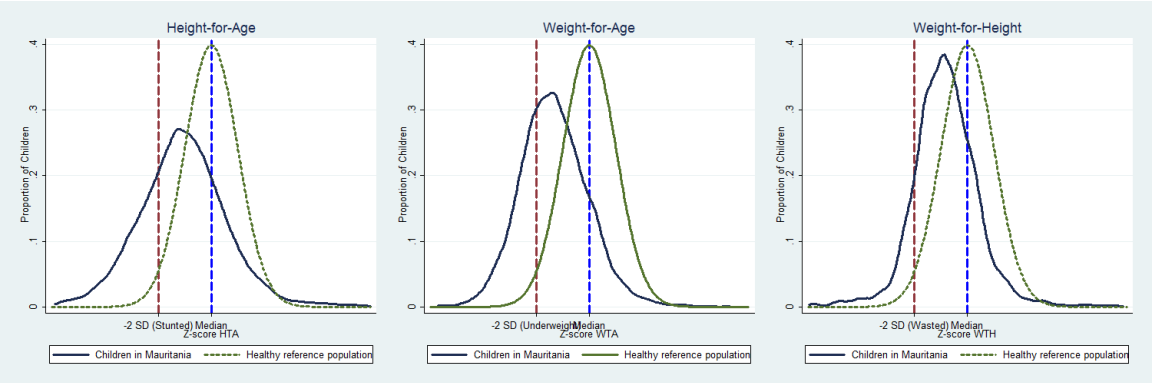
For Mauritania, all three distributions in figure 14 are shifted to the left of the respective reference healthy distributions, and the distribution of height for age (and to some degree that of weight for age) has heavy tails. This implies that a significant fraction of Mauritanian children have height and weight well below what we would expect in a healthy-population distribution. The problem is particularly acute for children's weight, leading to an inadequate proportion of weight for height. The fact that the distribution of weight for height is relatively narrow suggests that it tends to be the same children who are in the tails of the two height and weight distributions.

Figure 15 reveals that the bulk of the problem arises in the first 18 months of children's lives. Typical height for age falls by more than half of a standard deviation relative to the reference distribution, and the rate of stunting jumps from 15 to 40 percent among bottom wealth-quintile households, and from 10 to 20 in the upper quintile. With respect to weight for age, prevalence of underweight children rises to near 50 percent in the poorest fifth of households, and 18 percent among the fifth. Finally, the rate of wasting among children jumps to 29 percent among the poor, and 10 among the rich.

Another period of concern is the third and fourth years of children's lives when their height for age drops and prevalence of stunting rises again to near 45 in the bottom quintile and 25 in the top quintile (without corresponding changes in weight for age).

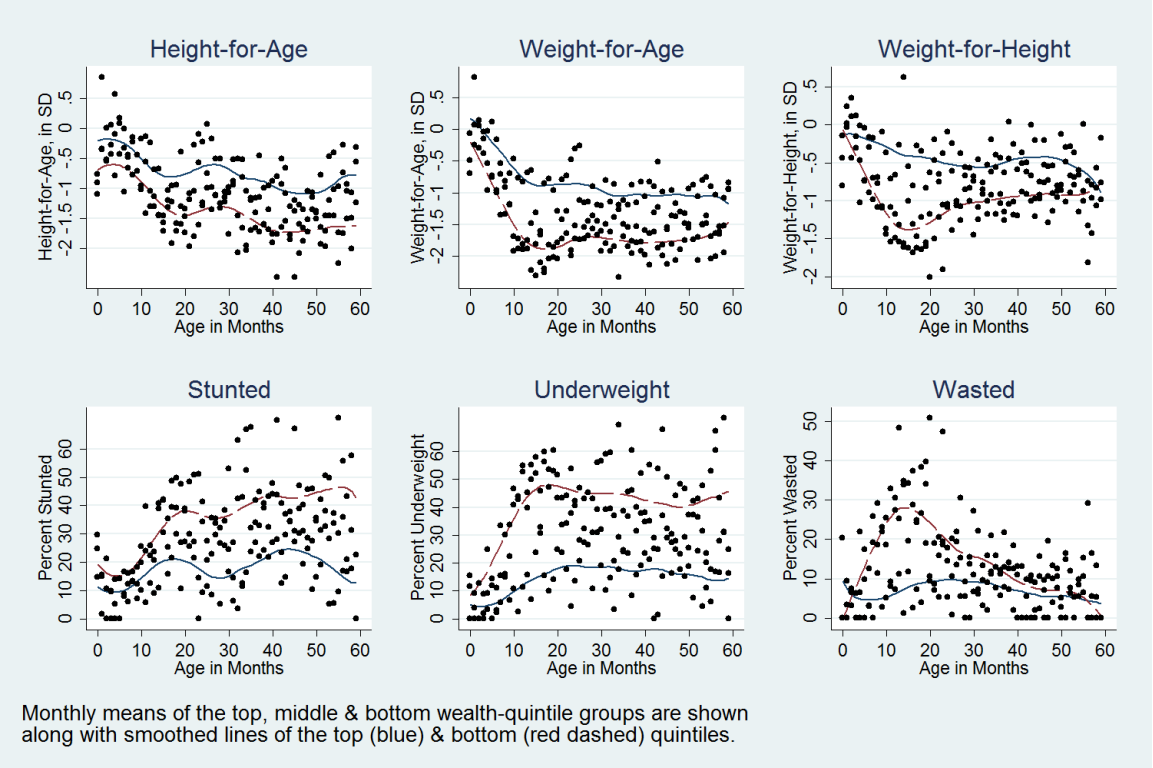
These high numbers of children who are stunted and underweight represent a great challenge to health workers and policymakers. Concerted effort should be exerted to improve children's access to nutrition and health through the first five years of their lives and particularly during the first 18 months.

Figure 14. Anthropometric Indicators of Child Development for Children Aged 0–59 Months vis-à-vis Reference Population, Mauritania 2007 (*z*-score deviations from reference distrib.)



The blue vertical line on the right shows the median of the reference healthy population, the standard normal distribution, while the red vertical line on the left shows the median less two standard deviations, serving as the official cutoff point for stunted, underweight and wasted population.

Figure 15. Anthropometric Indicators by Children's Age, Mauritania 2007



Each point represents the mean of values in a wealth-quintile group for a particular month. Fitted lines for the top and bottom wealth-quintiles are lowess-smoothed using a locally-weighted running-line least-squares method.

9. Palestine 2004, 2006, 2010 and 2014

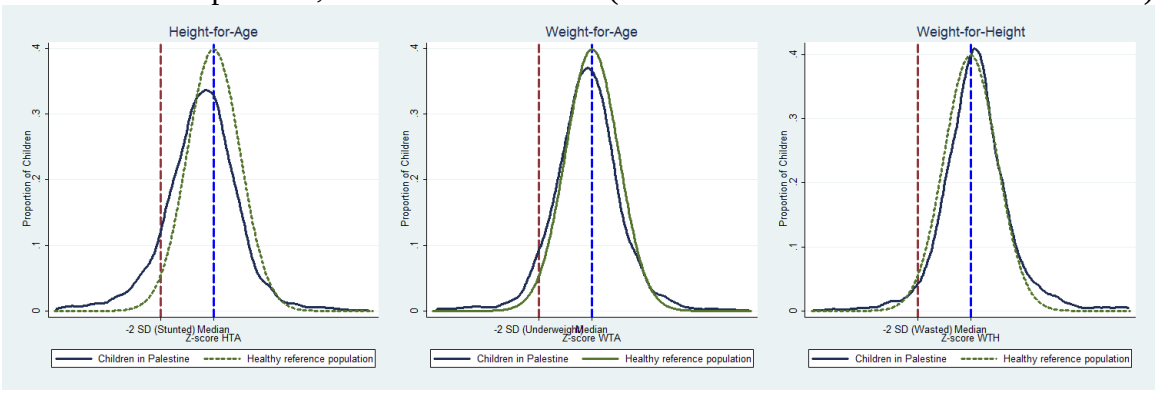
Across all waves of Palestinian surveys, children's height for age is distributed slightly lower than that of reference healthy population, while weight for age is distributed as highly as reference population (or higher, in 2006). Consequently, actual distribution of weight for height is somewhat to the right of the reference distribution. These trends jointly suggest that the distribution of height among Palestinian children is low.

Palestinian children's height for age falls dramatically in the first two years of their lives (in the 2004 survey only the second year), particularly in the poorest population quintile. Children's weight for age falls substantially in the first year of children's lives (especially in 2006 and 2010, and especially among the poorest population quintile), and continues falling during the following four years (especially in 2006–2014). Now, in 2006–2014 weight for age declines from relatively high starting values and the decline ends near zero when the mean weight for age is at the mean of the reference healthy distribution. Prevalence of children who are underweight or wasting is thus not much higher than those in reference population.

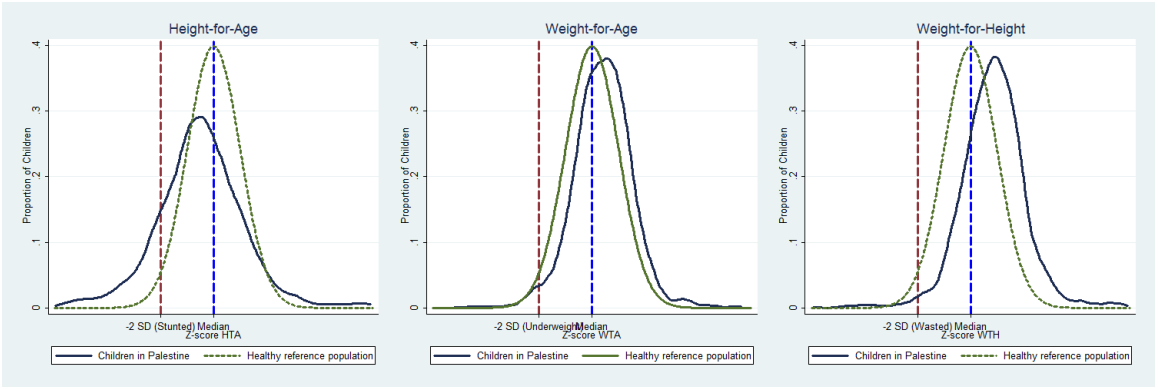
Comparing children's physical stature in 2004–2006 to that in 2010–2014 may shed light on any long-term health effects of the Israeli-Palestinian conflict. Distribution of height for age in 2006 was lower and more dispersed than in 2014. This may reflect the fact that food, medications and medical supplies were in short supply in Palestinian territories during the Second Intifada. On the other hand, the July 2014 outbreak of conflict in the Gaza Strip came too late to affect figures for the 2014 survey notably.

Figure 16. Anthropometric Indicators of Child Development for Children Aged 0–59 Months vis-à-vis Reference Population, Palestine 2004–2014 (*z*-score deviations from reference distrib.)

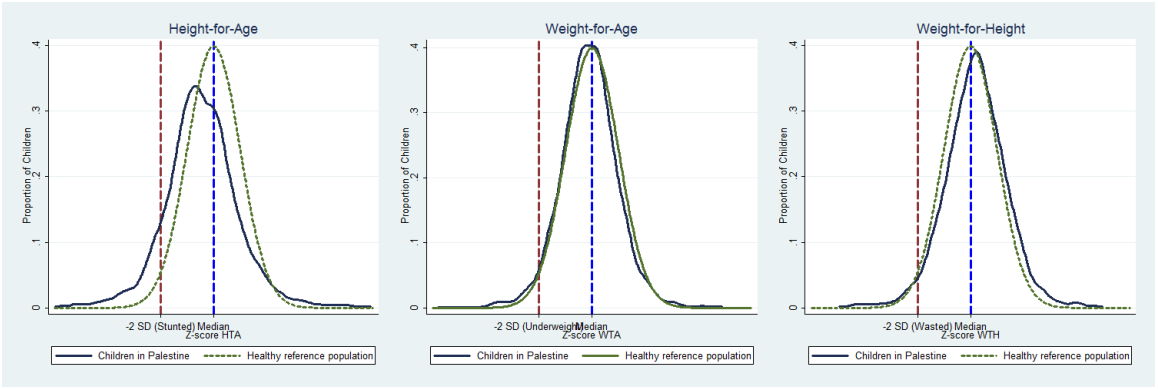
2004:



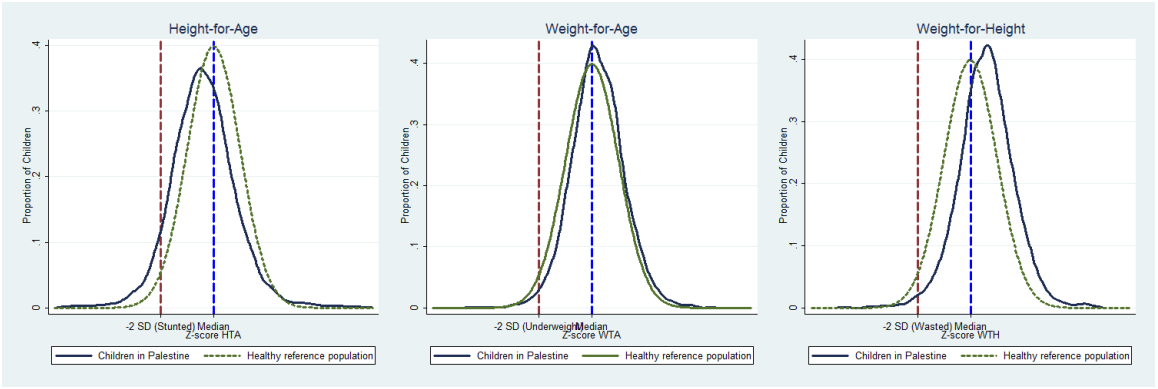
2006:



2010:



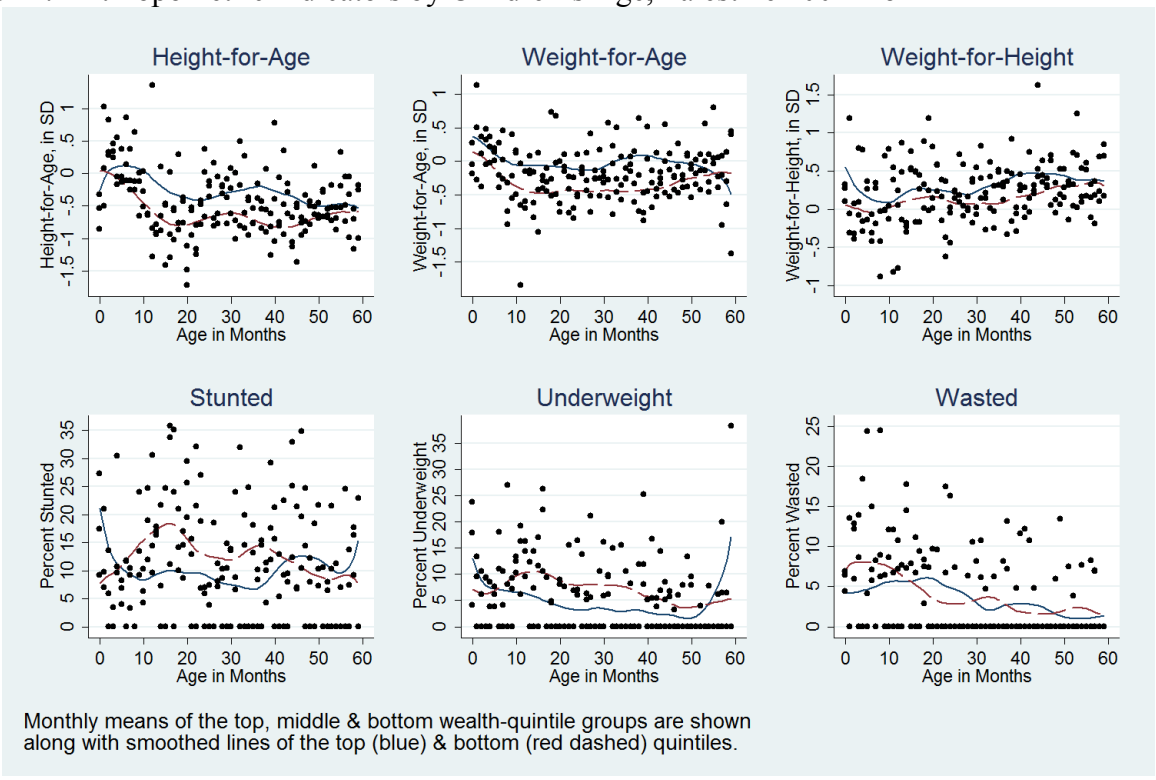
2014:



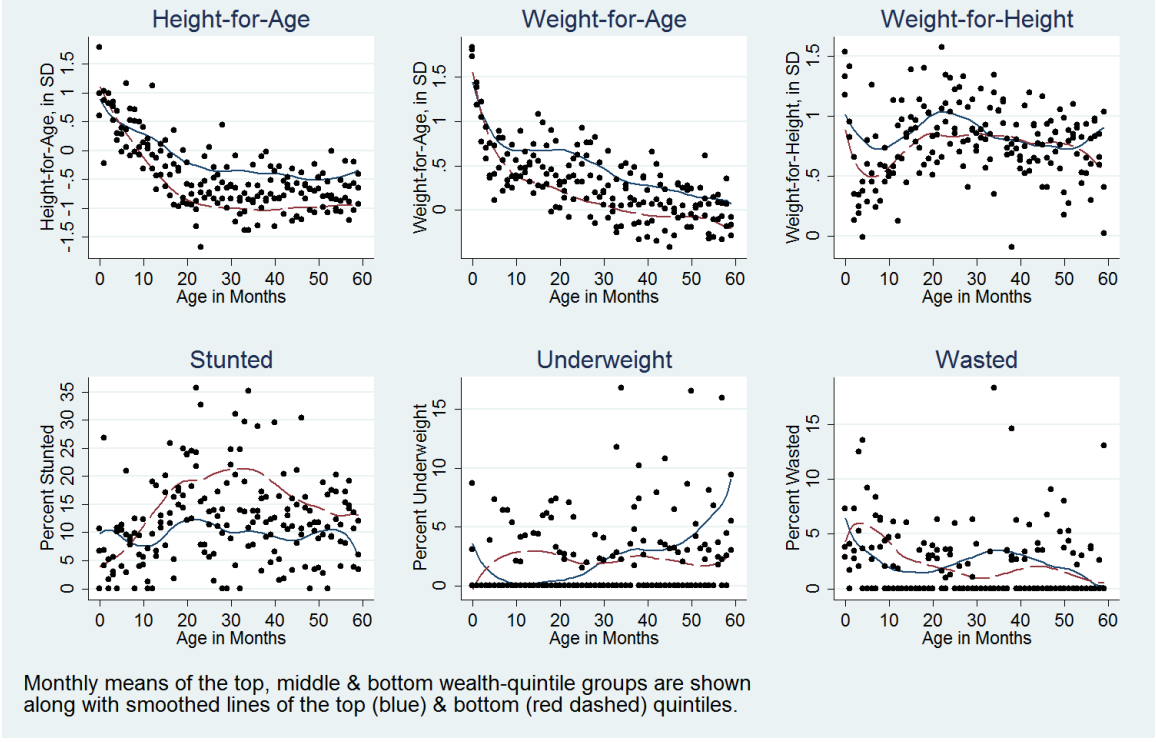
The blue vertical line shows the median of the reference healthy population, while the red vertical line shows the median less 2 standard deviations, serving as the official cutoff point for stunted, underweight & wasted population.

Figure 17. Anthropometric Indicators by Children's Age, Palestine 2004–2014

2004:



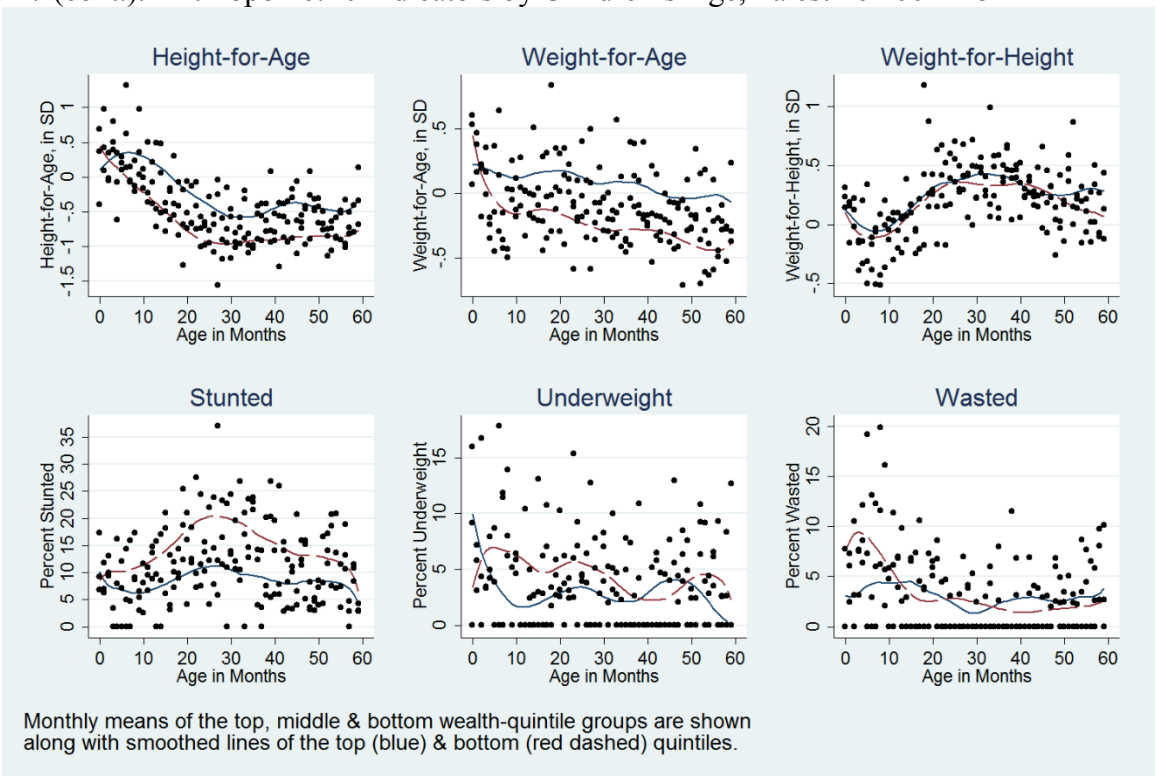
2006:



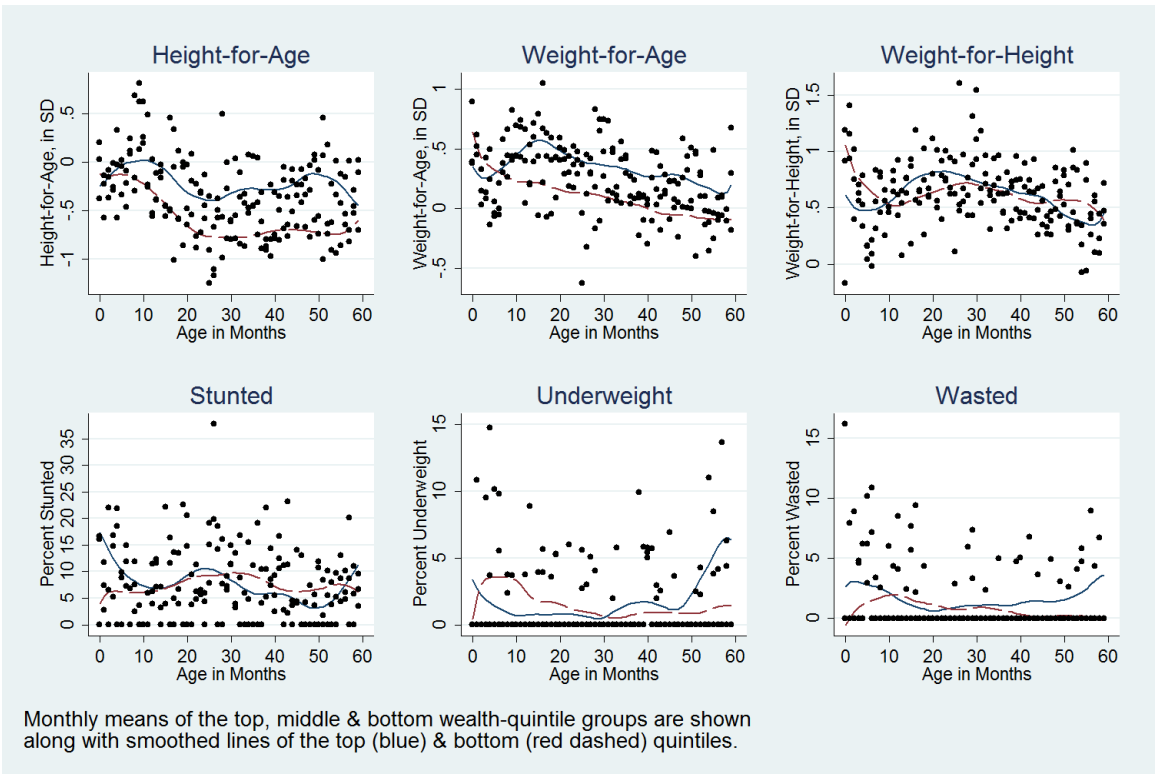
This figure is comparable to figure 14.2 for 2006 Palestinian PAPFAM in El-Kogali & Krafft (2015:270). Each point represents the mean of values in a wealth-quintile group for a particular month. Fitted lines for the top and bottom wealth-quintiles are lowess-smoothed using a locally-weighted running-line least-squares method.

Figure 17 (cont.). Anthropometric Indicators by Children's Age, Palestine 2004–2014

2010:



2014:



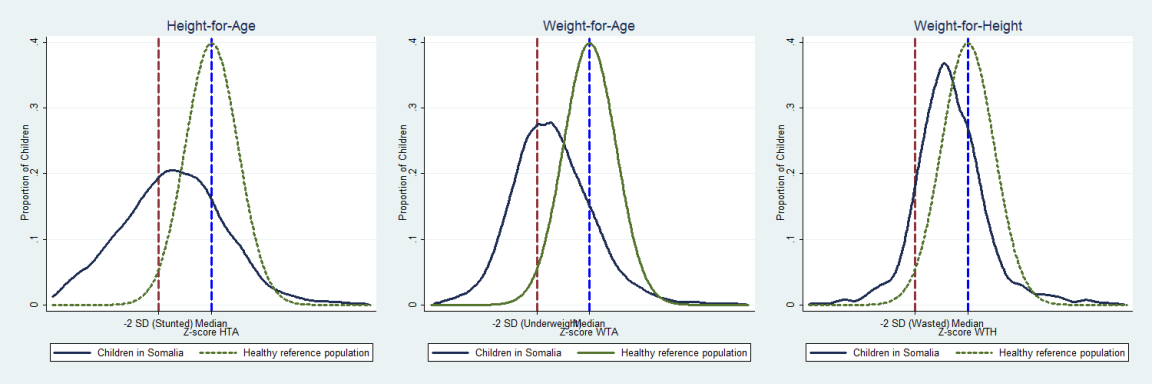
Each point represents the mean of values in a wealth-quintile group for a particular month. Fitted lines for the top and bottom wealth-quintiles are lowess-smoothed using a locally-weighted running-line least-squares method.

10. Somalia 2006

In Somalia, children's height for age and weight for age are distributed significantly below and significantly more widely than what would be expected in a reference healthy population. This suggests the presence of outlying children with exceptionally high or exceptionally low values. Distribution of weight for height also lies to the left of the reference distribution, but not as much as the former two distributions, and not as widely. We conclude that the distribution of both height and weight is low among Somali children, and children's weight is of particular concern. Children with exceptionally low height may not be same as those with exceptionally low weight, giving rise to a narrower distribution of weight for height.

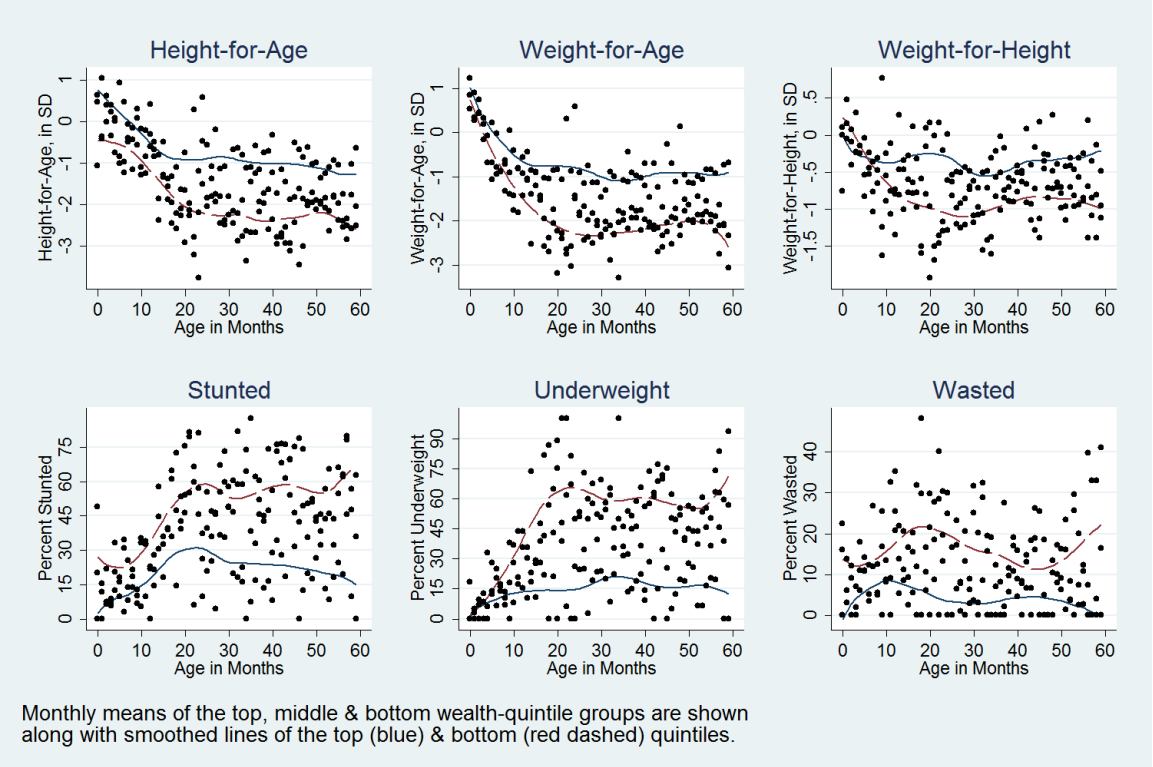
Figure 18 suggests that the first two years in children's lives are particularly problematic, with height of an average child falling by nearly two standard deviations relative to the reference distribution, and weight falling by more than two standard deviations. The deterioration is especially felt by children in the poorest fifth of households. By age two, 60 percent of children in poor households and 30 percent of children in rich households are stunted. Over 65 percent of children in poor households and 15 percent of children in rich households are underweight. Wasting is observed in 20 percent of children in poorest-quintile households.

Figure 18. Anthropometric Indicators of Child Development for Children Aged 0–59 Months vis-à-vis Reference Population, Somalia 2006 (*z*-score deviations from reference distrib.)



The blue vertical line on the right shows the median of the reference healthy population, the standard normal distribution, while the red vertical line on the left shows the median less two standard deviations, serving as the official cutoff point for stunted, underweight and wasted population.

Figure 19. Anthropometric Indicators by Children's Age, Somalia 2006



Each point represents the mean of values in a wealth-quintile group for a particular month. Fitted lines for the top and bottom wealth-quintiles are lowess-smoothed using a locally-weighted running-line least-squares method.

11. Syria 2006

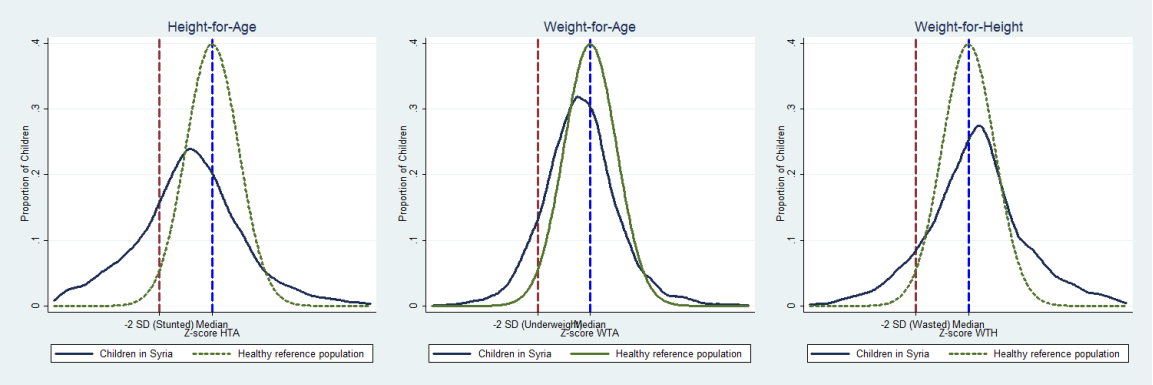
Syrian children's height for age has a fat left tail and is distributed lower than that of a reference healthy population. Weight for age is distributed just below the reference distribution. Weight for height is distributed higher than the reference distribution suggesting that, while the deficiency of both growth and of body mass is a problem among Syrian children, the former is a more acute problem.

The most significant drop in both height and weight statistics occurs in the first 18 months of babies' lives. The rate of stunting jumps to 37 among children in the poorest families and nearly 30 among children in the wealthiest families. A nutritional intervention in the early months may help children's growth and reduce infant mortality or life-long consequences. By children's second birthday, 17 percent of children in the poorest families and over 10 percent in the wealthiest families are officially underweight.

The left panels of figure 20 can be compared to the limited results for year 2009 reported by El-Kogali & Krafft (2015:229). In 2009, the distribution of children's height for age is above that in 2006 by nearly one half of a standard deviation, indicating improvement in children's welfare. Children's height for age in 2009 still falls in the first two years of children's lives and recovers afterwards, but the entire predicted line in 2009 is above the 2006 line. The rate of stunting in 2009 is also slightly below that in 2006, peaking at 35 percent around the 20th month of age and falling off to 15 percent by age five.

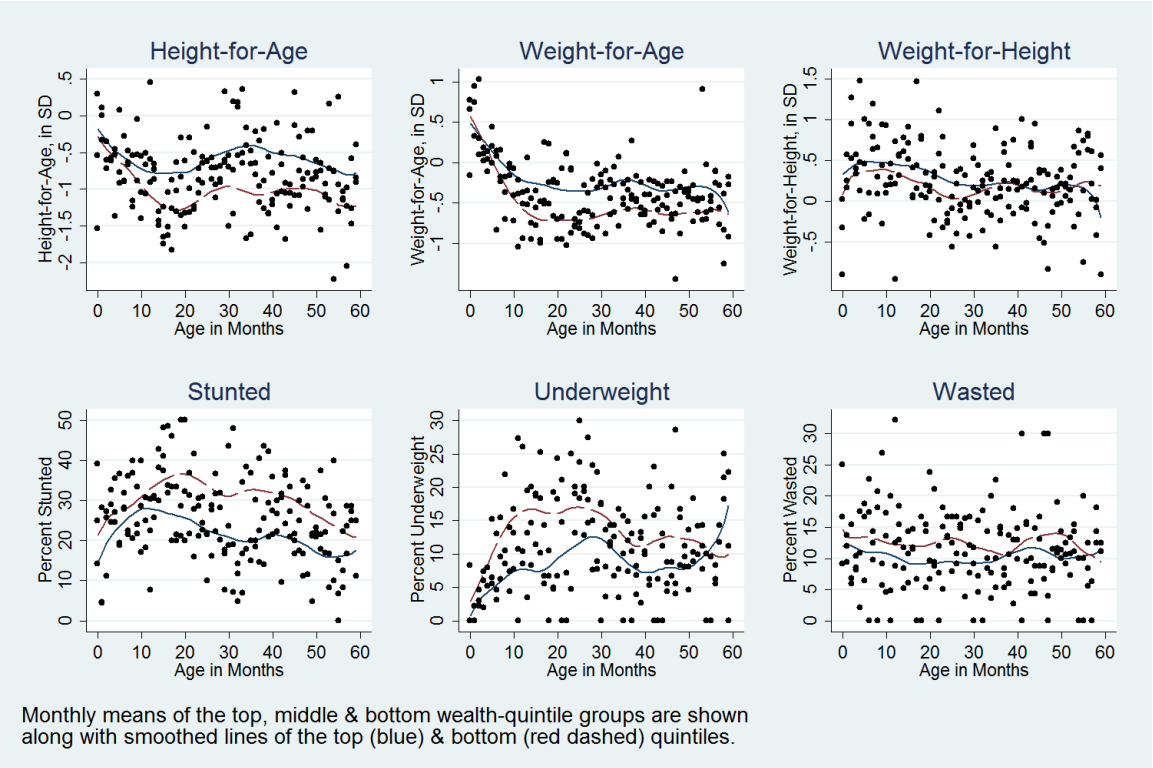
Incidentally, similarity of the shapes of the two sets of lines (in the top and bottom left panels of figure 20 vis-à-vis El-Kogali & Krafft's figure 12.3) suggests that a longitudinal interpretation of the figures is appropriate even though technically each monthly point represents a different cohort of children.

Figure 20. Anthropometric Indicators of Child Development for Children Aged 0–59 Months vis-à-vis Reference Population, Syria 2006 (*z*-score deviations from reference distrib.)



The blue vertical line on the right shows the median of the reference healthy population, the standard normal distribution, while the red vertical line on the left shows the median less two standard deviations, serving as the official cutoff point for stunted, underweight and wasted population.

Figure 21. Anthropometric Indicators by Children's Age, Syria 2006



This figure is comparable to figure 12.3 for 2009 Syrian PAPFAM in El-Kogali & Krafft (2015:229).
Each point represents the mean of values in a wealth-quintile group for a particular month. Fitted lines for the top and bottom wealth-quintiles are lowess-smoothed using a locally-weighted running-line least-squares method.

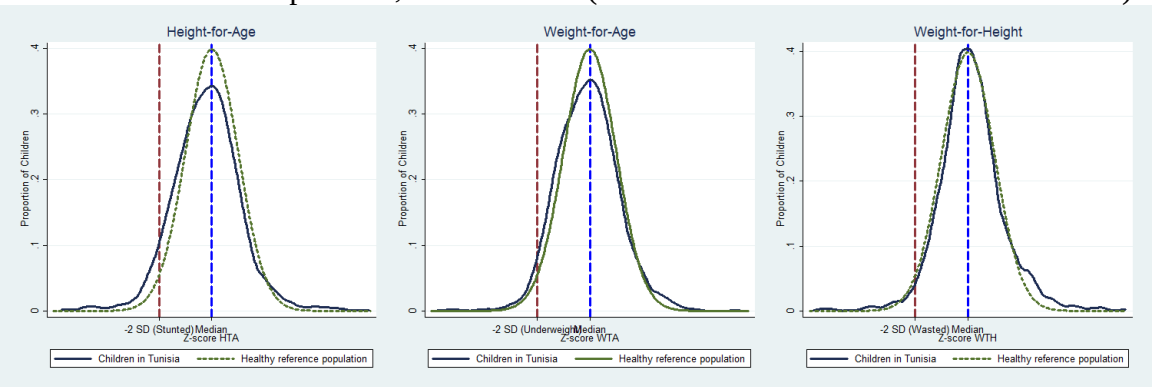
12. Tunisia 2006

Distribution of children's height and weight in Tunisia is very close to that for reference healthy population, with only a minor left skew of both statistics (refer to figure 22). Correspondingly, the predicted lines in figure 23 take values around zero across all children's ages. Even then, a large difference exists between children in the poorest and the richest groups of households, and this difference grows across time to over one standard deviation of the reference distribution. While children in wealthy households end up above the mean of the reference distribution, children in poor households end up at nearly one standard deviation below the reference mean.

Children's height and weight fall markedly in the first eighteen months of life, by over one standard deviation among children in the poorest fifth of households. Rate of stunting reaches 20 percent among the poor at 18 months of age, but falls to below 10 percent by the age of five.

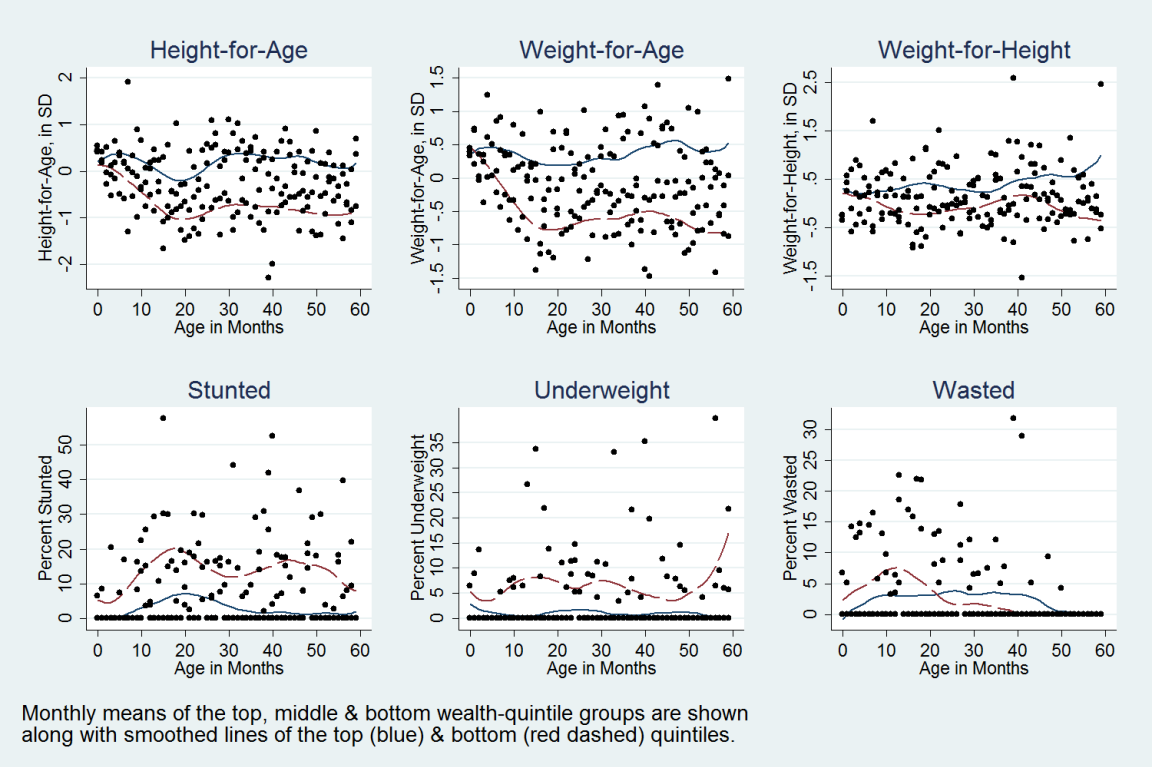
Figures 22 and 23 can be compared to those for year 2011 in the Appendix figures A11 and A12. This comparison reveals several surprising developments. Distribution of children's height in 2009 becomes significantly wider than in 2006, signifying that a greater share of children fall into the left tail representing stunted population. Distribution of children's weight, on the other hand, rises compared to 2006, indicating that fewer children fall into the underweight category. Because of these two trends, weight for height is now distributed higher and more widely than the reference distribution. Regarding trends over the children's first 60 months of life, there is no period that would be particularly worrying. The expected lines in the top panels of figure A10 are nearly horizontal, and still show a differential of 0.5 standard deviations between the richest and the poorest households.

Figure 22. Anthropometric Indicators of Child Development for Children Aged 0–59 Months vis-à-vis Reference Population, Tunisia 2006 (*z*-score deviations from reference distrib.)



The blue vertical line on the right shows the median of the reference healthy population, the standard normal distribution, while the red vertical line on the left shows the median less two standard deviations, serving as the official cutoff point for stunted, underweight and wasted population.

Figure 23. Anthropometric Indicators by Children's Age, Tunisia 2006



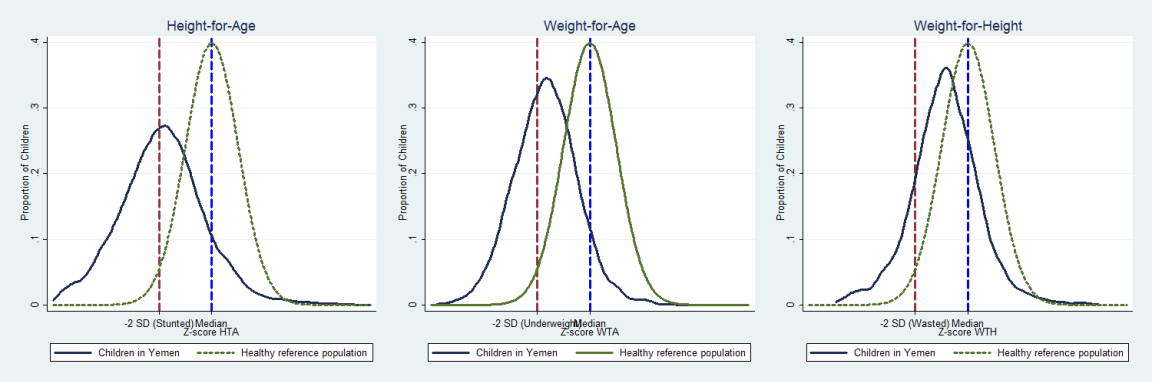
This figure is comparable to figure 13.3 for 2011 Tunisian MICS in El-Kogali & Krafft (2015:253).
Each point represents the mean of values in a wealth-quintile group for a particular month. Fitted lines for the top and bottom wealth-quintiles are lowess-smoothed using a locally-weighted running-line least-squares method.

13. Yemen 2013

In Yemen, distributions of children's height for age and weight for age are significantly below those in reference healthy population, particularly for height for age. Nearly one half of all children (46.3%) are officially classified as stunted, and more than a third (38.9%) are classified as underweight. These facts jointly imply that the distribution of children's weight for height is below that in reference population, with 16.4% of children classified as wasting (refer to figure 24).

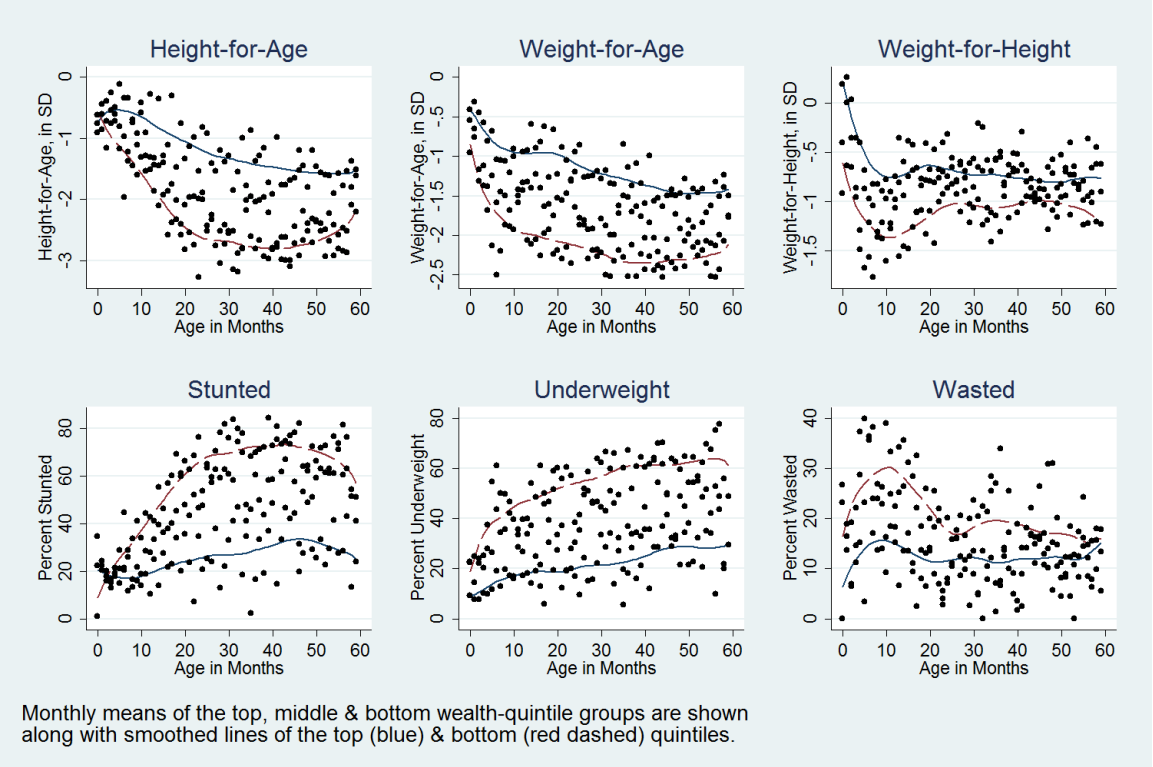
Evaluating trends for the poorest and richest population quintiles, and across the first five years of children's lives (figure 25), we find that children's height falls relative to the reference population throughout the first four years of their life, particularly sharply in the first two years among the bottom wealth quintile. In the fifth year, height for age stabilizes or slightly improves relative to the reference distribution. The rate of stunting among children peaks at the age of four years. Regarding weight for age, a similar picture emerges. Children's weight (relative to the reference) falls during the first four years, and the prevalence of children who are underweight peaks during the fifth year of children's life. Yemeni children thus have a dismal prospect for healthy growth without outside intervention and continuous monitoring.

Figure 24. Anthropometric Indicators of Child Development for Children Aged 0–59 Months vis-à-vis Reference Population, Yemen 2013 (*z*-score deviations from reference distrib.)



The blue vertical line on the right shows the median of the reference healthy population, the standard normal distribution, while the red vertical line on the left shows the median less two standard deviations, serving as the official cutoff point for stunted, underweight and wasted population.

Figure 25. Anthropometric Indicators by Children's Age, Yemen 2013



This figure is comparable to figure 15.3 for 2003 Yemeni PAPFAM in El-Kogali & Krafft (2015:292).
Each point represents the mean of values in a wealth-quintile group for a particular month. Fitted lines for the top and bottom wealth-quintiles are lowess-smoothed using a locally-weighted running-line least-squares method.

VI. Discussion

Results presented in tables 1–7 and figures 1–25 have various implications for our understanding of children's access to ECD opportunities in the Arab region, as well as inequality in this access across countries, across demographic groups domestically, and over time. This section summarizes main findings from the discussion in preceding sections.

Tables 1–7 jointly showed that, despite tremendous progress in the provision of health and education services over the last four decades, access to ECD opportunities is in many cases inadequate across the Arab region, and that it is subject to vast inequality between as well as within countries. This applies across various forms of ECD, namely health care, nutrition and cognitive development. With respect to health care, in several countries women have limited access to qualified physicians. In most countries too few children are being vaccinated, and too few receive adequate supply of iodine through household salt. This has implications for children's survival and physical growth. Mortality rates in the first month and the first year of children's life are higher than expected. Rates of stunting among children are uniformly higher in the fourteen countries than in a healthy reference population, suggesting inadequate nutrition, medical care or other conditions in children's lives. Rates of underweight and wasting are also high in a number of countries even if they are on par with the healthy distribution in others.

With respect to children's cognitive development, stimulation of children is inadequate both at home and that provided institutionally. Rates of enrolment in nurseries and preschool programs are worryingly low across the region. At home, only one half of all children receive adequate parental attention and stimulation. At the same time, 90 percent of children experience violent disciplining that may inhibit their development, and a quarter have house chores that distract them from more valuable cognitive learning. Across all ECD indicators and across the entire region, we conclude that best opportunities for children's development exist in Comoros, Jordan and Palestine. They are most limited in Iraq, Mauritania, Morocco, Somalia, Sudan and Yemen, with Somalia being a distant outlier.

Within countries, significant disparities exist in children's access to ECD opportunities across households from different wealth strata. Comparing the poorest one-fifth of the population with the top one-fifth, among the wealthiest 20% of households the ECD opportunities are significantly higher for most facets of ECD. Least advantaged households – in terms of household wealth, parents' education, level of local development and rurality of the place of residence – have significantly lower opportunities for ECD. These disparities are largest for mothers' access to qualified physicians, and children's access to nursery and pre-school education. Engagement in developmental activities at home is also subject to large differences across households.

Within-country inequality in ECD is driven to a large extent by economic differences across households, but various demographic factors contribute, including mother's and father's education, level of regional development, and rural vs. urban nature of residence. Furthermore, sex of the child and sex of the household head contribute in selected models. To reach a counterfactual state in which households from various backgrounds have equivalent access to ECD opportunities, a significant share of opportunities should be redistributed across least-advantaged and most-advantaged households. For instance, up to 58% of systematic differences in access to iodized salt across households with different backgrounds should be redistributed in Sudan to achieve within-country equality.

Household wealth explains a large portion of differences in the rate of stunting and access to iodized salt across households. Region in which a household lives explains a similarly large portion of the differences. Mother's and father's education explain a smaller portion –

approximately the same between them – of the differences. This suggests that inequality in early childhood development opportunities across households within a country is largely driven by differences in household wealth and regional level of economic development, and less so by other demographic factors at the household level.

Comparing children's access to ECD across multiple survey years for individual countries shows that in general the conditions are improving across countries and across individual forms of ECD, but the improvement is not even. For the rates of immunization, iodine intake and children's stunting, access has deteriorated in a large fraction of countries. For enrolment in pre-school programs and child labor, nothing can be said conclusively due to lacking data on more than one survey year. Among the considered ECD indicators and survey years, conditions were improving across most ECD indicators in Jordan and Tunisia, while many indicators were deteriorating in Djibouti, Egypt, Iraq, Morocco, Palestine and Syria.

The final result worth reiterating is that intergroup dissimilarity of within-country access to ECD – the portion of opportunities to be redistributed across demographic groups to achieve equality within countries – has been falling across ECD indicators and countries, but these improvements have been uneven. Inequality in prenatal medical care, assistance with child delivery, immunization, salt iodization, and access to nurseries has been falling. However, inequality in child mortality, enrolment in preschool programs, engagement in developmental activities at home, violent disciplining of children, and exploitation of children for housework has worsened. Egypt and Tunisia have seen improvements in inequality across most ECD indicators, while Algeria, Djibouti, Morocco and Syria have seen deterioration of inequality across many dimensions of ECD.

VII. Policy Recommendations

Findings in this study corroborate previous research with new data and new analyses, and indicate that while children's living conditions have been improving across the Arab region at large, significant gaps in access to developmental opportunities remain or even grow, particularly in the areas of cognitive stimulation, and availability of vaccinations and nutrients such as iodine in some countries. Significant gaps persist across socio-economic groups, both within and across countries. These gaps should be tackled by a variety of measures at the local, national and international levels because the literature has provided enough evidence that growth per se will not suffice to improve ECD levels and disparities (Vollmer et al., 2014). Specific policies and programs are needed to this effect.

Specific ECD-focused programs at national and sub-national levels, such as prenatal care, immunization and early postnatal care, micronutrient supplementation, awareness campaigns, conditional cash transfers aiming at behavioral changes, and pre-primary schools can help reduce gaps across socio-economic groups. Moreover, such programs have large benefits and high rates of return (Heckman, 2006; Lomborg. 2009; Nores and Barnett, 2010; Engle et al., 2011). For example, the benefit/cost ratio for iodization programs is in the range of 15-20USD for each dollar spent (Behrman et al., 2004). Van der Gaag and Tan (1998) found that investing in ECCE programs has rates of returns higher than investing in other education levels although some benefits take a long time to materialize (van Ravens and Aggio, 2008; Krafft, 2011). In support

of other studies (UNICEF, 2007, 2010, 2012, 2013, 2014; UNESCO, 2014), our findings corroborate evidence that the Arab region particularly lags behind in public provision of iodine supplements and nursery care, while it scores highest in regard to violent child discipline.

Local and national governments have the capacity to influence the circumstances that families live in. Policies can target ease of access to health facilities and pre-school programs in order to promote fair access to ECD for everyone. Hence, these are promising areas of priority for government actions in the region that should take advantage of the potential cross-beneficial effect of implementing multiple interventions in a coordinated fashion under single umbrella programs and overall national strategies. As poverty and inequality are multi-dimensional problems, tackling them from different ECD angles will increase their cost-effectiveness and potential impact. The approach taken in Jordan is a leading example in this respect.

Despite their potential impact, donors' funding to some components of ECD-related programs, such as kindergartens and preschools, has been disproportionally low in the Arab region. International organizations can help coordinate support for disadvantaged families and proper investment in medical and educational infrastructure.

Finally, systematic and quality collection of micro data is more important than ever in order to implement successful ECD policies and programs. Only few Arab countries, such as Jordan, have collected demographic and health surveys on regular basis over the past 25 years. This is an area that international assistance, including by the United Nations and particularly the United Nations Economic and Social Commission for Western Asia, should give priority to.

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Appendix 1: Description of Data

Comparison of data sources vis-à-vis El-Kogali and Krafft (2015)

Table A1 reports on the geographic and historical coverage of our study, and that achieved in El-Kogali and Krafft's book. For eight countries – Algeria, Comoros, Mauritania, Morocco, Palestine, Somalia, Sudan and Yemen – we have newer data than El-Kogali and Krafft. For three countries – Egypt, Jordan and Tunisia – we also have older surveys not evaluated by El-Kogali and Krafft. These surveys allow us to comment on the change in ECD opportunities over time. For eleven surveys from nine countries – Djibouti, Egypt, Iraq, Jordan, Libya, Palestine, Syria, Tunisia and Yemen – we also have the same surveys as El-Kogali and Krafft. These allow us to report additional ECD indicators not included in their book, as well as to verify their results.

Summing up, the main body of this report uses data from twenty standardized surveys for fourteen countries, namely: Algeria (2006), Comoros (2012), Djibouti (2006), Egypt (2005 and 2014), Iraq (2006), Jordan (2007 and 2009), Mauritania (2007), Morocco (2006 and 2011), Palestine (2004, 2006, 2010 and 2014), Somalia (2006), Sudan (2006), Syria (2006), Tunisia (2006) and Yemen (2013). Additional results for five surveys covered by El-Kogali and Krafft – Egypt (2008), Iraq (2011), Jordan (2012), Palestine (2006) and Tunisia (2011) – are included in the appendix.

Year 2006 waves of Djiboutian, Iraqi and Syrian MICS surveys are included even though they are also partially covered by El-Kogali and Krafft, because that book shares only selected indicators from the 2006 waves, instead focusing on the corresponding 2009–2012 waves.

Table A1. Surveys Evaluated in This Report vs. in El-Kogali and Krafft (2015)

Country	El-Kogali and Krafft (2015)	Additional datasets in our study
Maghreb region		
Algeria	PAPFAM 2002[a]	MICS 2006
Libya	PAPFAM 2007[a]	
Mauritania		MICS 2007
Morocco	DHS 2003/2004, MICS/PAPFAM 2006[b]	PAPFAM 2011
Tunisia	MICS 2011[a]	MICS 2006

Mashreq region		
Iraq	MICS 2006[b] & 2011[a]	
Jordan	DHS 2012[a]	DHS 2007 & 2009
Lebanon	PAPFAM 2004	
Palestine	PAPFAM 2006[a]	DHS 2004, MICS 2010 & 2014
Syria	MICS 2006[b], PAPFAM 2009[a]	
Red Sea region		
Djibouti	MICS 2006[b], PAPFAM 2012	
Egypt	DHS 2008[a]	DHS 2005 & 2014
Somalia		MICS/PAPFAM 2006
Sudan		PAPFAM 2006
Yemen	PAPFAM 2003, MICS 2006[a]	DHS 2013
Southeast Africa		
Comoros		DHS 2012

[a] We have access to these surveys previously evaluated by El-Kogali & Krafft (2015), and we are thus able to replicate the derivation of results for them, as well as report additional results in the appendix.
[b] El-Kogali & Krafft evaluated these survey waves, but reported only a small number of results for them, instead focusing on newer waves or waves with more data available to the authors. Because we have access to these surveys, we will report additional results.
DHS is the Demographic and Health Survey; MICS is the Multiple Indicator Cluster Survey; and PAPFAM is the Pan-Arab Project for Family Health Survey.

Note on Data Comparability across Countries

Results in sections IV and V are comparable across socio-economic groups in a country and are representative of the underlying population. This is achieved by a nationally-representative stratified sampling design, the usage of sampling weights, and partial harmonization across DHS, MICS and PAPFAM surveys. However, not all results are exactly comparable across countries, because of various data issues.[16] The following paragraphs list notable problems limiting our ability to compare quantitative results across countries. The issues fall into the following three categories: 1) differences in sample sizes; 2) differences in sources of variables; and 3) differences in variable definitions across countries.

Sample sizes: Sample sizes affect the representativeness of sample summary statistics for the underlying population, robustness of regression estimates, and sizes of standard errors. As Table A2 shows, sample sizes vary greatly across surveys.

Table A2. Sample Sizes Used in Various Survey Modules

	Households (complete interviews)	Ever-married women 15–49 in women's module (complete int.)	Children younger than 5 covered by responding women (complete int.)	Live births covered by responding women
Algeria '06	29,008	43,641	14,593	--
Comoros '12	4,482	3,094	3,022	2,016
Djibouti '06	4,888	6,019	2,245	--
Egypt '05	15,842	13,851	13,621	13,851
Egypt '08	14,733	12,008	10,540	8,367

[16] Moreover, country-selection issues may be responsible for differences between DHS, MICS and PAPFAM survey data. Because DHS is funded by United States Agency for International Development, surveyed countries tend to be US allies in a lower or transitional state of development (Kuhn 2012:677).

Egypt ‘14	28,175	59,266	56,568	15,848
Iraq ‘06	16,699	27,186	16,469	17,363
Iraq ‘11	35,701	55,194	33,908	13,994
Jordan ‘07	14,564	11,622	10,876	10,426
Jordan ‘09	13,577	10,109	9,407	7,759
Jordan ‘12	15,190	10,304	6,350	8,462
Libya ‘07	11,709	11,920	12,550	--
Mauritania ‘07	10,361	12,549	8,672	--
Morocco ‘06	7,931	6,608	3,721	--
Morocco ‘11	15,343	11,069	6,117	--
Palestine ‘04	5,799	4,972	4,833	4,974
Palestine ‘06	11,509	9,785	10,107	--
Palestine ‘10	13,330	11,384	10,070	11,298
Palestine ‘14	10,182	13,367	7,816	7,948
Somalia ‘06	5,969	8,438	8,812	6,348
Sudan ‘06	1,000	6,563	8,175	--
Syria ‘06	19,019	25,026	11,017	--
Tunisia ‘06	8,681	6,152	3,050	--
Tunisia ‘11	9,171	10,215	2,899	2,977
Yemen ‘06	3,586	3,742	3,783	4,099
Yemen ‘13	17,351	16,093	15,367	16,072

Notes: Sample sizes are only partially standardized due to differences in format, variable coverage and missing observations in individual surveys. Samples sizes used in regression models may be lower than these numbers due to missing data for dependent or explanatory variables, or perfect prediction of outcomes among some explanatory variables for some observations. “--” indicates missing data for a particular survey module.

Sources of variables: The following examples illustrate why dependent and explanatory variables are not always exactly comparable across surveys.

Household surveys are split into registers of all household members, household-heads’, women’s, and children’s modules, and birth recode registers. These various parts allow alternative ways for computing variables of interest. Household members’ age and education, for instance, are available in raw form as well as imputed. Children aged 5 years and a few days may be included in the children’s module along with 59-months old children.

Most surveys come with household wealth and the corresponding population quintiles imputed by survey administrators, but in Djibouti and Palestine (2004), household wealth had to be imputed for this study using principal component analysis of households’ ownership of durable goods such as rooms per person, wall, roof and floor covering, toilet and water storage facilities, water and fuel source, electrical appliances and vehicles. The one-dimensional wealth index was obtained from the first component in the principal component analysis of all observable household assets. This first component can be expressed as the weighted sum of households’ assets, where asset ownership is standardized by the mean and standard deviation across households, and where the weights a_p are selected to maximize sample variance of the index subject to $\Sigma_p a_p^2=1$ (McKenzie 2005):

$$w = \sum_p a_p \left(x_p - \overline{x_p}\right) \Big/ stdev\left(x_p\right) \qquad \text{(A1)}$$

Household level subscripts are omitted here for clarity of presentation.

Variable definitions: Information on education and preschool programs differs across countries due to differences in countries' institutions. Various non-standard types of school, levels of schooling and grades exist. As a result, educational achievement is difficult to harmonize across the entire Arab region.

The definition of violent disciplining in Tunisia excludes a general question about hitting of children, because the allowed responses (i.e, yes, sometimes, or no) and the resulting distribution differ from those in other countries (i.e., binary variables). Similarly, in Yemen, questions about shouting and verbal abuse are absent and are thus omitted from the definition of violent disciplining. The definition of child labor in Egypt 2014 covers a number of questions about individual activities performed by children (washing, shopping, child or elderly care, etc.), so the resulting indicator is not exactly comparable to those in other surveys and years. Data on immunizations for Tunisia '06 is restricted to BCG, DPT3, polio1 and polio2, and measles vaccinations - rather than the full set of three DPT and three polio vaccinations. To provide some information on relative access to vaccinations across households within Tunisia, full vaccination is taken to mean access to BCG, measles, DPT3 (or three or more DPT vaccinations, regardless of their order) and two or more polio vaccinations. The notable presence of refugee camps in Palestine following the Intifada and the availability of an indicator for them in the 2006 PAPFAM survey call for their consideration along with a rural/urban indicator in defining residence areas.

Appendix 2: Human Opportunity Index across ECD Indicators, and Intertemporal Comparison (Initial–Final Wave HOI, %)

	Prenatal care	Prenatal visits: 4+	Skilled delivery	Full immun.	Neonatal mortality	Infant mort.	Stunted	Under-weight	Wasted	Iodized salt	4+ dvlp. activities	ECCE 3-4yrs	ECE 5-6yrs	Violent discipl.	Child labor
Algeria '02–'06	.–85.3	.–48.0	.–92.8	.–86.8	.	.	.–14.2	.–5.0	.–4.5	.–50.7	.–57.3	.–5.9	.–16.7	.–88.7	.–23.6
Comoros '12	90.4	50.5	78.3	54.6	2.9	4.3	34.1	18.5	12.6	89.3	.	.	.	.	28.7
Djibouti '06	90.2	.	90.1	41.8	.	.	36.6	33.8	32.8	.	22.2	9.4	3.9	73.4	23.1
Egypt '05–'08–'14	61.4–67.0–87.3	49.5–58.4–78.2	66.5–71.9–88.5	79.6–90.1–31.7	2.2–2.1–1.7	3.7–2.9–2.7	19.8–31.5–19.6	7.1–6.7–7.8	4.5–8.2–8.3	64.8–69.2–84.7	.	23.5–31.4[b]–49.7	7.1–.–.	97.7–.–95.9	27.2–.–50.4
Iraq '06–'11	72.6–72.5	57.7–45.7	53.6–88.2	43.7–58.9	2.4–2.2	3.5–3.3	26.0–23.4	8.8–7.5	6.4–6.9	19.5–19.5	39.7–46.7	1.5–2.2	2.4–4.0[a]	90.4–79.5	15.1–12.0
Jordan '07–'09–'12	98.1–.–98.5	92.8–.–92.8	98.6–.–99.3	83.3–.–90.9	2.1–1.9–1.8	2.6–2.6–2.2	17.1–9.5–9.5	6.7–2.4–3.8	8.6–2.1–3.0	.	.–.–78.9	.–.–16.4	.	.–.–94.6	.
Libya '07	91.93	71.53	97.87	83.17	1.36	2.14	22.07	6.21	7.67	44.06	.	3.78	.	.	8.82
Mauritania '07	70.6	.	48.3	32.6	.	.	29.5	34.9	15.4	1.1	32.0	.	4.9	.	.
Morocco '04–'06–'11	.–.–68.7	.–.–31.1	.–.–18.0	.–.–48.1	.	.	.	.	.	.–13.3–.	.–40.6–27.1	.–25.5–.	.–28.6–.	.–97.7–.	.–24.2–.
Palestine '04–'06–'10–'14	97.9–98.0–98.2–99.2	82.6–88.2–92.9–95.2	88.7–97.0–65.1–99.4	93.1–83.6–90.6–84.4	2.5–.–1.4–1.4	4.5–.–2.2–2.3	11.9–13.5–12.0–8.2	6.9–2.5–4.1–1.7	4.0–2.2–3.7–1.5	62.7–86.8–73.8–70.1	.–65.1–62.5–75.8	.–29.9–15.0–22.9	67.1–.–92.8–87.6	.–96.3–93.5–95.4	.–17.6–36.5–.
Somalia '06	5.7	.	13.0	5.3	4.3	9.0	44.5	42.8	14.0	1.0	62.5	1.3	.	.	57.3
Sudan '06	48.9	29.9	52.7	19.1	.	.	.	.	.	4.6	.	.	.	.	.
Syria '06–'09	77.7–83.3	.–63.6	87.5–94.2	32.3–49.7	.	.	28.3–29.1	12.7–12.6	11.9–13.1	.–20.7	53.6–41.5	4.6–6.6[b]	41.7–29.5	89.3–67.6	13.8–4.3
Tunisia '06–'11	43.1–97.2	.	.	81.4–85.7	.–1.7	.–2.2	8.1–12.1	4.8–3.0	3.7–3.4	.	44.3–62.7	17.9–33.1	.	99.4–96.1	.–29.3
Yemen '13	52.1	17.2	33.6	37.2	3.0	4.6	52.0	18.4	44.1	40.5	.	.	.	82.0	.
Wghtd. avg.[c]	73.9	53.0	70.3	46.9	4.4	4.1	22.7	10.9	13.5	41.4	47.2	29.2	12.8	91.1	33.9

Legend: Light green background indicates improvement of values over time; darker red color indicates worsening. When information from three waves shows a non-monotonic trend, comparison of the first wave and the third wave is used.

Notes: For Egypt, Jordan, Morocco and Palestine, values from 3–4 waves are reported: Initial–Intermediate(s)–Final.

Access to prenatal and delivery care is evaluated among women who gave birth in the past 2 years; the rest of indicators are evaluated among children.

For negative indicators (child mortality, inadequate physical growth, violent disciplining & child labor), HOI for the corresponding opportunity is used: $HOI = 1 - (1 - \tilde{D})\tilde{p}$ where tildes are for the corresponding positive ECD opportunities, and lower HOI are preferred.

[a] Source: The Central Statistics Organization and the Kurdistan Regional Statistics Office (2012), as cited in El-Kogali & Krafft (2015:134).

[b] For Egypt '06 and Syria '09, we follow El-Kogali & Krafft in reporting ECCE attendance for children 3–5 years of age.

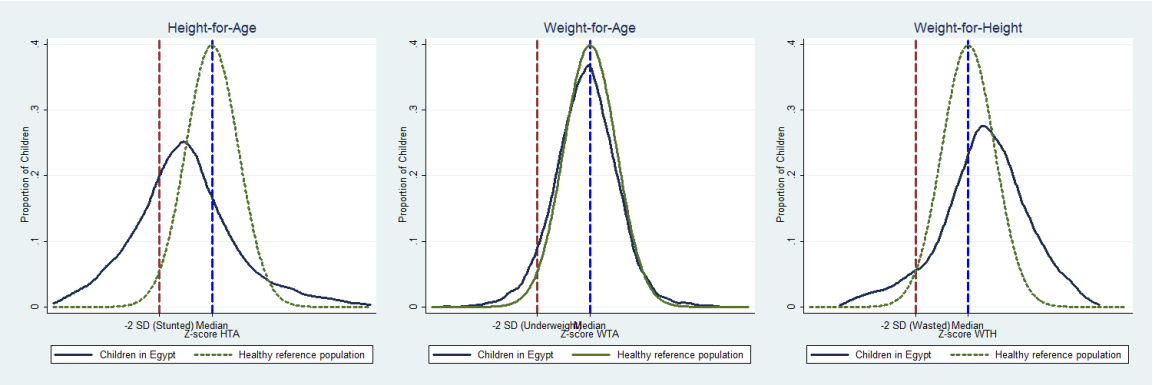
[c] Average of countries' most recent waves for which indicator is available, weighted by estimated 2015 population size (UN-DESA, 2015).

Appendix 3: Comparison Results Using El-Kogali and Krafft (2015) Surveys

For surveys previously evaluated by El-Kogali and Krafft, we can produce additional visual indicators of children's access to nutrition in early childhood comparable to the results presented above. Snapshots across all children 0-59 months old, as well as dynamic pictures of the evolution of children's physical health over time – across different socio-economic groups – can be drawn. The following sections discuss in turn the cases of Egypt (2008), Iraq (2011), Jordan (2012), Libya (2007), Syria (2009) and Tunisia (2011).

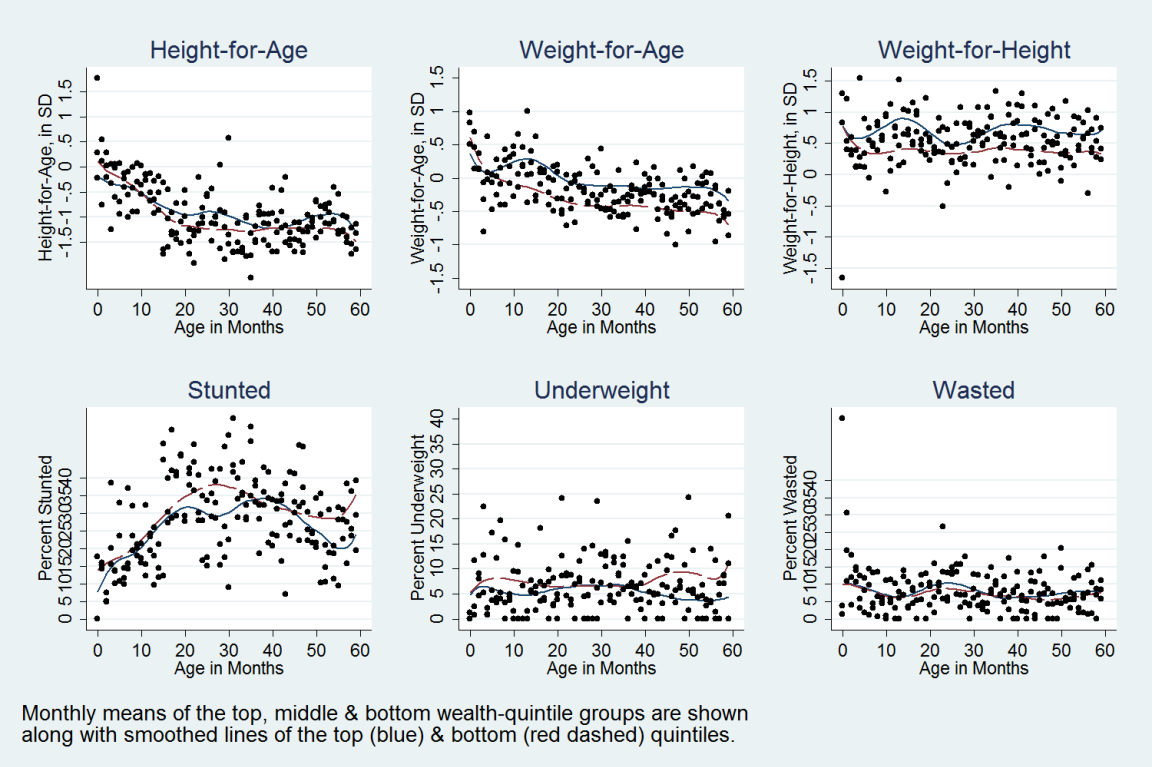
1. Egypt 2008

Figure A1. Anthropometric Indicators of Child Development for Children Aged 0–59 Months vis-à-vis Reference Population, Egypt 2008 (*z*-score deviations from reference distrib.)



The blue vertical line on the right shows the median of the reference healthy population, the standard normal distribution, while the red vertical line on the left shows the median less two standard deviations, serving as the official cutoff point for stunted, underweight and wasted population.

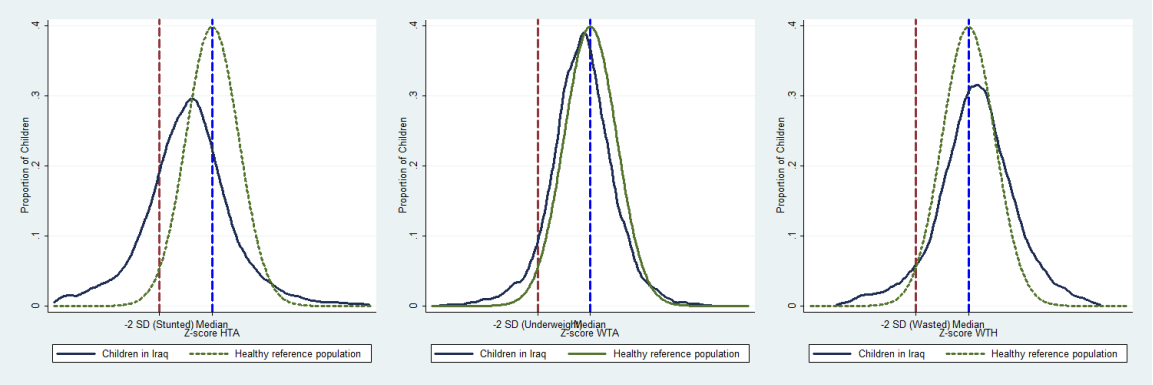
Figure A2. Anthropometric Indicators by Children's Age, Egypt 2008



This figure is comparable to figure 6.2 in El-Kogali & Krafft (2015:108).
Each point represents the mean of values in a wealth-quintile group for a particular month. Fitted lines for the top and bottom wealth-quintiles are lowess-smoothed using a locally-weighted running-line least-squares method.

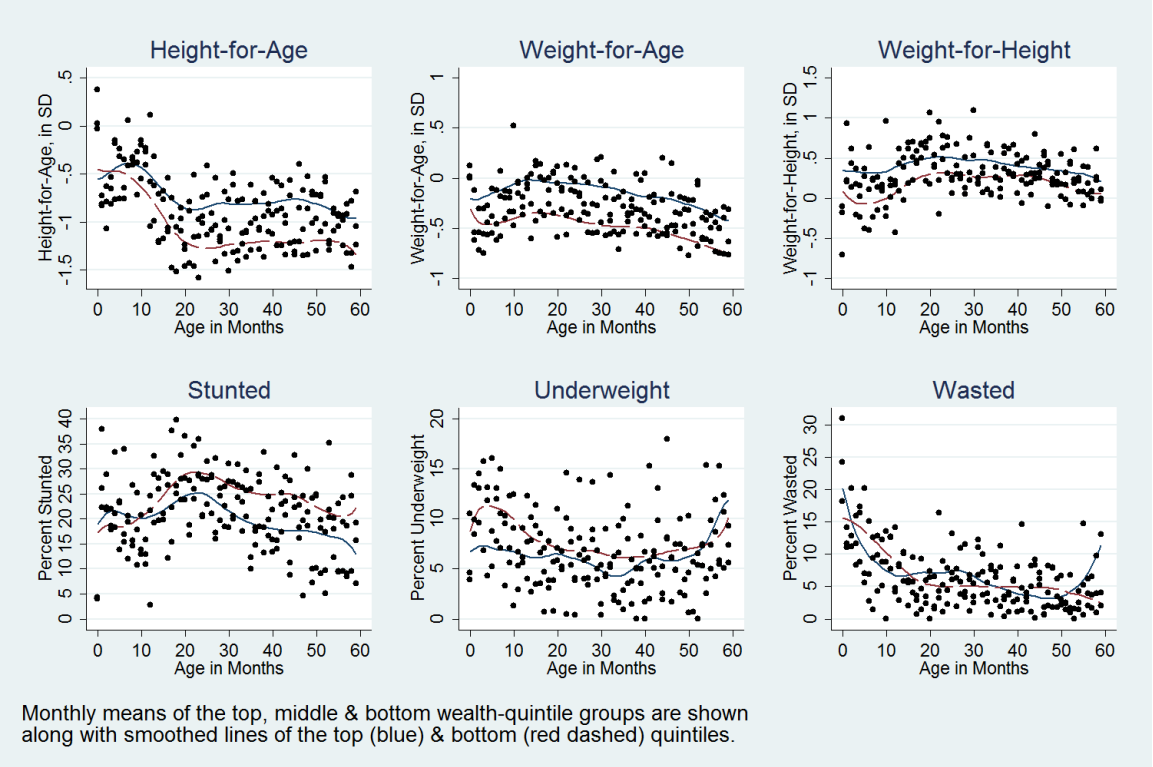
2. Iraq 2011

Figure A3. Anthropometric Indicators of Child Development for Children Aged 0–59 Months vis-à-vis Reference Population, Iraq 2011 (*z*-score deviations from reference distrib.)



The blue vertical line on the right shows the median of the reference healthy population, the standard normal distribution, while the red vertical line on the left shows the median less two standard deviations, serving as the official cutoff point for stunted, underweight and wasted population.

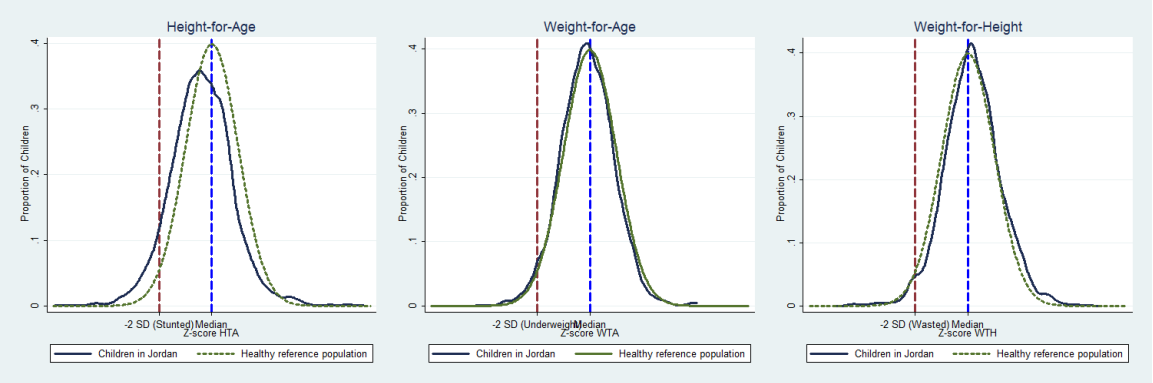
Figure A4. Anthropometric Indicators by Children's Age, Iraq 2011



This figure is comparable to figure 7.3 in El-Kogali & Krafft (2015:132).
Each point represents the mean of values in a wealth-quintile group for a particular month. Fitted lines for the top and bottom wealth-quintiles are lowess-smoothed using a locally-weighted running-line least-squares method.

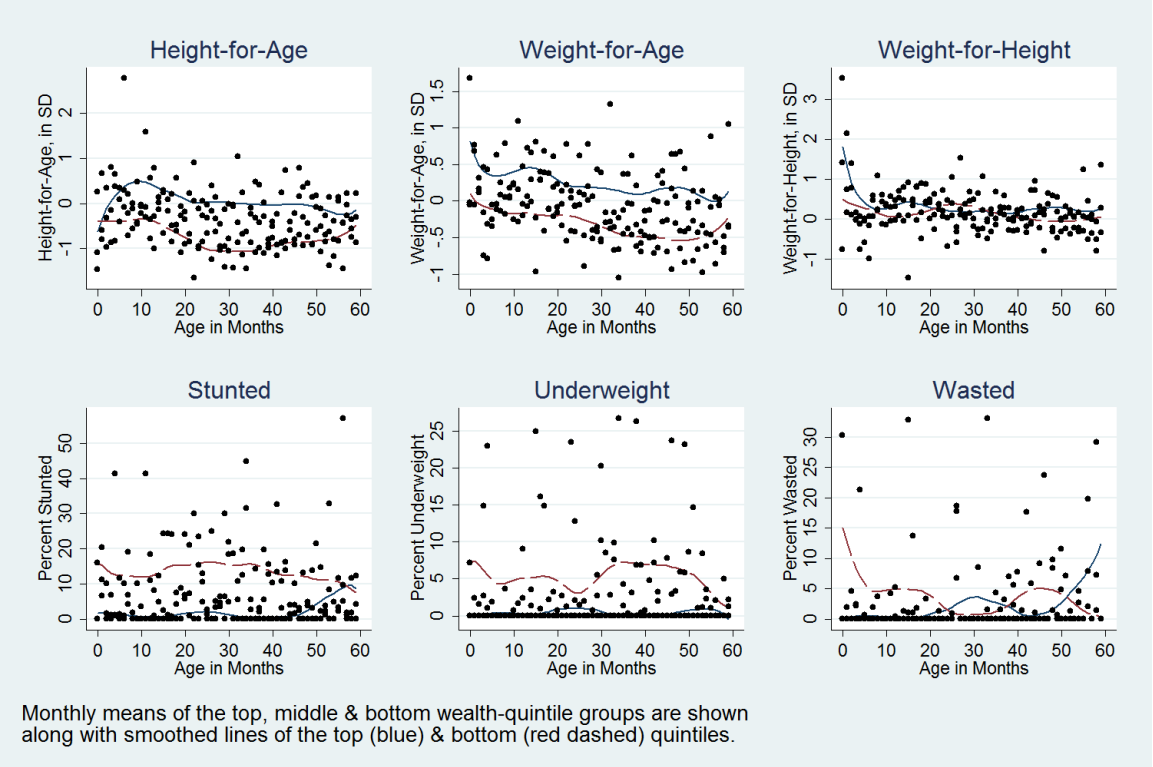
3. Jordan 2012

Figure A5. Anthropometric Indicators of Child Development for Children Aged 0–59 Months vis-à-vis Reference Population, Jordan 2012 (*z*-score deviations from reference distrib.)



The blue vertical line on the right shows the median of the reference healthy population, the standard normal distribution, while the red vertical line on the left shows the median less two standard deviations, serving as the official cutoff point for stunted, underweight and wasted population.

Figure A6. Anthropometric Indicators by Children's Age, Jordan 2012



This figure is comparable to figure 8.3 in El-Kogali & Krafft (2015:156).
Each point represents the mean of values in a wealth-quintile group for a particular month. Fitted lines for the top and bottom wealth-quintiles are lowess-smoothed using a locally-weighted running-line least-squares method.

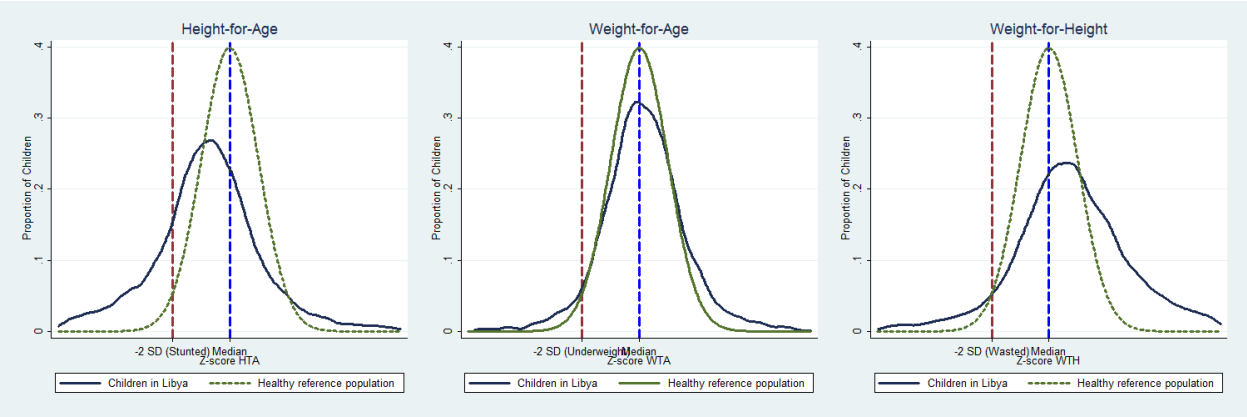
4. Libya 2007

Because Libyan PAPFAM surveys were not covered in the main text of the paper, a few words can be said about the results for this survey. Libyan children's height-for-age has fat tails and is distributed significantly lower than that of a reference healthy population. The heavy tails indicate the presence of an unexpectedly large number of children in the Libyan population with very low but also with very high height-for-age, compared to what would be expected in a healthy population. Children's weight-for-age is distributed the same way as a reference healthy population, with only slightly heavier tails. Weight for height is distributed slightly higher than the reference distribution, implying that insufficient body mass is not typically a problem among Libyan children. However, the heavy left tails of the weight-for-age and weight-for-height distributions still indicate that a disproportionally many Libyan children are officially classified as being underweight and wasted – 5.6% and 7.0%, respectively. These rates are marginally higher among children in the poorest quintile of the population (refer to figure A8 for illustration). These results jointly suggest that the deficiency of growth is a critical problem among Libyan children overall, while the deficiency of body mass is a problem among a small number of children.

The most significant drop in children's height occurs in the first 18 months of babies' lives. The rate of stunting jumps to 28 percent among children in the poorest families and rises above 20 even among children in the wealthiest families.

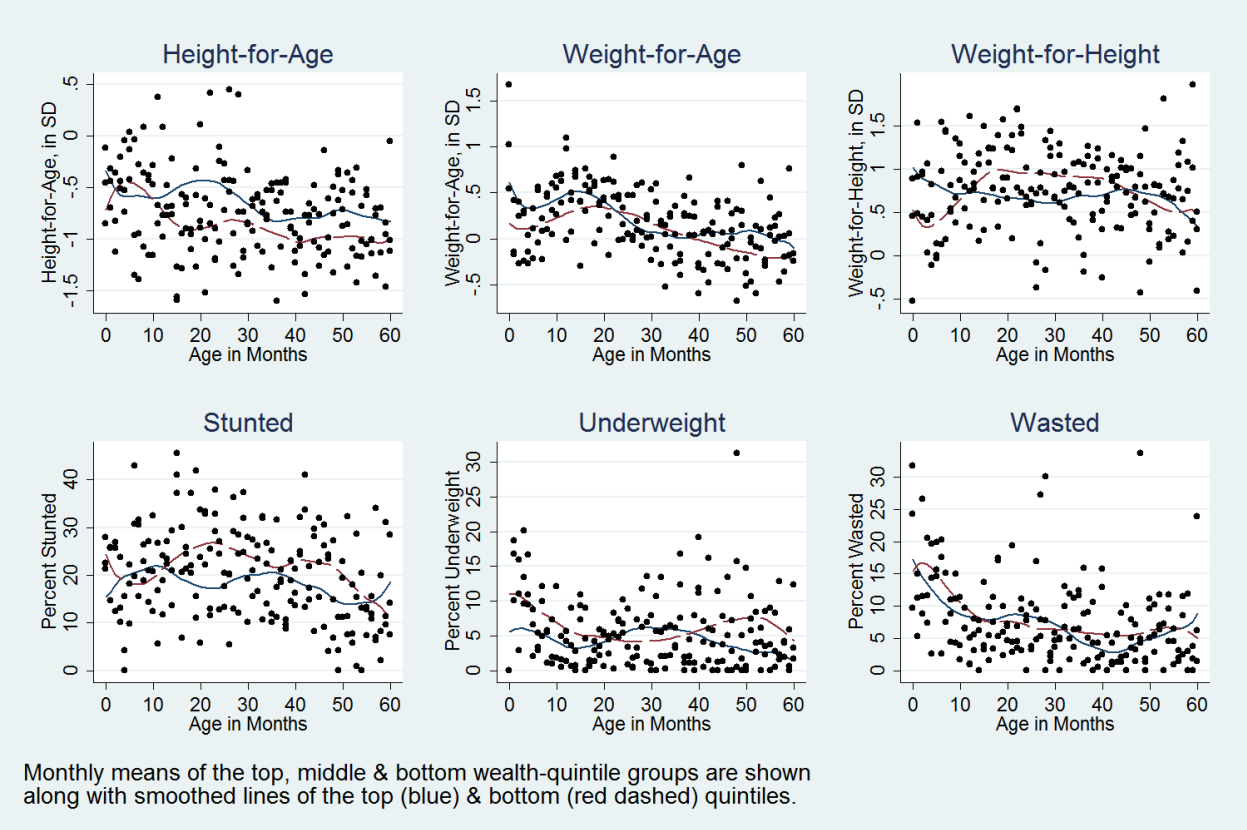
These results have direct implications for welfare policy. First, they suggest that a nutritional intervention is warranted to promote physical growth among children throughout the country, since the problem of stunting is widespread. Second, such a nutritional intervention should be undertaken in the early months of children's lives. Third, nutritional interventions helping children increase their body mass are needed for the minority of children in the bottom tail of the weight distribution. Better identification of children in need and targeting them with nutritional supplements are needed.

Figure A7. Anthropometric Indicators of Child Development for Children Aged 0–59 Months vis-à-vis Reference Population, Libya 2007 (*z*-score deviations from reference distrib.)



Notes: Computed by authors based on 2007 Libyan PAPFAM data.
The blue vertical line on the right shows the median of the reference healthy population, the standard normal distribution, while the red vertical line on the left shows the median less two standard deviations, serving as the official cutoff point for stunted, underweight and wasted population.

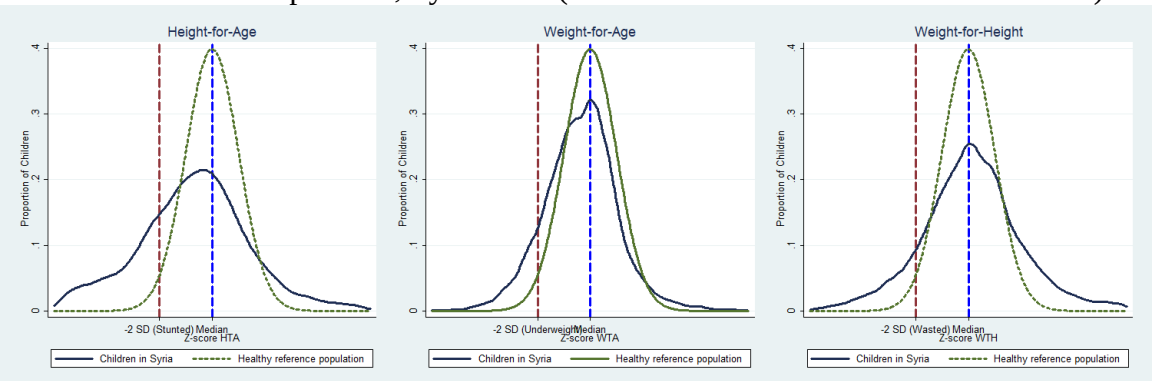
Figure A8. Anthropometric Indicators by Children's Age, Libya 2007



Notes: Computed by authors based on 2007 Libyan PAPFAM data.
Each point represents the mean of values in a wealth-quintile group for a particular month. Fitted lines for the top and bottom wealth-quintiles are lowess-smoothed using a locally-weighted running-line least-squares method.

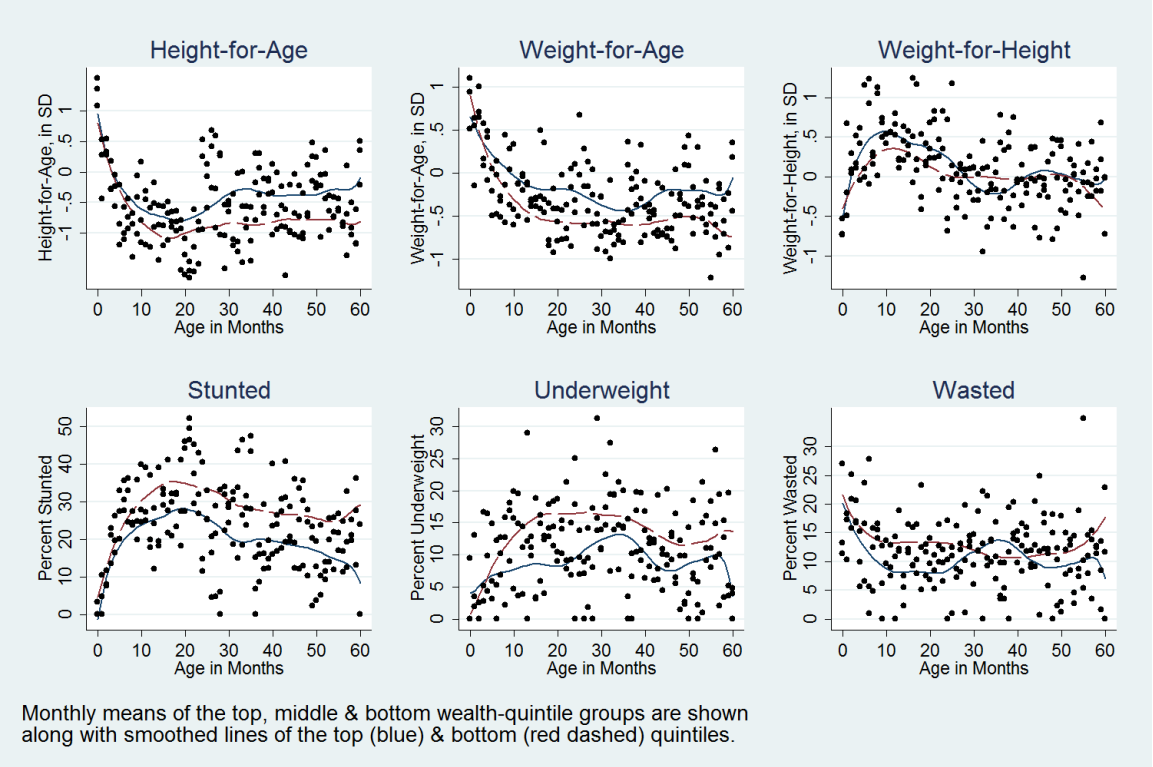
5. Syria 2009

Figure A9. Anthropometric Indicators of Child Development for Children Aged 0–59 Months vis-à-vis Reference Population, Syria 2009 (*z*-score deviations from reference distrib.)



The blue vertical line on the right shows the median of the reference healthy population, the standard normal distribution, while the red vertical line on the left shows the median less two standard deviations, serving as the official cutoff point for stunted, underweight and wasted population.

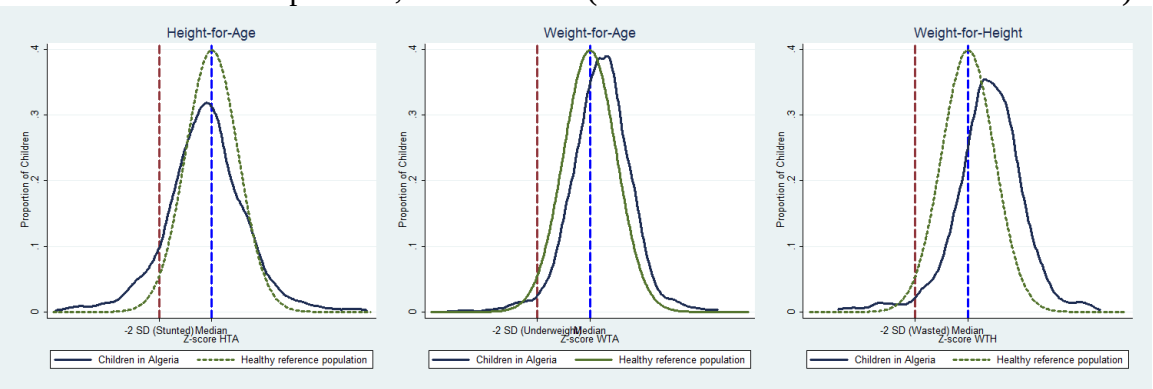
Figure A10. Anthropometric Indicators by Children's Age, Syria 2009



Each point represents the mean of values in a wealth-quintile group for a particular month. Fitted lines for the top and bottom wealth-quintiles are lowess-smoothed using a locally-weighted running-line least-squares method.

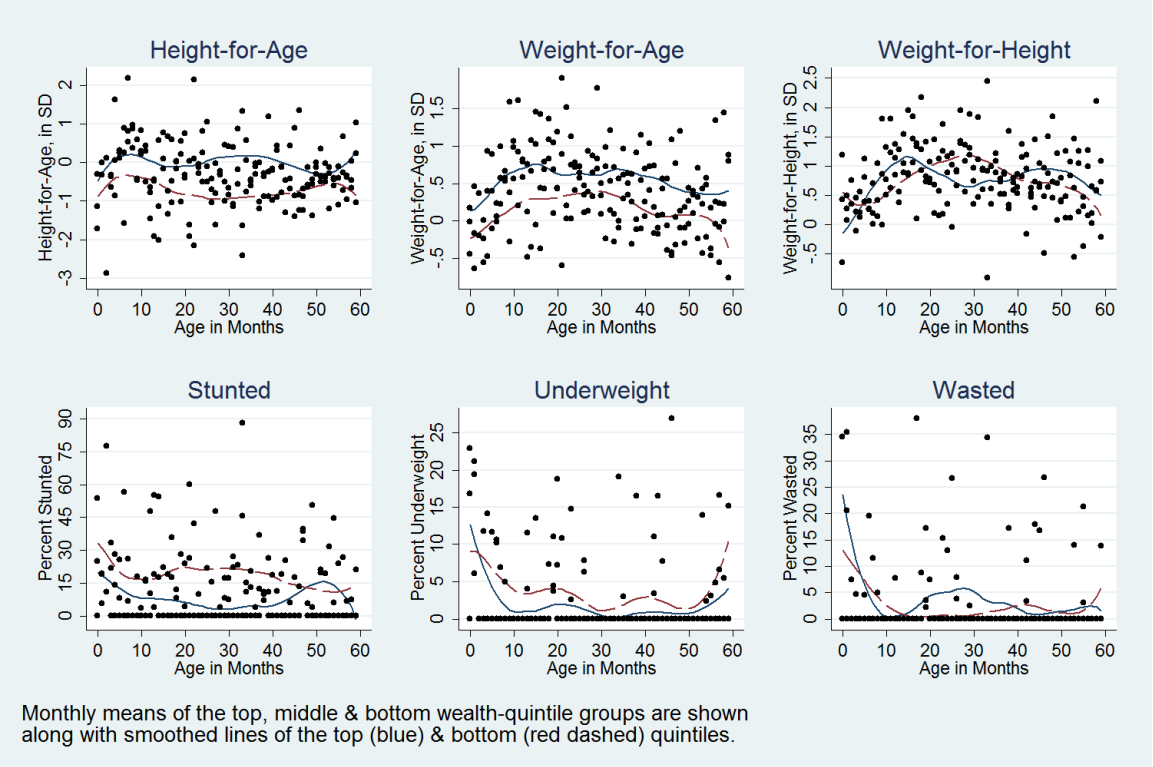
6. Tunisia 2011

Figure A11. Anthropometric Indicators of Child Development for Children Aged 0–59 Months vis-à-vis Reference Population, Tunisia 2011 (*z*-score deviations from reference distrib.)



The blue vertical line on the right shows the median of the reference healthy population, the standard normal distribution, while the red vertical line on the left shows the median less two standard deviations, serving as the official cutoff point for stunted, underweight and wasted population.

Figure A12. Anthropometric Indicators by Children's Age, Tunisia 2011



This figure is comparable to figure 13.3 in El-Kogali & Krafft (2015:253).
Each point represents the mean of values in a wealth-quintile group for a particular month. Fitted lines for the top and bottom wealth-quintiles are lowess-smoothed using a locally-weighted running-line least-squares method.