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SUPPLEMENT ARTICLE

Complementary feeding practices: Current global and regional estimates

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Abstract

Insufficient quantities and inadequate quality of complementary foods, together with poor feeding practices, pose a threat to children's health and nutrition. Interventions to improve complementary feeding are critical to reduce all forms of malnutrition, and access to data to ascertain the status of complementary feeding practices is essential for efforts to improve feeding behaviours. However, sufficient data to generate estimates for the core indicators covering the complementary feeding period only became available recently. The current situation of complementary feeding at the global and regional level is reported here using data contained within the UNICEF global database. Global rates of continued breastfeeding drop from 74.0% at 1 year of age to 46.3% at 2 years of age. Nearly a third of infants 4–5 months old are already fed solid foods, whereas nearly 20% of 10–11 months old had not consumed solid foods during the day prior to their survey. Of particular concern is the low rate (28.2%) of children 6–23 months receiving at least a minimally diverse diet. Although rates for all indicators vary by background characteristics, feeding behaviours are suboptimal even in richest households, suggesting that cultural factors and poor knowledge regarding an adequate diet for young children are important to address. In summary, far too few children are benefitting from minimum complementary feeding practices. Efforts are needed not only to improve children's diets for their survival, growth, and development but also for governments to report on progress against global infant and young child feeding indicators on a regular basis.

KEYWORDS

animal source foods, complementary feeding, complementary foods, dietary diversity, infant and young child feeding, introduction to solid, semisolid or soft foods

1 | INTRODUCTION

It is well recognized that the period between birth and 2 years of age is a critical window to promote health and development and prevent stunting (Black et al., 2008; de Onis & Branca, 2016). In most countries, the majority of the decline in length-for-age during the first 2 years of life occurs during the complementary feeding period, between 6 and 23 months of age (Dewey & Huffman, 2009; Victora, de Onis, Hallal, Blossner, & Shrimpton, 2010). Insufficient quantities and inadequate quality of complementary foods, together with poor feeding practices and increased rates of infection during this period are direct risk factors for stunting (Bhutta et al., 2013; Danaei et al., 2016). Interventions that improve complementary feeding, including education on appropriate feeding practices, with or without supplemental food, are among the most effective to reduce stunting during the first 2 years of life (Black et al., 2008; Dewey & Adu-Afarwuah, 2008; Roy et al., 2007). If interventions to improve complementary feeding practices were scaled up to nearly universal levels, approximately 100,000 under five deaths could be averted each year (Bhutta et al., 2013).

The World Health Organization (WHO) and UNICEF recommend that infants begin consuming safe and nutritionally adequate solid, semisolid, or soft foods starting at 6 months of age while continuing to be breastfed until 2 years of age or beyond. Recommended practices include the timely introduction of complementary foods at 6 months of age, sufficient meal frequency and portions sizes, diversity of diet, appropriate food texture, safe food preparation, storage and hygiene behaviours, and responsiveness to feeding cues. (PAHO, 2003; WHO, 1998; WHO & UNICEF, 2003).

Although considerable progress has been made over the last few decades towards the development and implementation of policies and programmes designed to protect, promote, and support breastfeeding, efforts to improve complementary feeding have lagged behind over the same period. Progress has been hampered, at least in part, by the lack of standard indicators for complementary feeding. Without standard indicators to assess practices, the complementary feeding situation at country, regional, or global level could not be ascertained. To address this limitation, WHO led the development of complementary feeding indicators amenable to population-level assessment and published them in 2008. The core complementary feeding indicators newly developed and/or redefined included: (a) introduction to solid, semisolid, or soft foods, (b) minimum meal frequency (MMF), (c) minimum diet diversity (MDD), and (4) minimum acceptable diet (MAD) (WHO, 2008). Indicators amenable to population-level assessment for other critical aspects of complementary feeding such as responsive feeding, adequate food texture, portion size and safe food preparation and storage were not developed as part of this process as they are more complex to assess. An operational manual to support standardized collection and analysis of these new indicators was released in 2010 (WHO, 2010). Two major household survey programmes, the UNICEF-supported Multiple Indicator Cluster Surveys (MICS) and United States Agency for International Development supported Demographic and Health Survey (DHS) included at least some of these new core indicators within their core survey modules as of 2010.

Sufficient data for generation of global estimates for three of the new complementary feeding indicators, namely, MMF, MDD, and MAD, only became available in 2016. The aim of this paper was to use available data on both these new core indicators, and several components of these indicators that provide additional insight on feeding practices, to report on the current global and regional complementary feeding situation. Given the lack of data from earlier time periods, trend analysis on these indicators is not yet possible and therefore out of the scope of this analysis. However, these current global and regional estimates provide evidence of the severity of suboptimal feeding practices in all regions, highlight gaps in consumption of various food groups, and emphasize population groups with the poorest situation, thus setting the scene for this supplement, while also establishing a baseline for the current period (2010–2016) from which future progress can be monitored.

Key messages

- The timing of introduction of complementary foods is problematic across all regions. About one third of infants 6–8 months are not yet eating solid, semisolid, or soft foods.
- Early introduction of complementary foods is particularly problematic in Latin America and the Caribbean and East Asia and the Pacific, where nearly half of all infants between 4 and 5 months of age are already consuming solids.
- Globally, approximately half of all children are not receiving a minimum meal frequency, and the percentage of children consuming the recommended minimum number of meals per day is low even in the richest households in West and Central Africa, Eastern and Southern Africa, and South Asia.
- A diverse diet can support children to meet their nutrient requirements for healthy growth and development. However, disparities due to wealth are stark; the rate for minimum diet diversity among children in the richest households is 2 times higher than that among children in the poorest households at the global level and 3 times higher than that in sub-Saharan Africa.

2 | METHODS

2.1 | Data sources

UNICEF maintains a global database of country-level estimates covering eight standard infant and young child feeding indicators defined by WHO (WHO, 2008). Six of these core indicators, defined in Table 1, cover the complementary feeding period between 6 and 23 months of age (UNICEF, 2016a). Table 1 also contains definitions of additional indicators that provide useful insight into young child feeding and/or allow for disaggregation of estimates. These additional indicators were defined in a manner aligned with the standard indicators. For example, continued breastfeeding among children 12–23 months of age was defined as an additional indicator using the same numerator and denominator as the standard indicator, but changing the age range to 12–23 months to allow for sufficient sample size to present disaggregated results. Other additional indicators were defined for feeding of animal source foods as well as feeding of specific food groups among children 6–23 months of age with the aim of providing more insight into feeding practices than possible with the standard indicators.

The UNICEF global database contains recent (2010–2016) estimates for these six core indicators from national-level household surveys for over 100 countries. As data collection for some of these indicators only began in 2010, only current (2010–2016) estimates are presented; generation of trends is not possible with this narrow set of years that constitutes the year range for current data in the most recent State of the World's Children Report (UNICEF, 2016b). The global database is updated regularly with a concerted annual data compilation exercise supported by UNICEF's field offices. In this annual exercise, field offices review estimates in the existing database and share any additional estimates along with source documentation. The submissions are evaluated for inclusion in the global database against a set of objective criteria assessing sampling methods, survey implementation, questionnaires, and data analysis to ensure that the sources were representative of the population at the national level, the estimates conformed to the standard indicator definition (WHO, 2008), and the survey was of adequate quality. On the basis of these

TABLE 1 Infant and young child feeding indicators for children 6–23 months of age

Indicator	Indicator definition
Core WHO indicators for children 6–23 months of age (breastfeeding)	
1. Continued breastfeeding at 1 year	Numerator: Children 12–15 months of age who received breastmilk during the previous day Denominator: Children 12–15 months of age
2. Continued breastfeeding at 2 years	Numerator: Children 20–23 months of age who received breastmilk during the previous day Denominator: Children 20–23 months of age
Core WHO indicators for children 6–23 months of age (feeding of solid, semisolid, or soft foods)	
3. Introduction of solid, semisolid, and soft foods[a]	Numerator: Infants 6–8 months of age who received solid, semisolid or soft foods during the previous day Denominator: Infants 6–8 months of age
4. Minimum[b] meal frequency[c]	Numerator: Breastfed children 6–23 months of age who received solid, semisolid, or soft foods the minimum number of times or more during the previous day and non-breastfed children 6–23 months of age who received solid, semisolid, or soft foods or milk feeds the minimum number of times or more during the previous day Denominator: Breastfed children aged 6–23 months and non-breastfed children aged 6–23 months
5. Minimum[d] dietary diversity[c]	Numerator: Children 6–23 months of age who received foods from ≥4 (out of 7) food groups during the previous day Denominator: Children 6–23 months of age
6. Minimum acceptable diet[c]	Numerator: Breastfed children 6–23 months of age who had at least the minimum dietary diversity and the minimum meal frequency during the previous day and non-breastfed children 6–23 months of age who received at least two milk feedings and had at least the minimum dietary diversity not including milk feeds and the minimum meal frequency during the previous day Denominator: Breastfed children aged 6–23 months and non-breastfed children aged 6–23 months
Additional indicators for children 6–23 months of age (breastfeeding and feeding of solid, semisolid or soft foods)	
7. Continued breastfeeding in the second year of life	Numerator: Children 12–23 months of age who received breastmilk during the previous day Denominator: Children 12–23 months of age
8. Number of animals source[e] food groups consumed	*% consuming zero animal source food groups* Numerator: Children 6–23 months of age did not consume any animal source food groups during the previous day Denominator: Children 6–23 months of age *% consuming one animal source food group* Numerator: Children 6–23 months of age who consumed one type of animal source food group during the previous day Denominator: Children 6–23 months of age *% consuming two animal source food groups* Numerator: Children 6–23 months of age who consumed two types of animal source food group during the previous day Denominator: Children 6–23 months of age *% consuming three animal source food groups* Numerator: Children 6–23 months of age who consumed three types of animal source food group during the previous day Denominator: Children 6–23 months of age
9. Consumption of grains, roots and tubers	Numerator: Children 6–23 months of age who consumed grains, roots, or tubers during the previous day Denominator: Children 6–23 months of age
10. Consumption of legumes, nuts and seeds	Numerator: Children 6–23 months of age who consumed legumes, nuts, and seeds during the previous day Denominator: Children 6–23 months of age
11. Consumption of dairy products	Numerator: Children 6–23 months of age who consumed dairy products (e.g., milk, cheese, and yogurt) during the previous day Denominator: Children 6–23 months of age
12. Consumption of flesh foods	Numerator: Children 6–23 months of age who consumed flesh foods (e.g., beef, chicken, fish, and organ meat) during the previous day Denominator: Children 6–23 months of age
13. Consumption of eggs	Numerator: Children 6–23 months of age who consumed eggs during the previous day Denominator: Children 6–23 months of age
14. Consumption of vitamin A rich[f] fruits and vegetables	Numerator: Children 6–23 months of age who consumed vitamin A rich fruits and vegetables (e.g., carrots, orange-flesh sweet potatoes, spinach, and mango) during the previous day Denominator: Children 6–23 months of age
15. Consumption of other fruits and vegetables	Numerator: Children 6–23 months of age who consumed other fruits and vegetables (e.g. tomatoes, zucchini, apples, and oranges) during the previous day Denominator: Children 6–23 months of age

[a]This indicator was re-defined in 2007. The previous indicator was an indicator for timely complementary feeding that required infants 6–9 months of age to be both breastfed and receiving complementary foods. The updated definition does not take into account the breastfeeding status of the child, and a more narrow age range of 6–8 months was chosen to bring the age group closer to the 6-month mark when introduction needs to begin (WHO, 2008).

[b]Minimum is defined as: 2 times for breastfed infants 6–8 months of age; 3 times for breastfed children 9–23 months of age; and 4 times for non-breastfed children 6–23 months of age (and can include milk/formula feeds for non-breastfed children). "Meals" include both meals and snacks, other than trivial amounts, and frequency is based on caregiver report.

[c]Indicator defined in 2007 (WHO, 2008).

[d]The four food groups are determined on the basis of the following food groups: (a) grains, roots, and tubers; (b) legumes and nuts; (c) dairy products (milk, yogurt, and cheese); (d) flesh foods (meat, fish, poultry, and liver/organ meats); (e) eggs; (f) vitamin A rich fruits and vegetables; (g) other fruits and vegetables.

[e]The animal source foods were grouped into the three following types (a) flesh foods (e.g. beef, chicken, and organ meat); (b) eggs; and (c) dairy (e.g. milk, cheese, and yogurt).

[f]Vitamin A rich is defined as food items that contain at least 120 retinol equivalents per 100 grams (equivalent to 60 retinol activity equivalents for plant foods).

parameters, common reasons for rejection include (a) sampling methods that would not render a representative sample, for example, lack of standard household listing methods for selected primary sampling units and/or insufficient documentation of sampling methods; (b) non-conformity to the indicator definition, for example, use of long-term retrospective questions rather than 24-hr recall as well as missing or combined food groups that cannot be disaggregated such as including meat and eggs in the same line item in the questionnaire that does not allow for analysis of seven food groups; and (c) implausible results such as unlikely percentages of children 12–23 months of age receiving no solid food at all or a continued breastfeeding rate at 20–23 months being substantially higher than the rate at 12–15 months.

A majority of the country-level estimates for the complementary feeding indicators in the global database come from national-level MICS and DHS. MICS and DHS employ scientific probability sampling and adhere to the fundamentals of scientific sampling, including complete coverage of the target population, use of suitable sample sizes, the need to conduct a new household listing and pre-selection of sample households, and preparation of appropriate sample documentation (Hancioglu & Arnold, 2013). They also use standardized questions (WHO, 2010), on feeding practices during the 24 hr preceding the survey. Detailed information about the MICS and the DHS is available online (ICF International, 2016; UNICEF, 2016c). Data from nationally representative household surveys other than the MICS and DHS are also included in the UNICEF global database if the set of objective criteria mentioned previously have been adhered to. Reported values from survey documents are used to populate the global database. When available, raw data from the surveys are obtained and re-analysed to ensure conformity to the standard indicator definitions and/or to generate additional parameters for the database, such as measurements of sampling error presented as 95% confidence intervals (CIs), and to generate additional indicators as listed in Table 1. Countries for which raw data are not available are not included in the expanded database with additional indicators and parameters.

2.2 | Data analysis

Population weighted means and where possible their corresponding 95% CIs were calculated for each of the indicators in Table 1 at the global level as well as for each of seven UNICEF regional groupings (UNICEF, 2016b) using the most recent estimate in the UNICEF global database for each country with available data between 2010 and 2016. The annual population by age interpolated datasets from the United Nations Department of Economic and Social Affairs, Population Division (UNPD) (United Nations, 2015) were used as country-level population weights. The national population estimates for 0- to 1-year-olds were applied to weigh the means for the total, as well as age and wealth disaggregated estimates. For any given indicator, the population weighted average was generated by (a) multiplying the rate for each country with available data by the number of 0- to 1-year-olds in that country, (b) summing all of the country specific products, and (c) dividing the sum of the products by the total population of 0- to 1-year-olds in all countries with data. For the generation of estimates by sex, the population of boys and girls aged 0–1 years (United Nations, 2015) were used as population weights. For generation of urban and rural population weighted estimates, the proportion of the population residing in urban areas (United Nations, 2015) was used in conjunction with the national population estimates for 0- to 1-year-olds.

Population coverage, or the share of the population for which an estimate is available in the UNICEF global database, was calculated for each indicator and disaggregation by dividing the population of 0- to 1-year-olds in countries with data by the total population of 0- to 1-year-olds in each respective region. The standard used for minimum population coverage was 50%. In some cases, the 50% threshold would not be met due to the absence of data for a populous country accounting for a large number of 0- and 1-year-olds in the region, so up to one specific populous country per region was excluded from the regional definition, and thus its population excluded from the denominator, to allow the 50% population coverage threshold to be met. Such exceptions are noted in the footnotes within the figures and tables of the results (e.g. East Asia and the Pacific excluding China).

The 95% CIs presented for the regional and global aggregates were generated by calculating population weighted means as described above, using the 95% CIs for each available country estimate in the database. Global and regional estimates and 95% CIs were only presented when the population coverage was at least 50%.

Wealth quintiles and place of residence were used as stratification variables in this analysis. Wealth quintiles are based on scores derived using principal component analyses, which is applied to a list of household assets and characteristics of the houses. The first quintile (Q1) represents the 20% poorest families, and the last quintile (Q5) represents the 20% wealthiest families. The list of assets is specific to each survey. As quintiles refer to households, and because fertility is higher among the poor, the poorest quintile tends to include more than 20% of all children surveyed, whereas the richest quintiles include less than one fifth of all children. Urban and rural residence was classified according to boundaries provided by local authorities.

3 | RESULTS

3.1 | Sample characteristics

In total, 121 surveys from 101 countries conducted between 2010 and 2016 (exception of China) were available in the UNICEF global database for this analysis, of which estimates for the set of disaggregations, additional indicators, and 95% CIs were available for 85 countries. Population coverage varied from 50% to 82% of the global population depending on the indicator, disaggregation, and countries excluded from analyses. The global and regional population coverages as well as lists of countries with available data for each indicator and disaggregation presented within the tables and figures of this paper are available in Tables S1 and S2.

3.2 | Global and regional situation for continued breastfeeding and complementary feeding based on the core standard indicators

Figure 1 presents the global and regional estimates for the core feeding indicators among children 6–23 months of age. Only 74.0% of children aged 12–15 months are still breastfed with the highest rates seen in Eastern and Southern Africa (ESA; 91.0%), West and

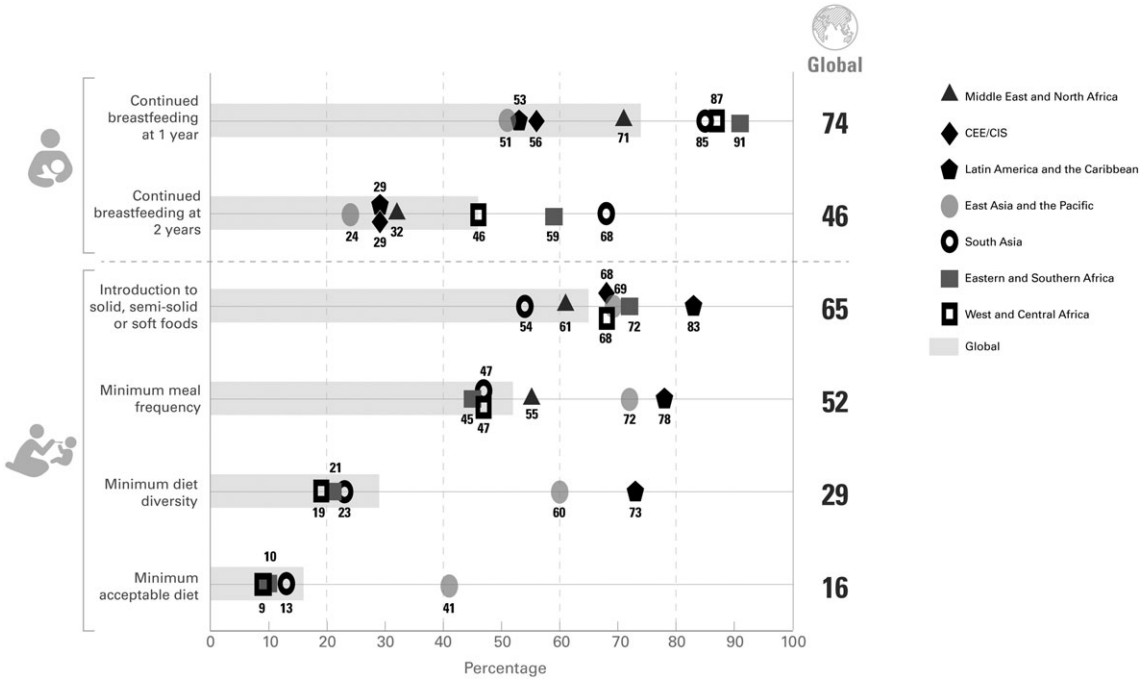

FIGURE 1 Global and regional estimates of infant and young child feeding practices during the complementary feeding period.
Source: UNICEF global databases, 2016, based on MICS, DHS and other nationally representative sources. All estimates where population coverage fell below the 50% threshold have been suppressed. The aggregates for Global and East Asia and Pacific region use data from 2008 for China for continued breastfeeding at 1 year, continued breastfeeding at 2 years and introduction to solid, semi-solid and soft foods. China is the only country for which data from before the year 2010 were used. Data were unavailable for China for minimum meal frequency, minimum diet diversity or minimum acceptable diet. CEE/CIS refers to Central and Eastern Europe and the Commonwealth of Independent States. Estimates presented exclude Russian Federation as data were unavailable and the threshold of 50% population coverage for the region could only be met when Russian Federation was removed from the analysis

Central Africa (WCA; 87.4%), and South Asia (SA; 85.1%) in stark contrast to East Asia and the Pacific (EAP; 50.7%), Latin America and the Caribbean (LAC; 53.4%), and Central and Eastern Europe and the Commonwealth of Independent States (CEE/CIS; 56.1%). Globally, continued breastfeeding drops to 46.3% among children 20–23 months of age.

Globally, only 64.5% of infants 6–8 months of age are fed solid, semisolid, or soft foods (for the sake of brevity, solid, semisolid, or soft foods will be referred to as "solid foods" throughout the rest of this paper), with the lowest rates in SA, at 53.5%, and highest in LAC, at 83.1%. Global rates of MMF and MDD were both low at 52.2% and 29.4%, respectively. In WCA, ESA, and SA, the rates of MMF are less than 50% and MDD less than 25%. Rates for both indicators are highest in EAP and LAC where about three in four children are getting MMF and MDD.

Rates for MAD are low across all regions with available data. Rates are highest in EAP at 41.1% and lowest in WCA at 8.6%, ESA at 9.8%, and SA at 13.0%.

Rates for all complementary feeding indicators are lowest in WCA, ESA, and SA, whereas rates of continued breastfeeding at 1 and 2 years are highest in these regions.

3.3 | Age of introduction to solid, semisolid, or soft foods

The percentage of infants receiving solid foods in the first year of life, by 2 month age bands, is presented in Figure 2. The age of investigation was widened to allow for assessment of early and late introduction. Consumption of solid foods *before* the recommended 6 months of age is found across all regions but is highest in the two regions that report the highest rates for consumption of solids among infants 6–8 months of age (reported in Figure 1): LAC and EAP. In these two regions, nearly half of infants 4–5 months of age and about 15% of infants 2–3 months of age are already consuming solids. Globally, among the oldest age group studied, 10- to 11-month-olds, 17.0% did *not* consume solid foods in the previous day, with the highest rates found in SA and the Middle East and North Africa (MENA), at 21.7% and 20.8%, respectively.

3.4 | Core complementary feeding indicators disaggregated by background characteristics

Table 2 presents further disaggregation of the core complementary feeding indicators and continued breastfeeding among 12- to 23-month-olds by area of residence, household wealth, and age in months. Disaggregation for the introduction of solid foods was not possible due to the small sample sizes associated with the indicator. Disaggregations are available for each of the seven regions for breastfeeding among 12- to 23-month-olds, but population coverage was insufficient to present disaggregations for MMF, MDD, and MAD for LAC, CEE/CIS, and MENA.

Continued breastfeeding among 1-year-olds is higher in rural areas than in urban areas and in the poorest households when compared to

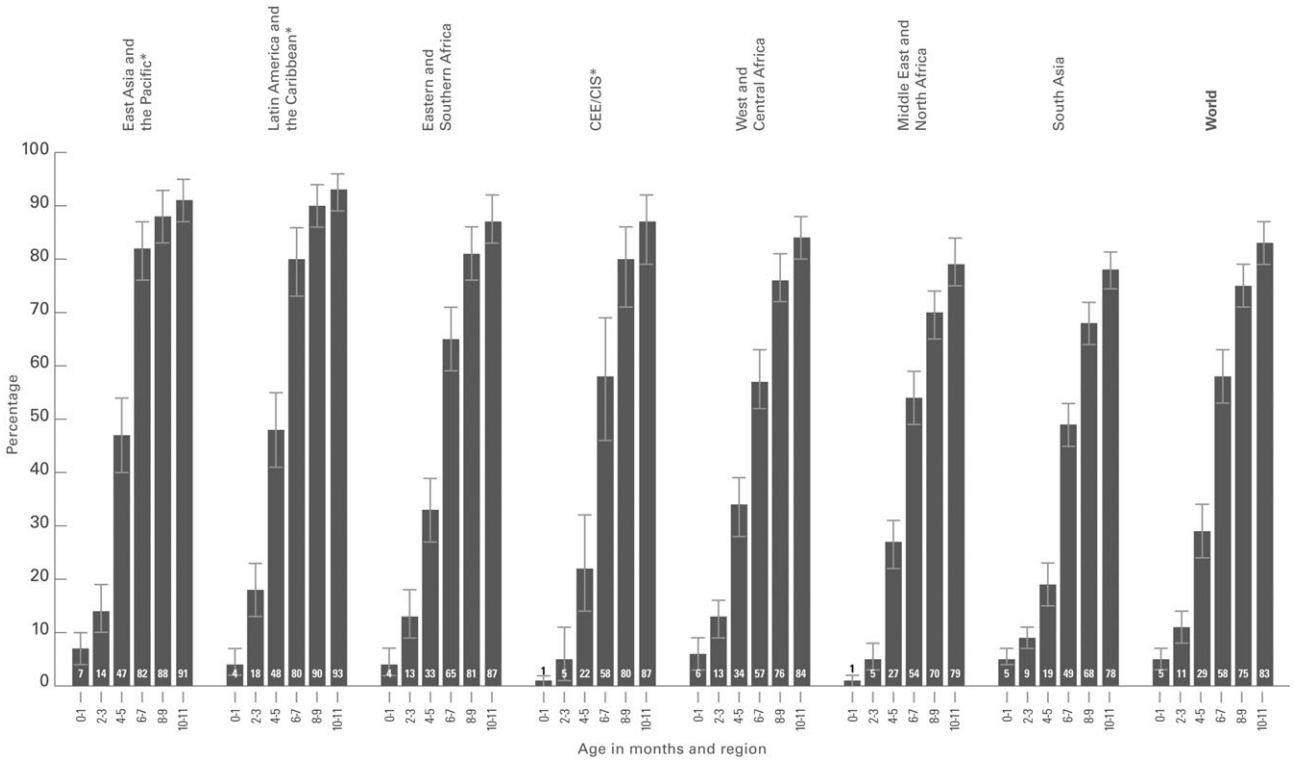

FIGURE 2 Per cent of children fed solid, semisolid, or soft foods, by age and by region, 2015.
Source: UNICEF global databases, 2016, based on MICS, DHS and other nationally representative sources. Analysis is based on a subset of 79 countries with data on feeding of solids between 2010 and 2014 for all age groups, covering 74% of the global population excluding China and Russian Federation. Regional estimates are presented only where adequate population coverage (≥50%) is met. * To meet adequate population coverage, East Asia and the Pacific does not include China, Latin America and the Caribbean does not include Brazil, CEE/CIS does not include Russian Federation, and World does not include China and Russian Federation

the richest households across all regions, with the exception of CEE/CIS, where rates are similar between all sub-groups.

The magnitude of differences in MMF between urban and rural households is generally small across regions with data. However, there are significant differences between rates of MMF in the poorest and richest households in all regions expect WCA. There is no notable difference for MMF between any age group, with the exception of SA, where significantly more children aged 18–23 months consume MMF than those 6–11 months.

For MDD, children residing in urban areas and in the richest households have higher rates than their rural and poor counterparts across the four regions with data. Disparities due to wealth are stark; the rate among children in the richest households is 2 times higher than children in the poorest households at the global level and 3 times higher in both WCA and ESA. When comparing between regions, children in the poorest households in EAP have a significantly higher rate of MDD (42.0%, 95% CI [37.5, 46.5]) than children in the richest households in SA (31.9%, 95% CI [28.8, 35.1]). At the global level, the rate of MDD among children 12–17 months of age is nearly double the rate among those 6–11 months of age.

Disparities by area of residence and household wealth quintile for MAD are similar to MDD, albeit less pronounced, with higher MAD rates among those residing in urban areas and the richest households. At the global level, a higher percentage of older children are also receiving MAD when compared to those 6–11 months of age.

Across all indicators, no notable differences are found between boys and girls (data not presented).

3.5 | Types of food groups consumed by background characteristics

Table 3 presents disaggregated results for the consumption of each of the seven food group types used in MDD: grains, roots, and tubers; legumes, nuts, or seeds; dairy products; flesh foods; eggs; vitamin A rich fruits and vegetables; and other fruits and vegetables.

Not surprisingly, consumption of staple foods (grains, roots, and tubers) is high with close to 80% of children 6–23 months having consumed them during the previous day. There is no significant difference between area of residence except for WCA and SA where consumption of staples is slightly higher in urban areas.

At the global level, only 28.3% of children 6–23 months of age consumed any legumes, nuts, or seeds in the previous day with higher rates in urban areas in WCA, EAP, and LAC. Significant differences between the richest and poorest are found in the two Asian regions, but they are of small magnitude. In all regions, a higher percentage of children over 1 year were consuming legumes, nuts, or seeds when compared to that of the youngest age group of 6- to 11-month-olds.

TABLE 2 Global and regional estimates of infant and young child feeding practices during the complementary feeding period by background characteristics

Indicator	Global[ad]	West and Central Africa	Eastern and southern Africa	South Asia	East Asia and the Pacific[b]	Latin America and the Caribbean[c]	CEE/CIS[d]	Middle East and North Africa
Continued breastfeeding (12–23 months)	68.3 [66.0, 70.5]	71.0 [68.4, 73.5]	76.5 [73.9, 79.1]	77.8 [76.3, 79.3]	56.7 [53.8, 59.5]	37.3 [34.5, 40.2]	42.9 [38.4, 47.3]	49.6 [47.3, 51.8]
Urban	58.0 [54.1, 62.0]	58.6 [54.3, 62.9]	67.4 [61.5, 73.2]	72.0 [69.0, 74.9]	52.4 [48.3, 56.4]	33.5 [29.8, 37.2]	44.3 [37.3,51.3]	43.6 [40.2,46.9]
Rural	74.2 [71.7, 76.8]	77.5 [74.8, 80.2]	79.1 [76.2, 81.9]	80.3 [78.6, 82.1]	59.8 [56.0, 63.7]	45.9 [41.9, 50.5]	43.3 [36.5, 50.1]	55.0 [52.1, 57.9]
Poorest	76.2 [72.4, 80.1]	82.7 [79.2, 86.3]	82.0 [77.6, 86.3]	84.9 [82.4, 87.3]	66.0 [60.6, 71.4]	49.9 [44.5, 55.3]	44.2 [34.5, 53.9]	54.7 [50.0, 59.3]
Richest	57.9 [52.8, 62.9]	52.5 [47.2, 57.8]	66.8 [60.1, 73.4]	70.8 [67.7, 74.0]	42.1 [35.5, 48.8]	25.4 [17.6, 33.2]	40.1 [32.5, 47.7]	45.0 [39.2, 50.8]
Minimum meal frequency	50.3 [48.1, 52.4]	45.4 [42.9, 47.8]	44.6 [41.8, 47.4]	47.0 [45.3, 48.8]	71.7 [69.5, 73.9]			
Urban	54.6 [51.0, 58.2]	44.8 [40.8, 48.8]	49.4 [42.9, 55.8]	51.2 [48.3, 54.0]	74.4 [71.5, 77.3]			
Rural	48.0 [45.4, 50.5]	45.6 [42.5, 48.6]	43.2 [40.1, 46.3]	45.3 [43.2, 47.4]	69.9 [66.9, 72.9]			
Poorest	46.6 [42.6, 50.7]	45.8 [41.7, 50.0]	38.5 [33.7, 43.2]	43.2 [39.6, 46.7]	64.1 [59.7, 68.5]			
Richest	56.3 [52.0, 60.6]	45.2 [39.7, 50.6]	53.6 [47.1, 60.2]	54.4 [51.5, 57.4]	79.1 [75.0, 83.1]			
6–11 months	46.3 [43.2, 49.5]	44.2 [40.9, 47.5]	44.5 [40.1, 48.8]	39.5 [37.0, 42.0]	72.4 [68.8, 76.1]			
12–17 months	50.7 [47.5, 53.9]	47.0 [43.4, 50.5]	43.1 [38.7, 47.5]	47.8 [45.3, 50.3]	70.1 [66.6, 73.5]			
18–23 months	54.3 [50.9, 57.6]	44.5 [40.6, 48.4]	47.1 [42.8, 51.4]	54.8 [52.1, 57.4]	72.1 [68.7, 75.5]			
Minimum diet diversity	28.2 [26.3, 30.1]	19.3 [17.1, 21.5]	23.1 [20.9, 25.3]	22.9 [21.4, 24.4]	61.6 [59.1, 64.1]			
Urban	37.5 [34.2, 40.8]	29.2 [25.4, 33.0]	35.0 [30.0, 40.0]	27.8 [25.3, 30.3]	68.3 [65.0, 71.6]			
Rural	23.7 [21.6, 25.8]	14.1 [11.8, 16.4]	19.8 [17.5, 22.0]	20.9 [19.2, 22.6]	56.7 [53.4, 60.0]			
Poorest	19.1 [16.1, 22.1]	10.2 [7.5, 12.9]	13.6 [10.5, 16.8]	15.6 [13.2, 17.9]	42.0 [37.5, 46.5]			
Richest	40.2 [35.9, 44.5]	34.0 [28.8, 39.2]	39.3 [33.8, 44.9]	31.9 [28.8, 35.1]	78.1 [73.4, 82.7]			
6–11 months	16.8 [14.5, 19.1]	11.5 [9.3, 13.7]	15.6 [12.8, 18.4]	11.4 [9.8, 13.0]	42.0 [38.0, 46.0]			
12–17 months	31.5 [28.7, 34.4]	21.5 [18.4, 24.5]	26.1 [22.4, 29.8]	25.8 [23.7, 28.0]	67.4 [63.6, 71.2]			
18–23 months	37.6 [34.4, 40.8]	26.5 [22.9, 30.2]	28.4 [24.5, 32.3]	32.2 [29.5, 34.9]	76.9 [73.7, 80.2]			
Minimum acceptable diet	15.9 [14.4, 17.3]	8.7 [7.4, 10]	11.5 [9.9, 13.1]	13.0 [11.9, 14.1]	40.9 [38.5, 43.3]			
Urban	20.6 [18.0, 23.3]	12.0 [9.4, 14.5]	16.9 [13.1, 20.8]	15.6 [13.6, 17.6]	45.9 [42.4, 49.4]			
Rural	13.5 [11.9, 15.1]	7.0 [5.5, 8.4]	9.9 [8.3, 11.5]	12.0 [10.7, 13.3]	37.4 [34.2, 40.5]			
Poorest	11.0 [8.6, 13.3]	5.6 [3.7, 7.6]	6.7 [4.4, 9.1]	9.1 [7.2, 11.0]	24.9 [21.0, 28.8]			
Richest	22.8 [19.1, 26.6]	13.8 [10.0, 17.7]	20.8 [16.0, 25.6]	18.8 [16.2, 21.4]	56.1 [50.8, 61.5]			
6–11 months	11.2 [9.3, 13.1]	6.9 [5.3, 8.5]	9.1 [6.9, 11.3]	7.4 [6.1, 8.7]	30.7 [27.2, 34.3]			
12–17 months	18.1 [15.7, 20.5]	10.6 [8.5, 12.7]	13.1 [10.4, 15.9]	14.3 [12.5, 16.1]	45.4 [41.3, 49.5]			
18–23 months	18.7 [16.2, 21.3]	8.4 [6.3, 10.4]	12.5 [9.6, 15.5]	17.7 [15.6, 19.8]	47.5 [43.3, 51.6]			

Source: UNICEF global databases, 2016, based on MICS, DHS, and other nationally representative sources. All estimates where population coverage fell below the 50 per cent threshold have been suppressed.

[a]The aggregates for Global exclude China and Russian Federation as data were unavailable for these two countries and the threshold of 50 per cent for global population coverage for *urban areas* could only be met when these countries were removed from the analysis.

[b]The aggregates for East Asia and the Pacific region exclude China as data were unavailable and the threshold of 50% population coverage for the region could only be met when China was removed from the analysis.

[c]Estimates exclude Brazil as data were unavailable and the threshold of 50% population coverage for the region could only be met when Brazil was removed from the analysis.

[d]CEE/CIS refers to Central and Eastern Europe and the Commonwealth of Independent States. Estimates exclude Russian Federation as data were unavailable and the threshold of 50% population coverage for the region could only be met when Russian Federation was removed from the analysis.

TABLE 3 Global and regional estimates for consumption of different food groups as well as number of animal source food groups in the previous day by background characteristics

Indicator (percentage of 6- to 23-month-olds consuming)	Global[ad]	West and Central Africa	Eastern and southern Africa	South Asia	East Asia and the Pacific[b]	Latin America and Caribbean[c]
Grains, roots, or tubers	79.3 [77.7, 80.8]	73.3 [71.3, 75.4]	82.6 [80.7, 84.5]	76.8 [75.5, 78.2]	93.6 [92.4, 94.8]	87.7 [86.1, 89.3]
Urban	83.2 [80.8, 85.6]	78.5 [75.5, 81.5]	86.6 [82.8, 90.4]	80.4 [78.3, 82.5]	95.3 [93.9, 96.7]	87.6 [85.5, 89.6]
Rural	77.4 [75.4, 79.3]	70.6 [68.0, 73.2]	81.5 [79.3, 83.6]	75.4 [73.7, 77.0]	92.3 [90.5, 94.1]	87.9 [85.4, 90.3]
Poorest	75.8 [72.4, 79.3]	68.1 [64.0, 72.2]	79.6 [76.0, 83.2]	73.9 [70.6, 77.1]	90.4 [87.7, 93.1]	87.2 [84.2, 90.0]
Richest	83.9 [80.8, 87.0]	79.8 [76.0, 83.7]	85.7 [81.2, 90.2]	81.9 [79.5, 84.4]	95.1 [92.7, 97.5]	88.8 [84.5, 92.4]
6–11 months	65.5 [62.7, 68.3]	58.8 [55.6, 62.0]	72.9 [69.4, 76.4]	59.8 [57.4, 62.2]	90.4 [88.1, 92.7]	83.3 [79.9, 86.3]
12–17 months	84.6 [82.4, 86.8]	79.5 [76.8, 82.3]	86.0 [83.1, 88.9]	83.3 [81.5, 85.1]	94.8 [92.9, 96.7]	90.0 [87.7, 92.2]
18–23 months	88.9 [86.9, 90.9]	84.2 [81.6, 86.8]	91.0 [88.7, 93.3]	87.8 [86.1, 89.6]	95.7 [94.3, 97.2]	90.1 [87.8, 92.2]
Legumes, nuts, or seeds	28.3 [26.5, 30.1]	17.4 [15.7, 19.1]	32.3 [29.6, 35.1]	32.6 [31.3, 34.0]	28.3 [26.1, 30.5]	24.7 [22.7, 26.9]
Urban	29.3 [26.4, 32.3]	21.1 [18.1, 24.0]	31.9 [26.6, 37.2]	33.9 [31.8, 36.1]	32.2 [29.0, 35.5]	22.8 [20.3, 25.5]
Rural	28.0 [25.8, 30.1]	15.5 [13.6, 17.5]	32.5 [29.4, 35.6]	32.1 [30.4, 33.8]	25.0 [22.1, 27.8]	29.5 [26.2, 33.1]
Poorest	25.2 [22.1, 28.3]	14.2 [11.2, 17.1]	27.9 [23.3, 32.6]	30.2 [27.7, 32.7]	20.5 [17.0, 24.1]	27.3 [23.6, 31.3]
Richest	30.9 [27.2, 34.6]	20.3 [16.4, 24.2]	34.6 [28.7, 40.5]	36.4 [34.0, 38.8]	30.1 [25.5, 34.6]	21.6 [16.5, 27.5]
6–11 months	18.4 [16.2, 20.6]	11.5 [9.6, 13.4]	24.2 [20.5, 27.9]	20.4 [18.8, 22.0]	18.0 [15.2, 20.9]	19.0 [15.9, 22.4]
12–17 months	31.8 [29.0, 34.5]	19.6 [17.1, 22.2]	35.0 [30.8, 39.1]	36.9 [34.9, 38.9]	32.1 [28.4, 35.7]	27.5 [24.2, 31.1]
18–23 months	35.6 [32.5, 38.6]	22.3 [19.4, 25.2]	39.2 [34.4, 43.9]	40.7 [38.5, 43.0]	35.9 [32.1, 39.8]	28.2 [24.9, 31.8]
Vitamin A rich fruits/vegetables	41.1 [39.1, 43.1]	40.0 [37.7, 42.3]	49.7 [47.2, 52.2]	31.5 [29.9, 33.1]	75.4 [73.3, 77.5]	-
Urban	43.7 [40.5, 47.0]	40.6 [36.8, 44.4]	54.2 [49.4, 59.1]	31.5 [28.9, 34.1]	80.0 [77.3, 82.7]	-
Rural	39.5 [37.1, 41.9]	39.6 [36.8, 42.4]	47.9 [45.1, 50.7]	31.4 [29.4, 33.3]	71.9 [69.0, 74.8]	-
Poorest	38.1 [34.3, 41.9]	39.0 [34.8, 43.1]	46.7 [42.4, 51.0]	29.1 [25.9, 32.2]	66.6 [62.3, 71.0]	-
Richest	44.2 [40.0, 48.4]	38.6 [33.6, 43.7]	53.6 [48.3, 58.9]	34.6 [31.4, 37.7]	84.5 [80.6, 88.4]	-
6–11 months	27.6 [25.0, 30.3]	26.7 [23.9, 29.4]	37.4 [33.7, 41.0]	17.2 [15.4, 19.1]	60.2 [56.2, 64.3]	-
12–17 months	46.0 [43.0, 48.9]	45.5 [42.1, 48.9]	55.2 [51.3, 59.2]	35.6 [33.3, 38.0]	82.9 [80.2, 85.7]	-
18–23 months	50.9 [47.6, 54.1]	50.2 [46.4, 54.0]	57.7 [53.7, 61.6]	42.1 [39.4, 44.7]	84.1 [81.4, 86.8]	-
Other fruits/vegetables	20.8 [19.1, 22.5]	15.7 [13.9, 17.6]	22.5 [20.3, 24.8]	16.5 [15.2, 17.8]	29.2 [26.9, 31.6]	63.3 [60.8, 65.7]
Urban	26.7 [23.8, 29.7]	21.4 [18.3, 24.4]	31.7 [26.5, 36.9]	20.1 [17.9, 22.2]	33.4 [30.0, 36.7]	66.4 [63.2, 69.4]
Rural	17.9 [15.9, 19.9]	12.8 [10.7, 14.9]	20.0 [17.7, 22.2]	15.0 [13.5, 16.5]	26.1 [23.0, 29.2]	55.7 [51.9, 59.3]
Poorest	14.7 [11.9, 17.6]	9.9 [7.4, 12.4]	14.7 [11.4, 18.1]	12.0 [9.5, 14.5]	17.9 [14.5, 21.2]	55.8 [51.3, 60.1]
Richest	29.2 [25.2, 33.2]	23.4 [19.1, 27.8]	35.5 [30.1, 40.9]	23.1 [20.4, 25.9]	39.6 [34.3, 44.9]	71.3 [64.6, 77.4]
6–11 months	14.0 [11.8, 16.2]	10.4 [8.4, 12.4]	16.7 [13.8, 19.7]	9.7 [8.2, 11.2]	22.1 [18.7, 25.6]	58.4 [54.0, 62.5]
12–17 months	22.7 [20.1, 25.3]	17.2 [14.6, 19.8]	25.1 [21.7, 28.4]	18.1 [16.3, 20.0]	30.9 [27.0, 34.8]	65.3 [61.2, 69.1]
18–23 months	26.6 [23.7, 29.6]	20.9 [17.8, 24.0]	26.5 [22.8, 30.2]	22.2 [19.9, 24.4]	34.9 [30.9, 38.9]	66.6 [62.2, 70.7]
Dairy products	42.2 [40.1, 44.2]	22.5 [20.2, 24.7]	24.9 [22.6, 27.2]	49.3 [47.5, 51.1]	54.8 [52.2, 57.4]	75.2 [73.0, 77.4]
Urban	51.8 [48.4, 55.2]	34.2 [30.1, 38.3]	32.6 [27.7, 37.5]	56.1 [53.4, 58.8]	64.4 [61.1, 67.6]	80.3 [77.6, 82.8]
Rural	37.7 [35.4, 40.0]	16.2 [14.2, 18.3]	22.9 [20.4, 25.4]	46.5 [44.4, 48.7]	47.8 [44.4, 51.3]	64.5 [60.3, 68.4]
Poorest	31.0 [27.6, 34.4]	15.3 [12.4, 18.2]	19.6 [16.0, 23.1]	36.2 [33.1, 39.3]	31.4 [26.9, 35.8]	60.3 [55.7, 64.8]
Richest	58.9 [54.8, 63.0]	44.9 [39.5, 50.3]	39.8 [34.4, 45.1]	63.5 [60.5, 66.5]	77.6 [73.4, 81.8]	86.7 [80.9, 91.3]
6–11 months	35.9 [32.9, 38.9]	20.2 [17.3, 23.1]	23.9 [20.6, 27.2]	40.0 [37.4, 42.5]	44.9 [40.8, 49.0]	69.0 [65.0, 72.8]
12–17 months	43.8 [40.9, 46.7]	23.0 [20.0, 26.0]	25.7 [22.3, 29.1]	52.0 [49.6, 54.4]	55.0 [51.0, 58.9]	76.4 [72.6, 80.0]
18–23 months	47.1 [44.0, 50.2]	24.7 [21.4, 28.0]	25.1 [21.6, 28.7]	56.2 [53.5, 58.8]	65.1 [61.2, 69.1]	80.6 [77.2, 83.7]
Flesh foods	27.6 [25.7, 29.4]	37.5 [34.9, 40.2]	25.1 [22.7, 27.5]	12.5 [11.4, 13.6]	62.5 [60.3, 64.8]	62.3 [59.8, 64.7]
Urban	36.3 [33.1, 39.4]	46.7 [42.5, 50.9]	35.9 [31.0, 40.8]	16.0 [13.9, 18.0]	63.4 [60.2, 66.7]	66.6 [63.6, 69.5]
Rural	23.2 [21.1, 25.3]	32.6 [29.4, 35.7]	22.2 [19.6, 24.8]	11.2 [9.9, 12.4]	62.3 [59.4, 65.1]	52.3 [48.4, 56.2]
Poorest	21.9 [18.7, 25.1]	27.4 [23.4, 31.4]	19.9 [15.8, 23.9]	9.4 [7.4, 11.4]	54.9 [50.5, 59.3]	53.1 [48.5, 57.7]
Richest	34.7 [30.6, 38.8]	48.9 [43.5, 54.3]	34.7 [29.4, 40.0]	15.8 [13.3, 18.4]	74.4 [69.7, 79.1]	70.5 [63.6, 76.9]
6–11 months	17.6 [15.3, 19.9]	24.9 [21.8, 28.1]	16.8 [13.9, 19.8]	6.1 [4.8, 7.3]	45.4 [41.6, 49.2]	50.5 [46.2, 54.8]
12–17 months	30.6 [27.8, 33.4]	42.1 [38.4, 45.8]	28.3 [24.6, 32.0]	13.9 [12.1, 15.6]	67.4 [64.0, 70.9]	67.0 [62.8, 71.0]
18–23 months	35.9 [32.9, 38.9]	47.8 [43.8, 51.7]	31.1 [27.1, 35.1]	18.3 [16.3, 20.4]	76.4 [73.1, 79.6]	69.6 [65.6, 73.4]
Eggs	16.6 [15.0, 18.2]	11.7 [10.0, 13.3]	11.2 [9.5, 12.9]	11.8 [10.5, 13.1]	44.0 [41.6, 46.4]	37.2 [34.8, 39.6]

(Continues)

TABLE 3 (Continued)

Indicator (percentage of 6- to 23-month-olds consuming)	Global[ad]	West and Central Africa	Eastern and southern Africa	South Asia	East Asia and the Pacific[b]	Latin America and Caribbean[c]
Urban	23.1 [20.2, 26.1]	19.4 [16.3, 22.5]	18.0 [13.5, 22.4]	15.6 [13.2, 17.9]	46.7 [43.5, 50.0]	37.3 [34.3, 40.5]
Rural	13.4 [11.6, 15.2]	7.6 [6.0, 9.3]	9.4 [7.7, 11.2]	10.3 [8.8, 11.8]	41.7 [38.3, 45.1]	36.9 [33.3, 40.5]
Poorest	12.2 [9.7, 14.7]	4.6 [2.9, 6.2]	6.7 [4.3, 9.1]	8.5 [6.2, 10.7]	38.0 [33.7, 42.3]	39.1 [34.4, 43.9]
Richest	23.3 [19.4, 27.2]	23.5 [19.3, 27.7]	19.8 [14.5, 25.0]	16.6 [14.0, 19.2]	49.3 [43.8, 54.7]	36.7 [30.1, 43.8]
6–11 months	11.0 [9.0, 13.0]	8.5 [6.6, 10.4]	8.9 [6.4, 11.4]	7.0 [5.6, 8.4]	28.6 [25.2, 31.9]	25.3 [21.8, 28.9]
12–17 months	18.3 [15.8, 20.7]	12.2 [10.0, 14.5]	12.3 [9.5, 15.0]	12.9 [11.1, 14.7]	49.7 [45.5, 53.8]	40.9 [36.8, 45.2]
18–23 months	21.3 [18.5, 24.2]	15.0 [12.2, 17.9]	12.6 [9.7, 15.5]	16.0 [13.6, 18.4]	55.2 [51.2, 59.1]	45.6 [41.4, 50.0]
0 animal source food groups	39.1 [37.0, 41.3]	48.4 [45.6, 51.1]	52.1 [49.2, 55.1]	42.8 [41.0, 44.6]	17.5 [15.6, 19.5]	9.8 [8.4, 11.3]
Urban	28.4 [25.2, 31.5]	35.2 [31.0, 39.5]	38.8 [32.7, 44.8]	36.0 [33.6, 38.5]	15.0 [12.6, 17.5]	7.1 [5.6, 8.9]
Rural	44.9 [42.3, 47.6]	55.4 [52.2, 58.7]	55.5 [52.2, 58.8]	45.6 [43.4, 47.7]	19.2 [16.6, 21.8]	15.6 [13.0, 18.4]
Poorest	49.7 [45.8, 53.7]	60.0 [55.6, 64.3]	61.0 [55.7, 66.3]	55.3 [52.0, 58.6]	28.0 [23.8, 32.2]	16.1 [13.2, 19.3]
Richest	25.4 [21.6, 29.4]	28.7 [23.8, 33.6]	34.3 [28.3, 40.3]	29.6 [26.8, 32.3]	8.8 [5.5, 12.1]	4.9 [2.0, 9.8]
6–11 months	49.8 [46.6, 53.1]	59.7 [56.0, 63.4]	59.3 [55.1, 63.4]	55.2 [52.6, 57.8]	29.7 [25.9, 33.5]	15.2 [12.4, 18.3]
12–17 months	35.5 [32.6, 38.5]	44.1 [40.4, 47.8]	48.8 [44.3, 53.3]	39.1 [36.8, 41.4]	13.9 [11.3, 16.6]	7.7 [5.7, 10.1]
18–23 months	31.2 [28.2, 34.2]	39.2 [35.4, 43.0]	47.8 [43.0, 52.5]	33.6 [31.1, 36.2]	7.7 [5.8, 9.7]	6.5 [4.9, 8.3]
1 animal source food group	38.1 [36.0, 40.1]	35.4 [33.1, 37.6]	36.7 [34.0, 39.5]	44.1 [42.5, 45.8]	25.3 [23.2, 27.3]	27.2 [24.9, 29.5]
Urban	37.5 [34.3, 40.7]	37.0 [33.5, 40.5]	40.8 [35.1, 46.5]	45.7 [43.2, 48.3]	22.7 [20.0, 25.5]	25.5 [22.7, 28.4]
Rural	38.6 [36.1, 41.1]	34.4 [31.7, 37.1]	35.8 [32.7, 38.9]	43.4 [41.4, 45.4]	27.1 [24.2, 30.0]	31.2 [27.7, 34.8]
Poorest	35.2 [31.3, 39.1]	33.6 [29.4, 37.7]	33.0 [28.0, 38.0]	37.1 [34.0, 40.3]	30.9 [26.8, 34.9]	31.6 [27.4, 36.0]
Richest	40.5 [36.3, 44.7]	36.0 [31.3, 40.6]	42.4 [36.4, 48.5]	50.9 [47.9, 53.9]	17.2 [13.5, 21.0]	21.5 [16.1, 27.5]
6–11 months	35.6 [32.5, 38.7]	29.1 [26.0, 32.2]	33.3 [29.4, 37.2]	38.0 [35.5, 40.4]	33.0 [29.3, 36.7]	36.8 [32.5, 41.2]
12–17 months	39.4 [36.3, 42.5]	38.7 [35.2, 42.1]	38.6 [34.3, 42.9]	46.3 [44.1, 48.6]	23.3 [20.0, 26.6]	23.9 [20.4, 27.5]
18–23 months	39.2 [35.7, 42.6]	39.2 [35.5, 42.9]	38.4 [33.8, 42.9]	47.9 [45.0, 50.8]	19.2 [16.0, 22.4]	20.6 [17.1, 24.5]
2 animal source food groups	15.9 [14.4, 17.4]	12.5 [10.8, 14.2]	8.9 [7.5, 10.4]	9.7 [8.7, 10.8]	35.5 [33.2, 37.8]	41.5 [39.2, 43.9]
Urban	22.5 [19.6, 25.3]	20.0 [16.8, 23.1]	15.7 [11.7, 19.8]	12.8 [10.9, 14.7]	34.8 [31.6, 38.1]	43.4 [40.4, 46.5]
Rural	12.3 [10.7, 13.9]	8.5 [6.8, 10.2]	7.3 [5.8, 8.7]	8.5 [7.3, 9.7]	36.3 [33.2, 39.4]	37.3 [33.9, 40.7]
Poorest	11.2 [8.9, 13.5]	5.7 [3.8, 7.6]	4.9 [3.0, 6.8]	5.7 [4.2, 7.2]	30.1 [26.0, 34.2]	36.1 [31.7, 40.5]
Richest	22.2 [18.3, 26.0]	24.7 [20.3, 29.1]	17.9 [13.2, 22.6]	13.6 [11.3, 15.8]	38.0 [32.9, 43.0]	48.5 [41.4, 55.5]
6–11 months	11.1 [9.1, 13.1]	9.0 [7.0, 11.0]	6.0 [4.1, 7.8]	5.5 [4.3, 6.7]	26.0 [22.4, 29.6]	36.1 [32.0, 40.4]
12–17 months	17.6 [15.2, 20.0]	13.0 [10.7, 15.3]	10.1 [7.7, 12.5]	11.2 [9.6, 12.9]	39.6 [35.5, 43.6]	44.9 [40.6, 49.2]
18–23 months	19.5 [16.7, 22.3]	16.5 [13.3, 19.6]	11.1 [8.4, 13.8]	12.7 [10.7, 14.7]	41.6 [37.8, 45.5]	43.5 [39.2, 47.8]
3 animal source food groups	6.9 [5.9, 7.9]	3.7 [2.9, 4.6]	2.2 [1.6, 2.8]	3.3 [2.7, 3.9]	21.7 [19.6, 23.8]	21.5 [19.5, 23.6]
Urban	11.7 [9.7, 13.8]	7.8 [5.7, 9.9]	4.7 [2.8, 6.6]	5.4 [4.2, 6.7]	27.4 [24.2, 30.6]	24.0 [21.4, 26.7]
Rural	4.2 [3.3, 5.1]	1.7 [1.1, 2.3]	1.4 [0.9, 1.9]	2.5 [1.9, 3.2]	17.4 [14.8, 19.9]	16.0 [13.3, 18.8]
Poorest	3.9 [2.6, 5.2]	0.8 [0.2, 1.3]	1.1 [0.5, 1.7]	1.8 [0.9, 2.8]	11.1 [8.2, 13.9]	16.2 [13.0, 19.8]
Richest	11.9 [9.0, 14.9]	10.7 [7.3, 14.0]	5.3 [3.0, 7.6]	6.0 [4.3, 7.6]	36.0 [30.5, 41.5]	25.2 [19.5, 31.5]
6–11 months	3.5 [2.4, 4.5]	2.2 [1.3, 3.1]	1.4 [0.6, 2.2]	1.4 [0.8, 2.0]	11.3 [8.9, 13.7]	11.9 [9.4, 14.8]
12–17 months	7.4 [5.9, 9.0]	4.2 [2.8, 5.6]	2.5 [1.4, 3.5]	3.3 [2.5, 4.2]	23.2 [19.7, 26.7]	23.6 [20.2, 27.2]
18–23 months	10.1 [8.2, 12.1]	5.1 [3.5, 6.8]	2.8 [1.6, 3.9]	5.7 [4.3, 7.1]	31.4 [27.3, 35.5]	29.4 [25.6, 33.4]

Source: UNICEF global databases, 2016, based on MICS, DHS, and other nationally representative sources. All estimates where population coverage fell below the 50 per cent threshold have been suppressed.

[a]The aggregates for Global exclude China and Russian Federation as data were unavailable for these two countries and the threshold of 50% for global population coverage for *urban areas* could only be met when these countries were removed from the analysis. The Global estimates also exclude Mexico given that the data from Mexico was based out of six food groups (vitamin A rich fruits and vegetables were not included as a separate group).

[b]The aggregates for East Asia and the Pacific region exclude China as data were unavailable and the threshold of 50% population coverage for the region could only be met when China was removed from the analysis.

[c]Estimates exclude Brazil as data were unavailable and the threshold of 50% population coverage for the region could only be met when Brazil was removed from the analysis. Data were only available for Mexico for six out of seven food groups, and therefore, the regional estimate for vitamin A rich fruits/vegetables could not be generated.

Consumption of vitamin A rich fruits and vegetables in the previous day is highest in EAP (75.4%, 95% CI, [73.3, 77.5]) and lowest in SA (31.5%, 95% CI [29.9, 33.1]). In WCA, rates are similar regardless of household wealth quintile or area of residence. The largest disparities at the global level are related to sub-age groups with children 18–23 months of age having a rate nearly twice as high as those 6–11 months of age.

Consumption of other fruits and vegetables in the previous day among children 6–23 months of age is low across all regions. Only 15.7% of children in WCA and 16.5% in SA received any other fruits and vegetables in the previous day. Consumption is higher in urban areas and the richest households across all regions and, as with other food groups, increases with age. However, consumption is very low even among children 18–23 months of age in every region except LAC.

3.6 | Consumption of animal source foods by background characteristics

The consumption of ASF in the previous day is low across all three types—flesh foods, eggs, and dairy—at the global level. Just two out of five children 6–23 months of age consumed dairy products in the previous day (42.2%, 95% CI [40.1, 44.2]), with much lower rates for consumption of flesh foods (27.6%, 95% CI [25.7, 29.4]) and eggs (16.6%, 95% CI [15, 18.2]). The consumption of flesh foods, dairy products, and eggs is highest in EAP, at 62.5%, 54.8%, and 44.0%, respectively. The lowest rates of consumption of any type of ASF are found in ESA, WCA, and SA. In all three regions, consumption of eggs is similarly low (around 11%), whereas flesh food consumption is significantly higher in WCA at 37.5% (95% CI [34.9, 40.2]), when compared to that in ESA (25.1%, 95% CI [22.7, 27.5]) or SA (12.5%, 95% CI [11.4, 13.6]). In addition, consumption of dairy products is nearly double in SA at 49.3% (95% CI [47.5, 51.1]) when compared to that in WCA (22.5%, 95% CI [20.2, 24.7]) and ESA (24.9%, 95% CI [22.6, 27.2).

Consumption of all types of ASF is higher in children over 1 year of age, but the difference in consumption by age is most stark for flesh foods, with nearly twice as many children consuming flesh foods after 1 year of age than those 6–11 months of age in all regions. Large disparities in consumption of any type of ASF are also seen by area of residence and wealth quintile. For example, in WCA, the percentage of children who consumed eggs in the richest households is nearly 5 times higher when compared to the poorest households.

Table 3 also shows the rates for children consuming no ASF in the previous day. No consumption is highest in the sub-Saharan Africa regions at about 50%. In contrast, only 9.8% and 17.5% of children in LAC and EAP did *not* receive any ASF in the previous day, respectively. Of those children consuming any ASF, in ESA, WCA, and SA, the vast majority are consuming only one type of ASF—a stark contrast to LAC where about two thirds consumed two or more types of ASF in the previous day. No notable differences are found between boys and girls (results not shown here).

4 | DISCUSSION

This analysis paints a clear picture that far too few children are benefitting from even the minimum complementary feeding practices. The findings help to frame the regional disparities not only in the core complementary feeding indicators but also in the types of food children are consuming, at what age they are being consumed and differences in consumption by background characteristics. These estimates may serve as a baseline to measure future progress. In addition, these global and regional estimates help to summarize the gravity of the situation overall with regards to complementary feeding and can be used to advocate for greater attention to and investments in support of complementary feeding policies and programmes, which are essential to reduce malnutrition.

The three regions with the lowest rates of MMF, MDD, and MAD are ESA, WCA and SA. These regions also have some of the highest rates of children over 8 months of age reported to not have consumed solid foods in the previous day. Although this analysis does not attempt to associate complementary feeding practices with nutrition outcomes, and is unable to determine trends in complementary feeding indicators over time (due to lack of available data from earlier time periods), the lowest rates of improvement in stunting between 1990 and 2015 are similarly found in these three regions. In contrast, the two regions with the highest rates of complementary feeding practices are EAP and LAC, the same two regions with the largest improvements in stunting rates between 1990 and 2015, at 75% and 55%, respectively (UNICEF, WHO, & World Bank, 2016).

Although the findings on the introduction of solid foods among 6- to 8-month-olds are encouraging for some regions, such as LAC with a rate of 83.1%, it is important to emphasize that this indicator does not assess the *timeliness* of introduction. Further investigation in this analysis highlighted that nearly half of infants 4–5 months of age in this region are already fed solid foods. Similar rates of early introduction were found in EAP. However, there is no added benefit to introducing children to solid foods before 6 months of age; evidence suggests that early introduction of complementary foods has no added growth advantage over exclusive breastfeeding (Dewey, 2001) and may instead increase an infants' exposure to pathogens and result in early weaning (PAHO, 2003) or even increase the odds of above normal body mass index at 1 year of age (Sun et al., 2016).

In contrast, this analysis also highlighted the considerable proportion of children over 6 months of age who did *not receive* solid foods during the previous day. For example, over 20% of infants 10- to 11-months old in MENA and SA did not consume any solid foods. These results are similar to previous findings showing the delayed introduction of complementary foods in SA, particularly in Pakistan (Hazir et al., 2012). In these previous analyses, delayed introduction was found to be common among mothers with little to no education across all South Asian countries (Joshi, Agho, Dibley, Senarath, & Tiwari, 2012; Patel et al., 2012; Senarath, Godakandage, Jayawickrama, Siriwardena, & Dibley, 2012).

Rates of MDD are of great concern with less than a third of children 6–23 months of age receiving at least four food groups in the previous day. In addition, infants 6–11 months old—those most in need of nutrient-dense meals—have the lowest rates of MDD than any other age group. The period between 6 and 11 months of age typically represents the greatest challenge for meeting micronutrient needs of infants (Dewey, 2013). Consumption of a diverse and iron-rich diet during the second half of infancy is crucial to meet the high-nutrient needs of this age group, particularly for iron and zinc, which are most deficient early in life. This analysis clearly shows that consumption of a minimally diverse diet is more common in children over 1 year of age—the proportion of children getting MDD nearly doubles across all regions between 6 and 11 months and 12 and 17 months. Other research on the association between MDD and stunting has found that

children consuming MDD have a significantly lower risk of stunting (Jones et al., 2014; Marriott, White, Hadden, Davies, & Wallingford, 2012) and consumption of a minimally diverse diet at 6 months of age has been associated with greater height-for-age and weight-for-height at 18 months of age (Mallard et al., 2014). Interestingly, even in richest households, rates of MDD are suboptimal suggesting that cultural factors and poor knowledge regarding an adequate diet for young children are also important to address in addition to economic factors.

Consumption of ASF throughout the complementary feeding period is important, as ASF—particularly flesh foods—are the richest sources of iron and zinc (Dewey & Brown, 2003). In observational studies, a higher than usual intake of ASF in low- and middle-income countries is associated with better growth, status of some micronutrients, cognitive performance, and motor development and activity (Allen, 2013). This analysis found that approximately half of children 6–23 months old in WCA and ESA consumed no ASF, and approximately 60% of children 6–11 months in these regions consumed no ASF. A separate paper in this supplement found that no consumption of ASF in infants 6–11 months old resulted in an approximately 1.4 times higher odds of stunting when compared to children 6–11 months old that consumed 3 types of ASF. In addition, children 6–23 months old consuming no ASF in low- and low-middle-income countries were found to have significantly higher odds of stunting compared to those children consuming three types of ASF (Krasevec, An, Kumapley, Bégin, & Frongillo, 2017). Given the known benefits of early consumption of ASF, the clear gaps in consumption of ASF in certain regions—and delayed consumption until after 1 year of age—shown in this analysis highlight the need for advocacy around promotion of ASF consumption for children during the complementary feeding period.

This analysis was unable to take into account consumption of fortified or commercially produced complementary foods given that there are no standard indicators for the consumption of these products. Consumption of adequately fortified commercially produced complementary foods can help improve children's nutrient intake particularly when access to a diverse diet is limited. However, commercially produced snack foods—such as chips and cookies—may be nutritionally detrimental because they are often nutrient poor and high in saturated fats, trans-fatty acids, sugar, and salt. It is important to control the promotion and consumption of such foods as recent studies have shown that intake is on the rise even in low income countries and is associated with lower maternal education (Pries, 2017; Pries et al., 2016; Pries et al., 2016).

Limitations of this study include the lack of available raw data to generate the additional indicators and disaggregations utilized in this analysis for several countries within the UNICEF global database. Unfortunately, these countries had to be excluded from parts of the analysis, decreasing representation at regional and global level. In addition, although this study only presented estimates and 95% CIs when the population coverage was at least 50%, it is possible to reach the 50% population coverage set as the minimum while omitting some populous countries in a region that could affect the rates had they been available. However, 50% is the standard used for reporting on global goals like the Millennium Development Goals.

In order to further understand the complementary feeding situation and track progress effectively, governments need to ensure that credible and comprehensive data on infant and young child feeding, aligned with the standard global indicators, are reported on regularly, about every 3 to 5 years. Robust monitoring and evaluation systems are essential for successful programmes. Adequate resources should be allocated for monitoring these programmes within government plans at all levels. Although the existing indicators provide some insight into the global situation of complementary feeding, it would be timely to undertake a review and work towards development of indicators that can more comprehensively assess child feeding practices and other relevant IYCF programme indicators such as caregiver report of complementary feeding counselling.

5 | CONCLUSIONS

The complementary feeding period represents a window of opportunity for preventing all forms of malnutrition, including stunting, wasting, overweight, and obesity. Our analysis found that globally, too few children are benefiting from minimally acceptable complementary feeding practices and that poor practices are found even among the richest households. Low rates of minimum dietary diversity is of particular concern as is the low consumption of fruits and vegetables and animal source foods found across all regions. Across all regions, urgent action is needed to improve complementary feeding, including through nutrition education, behaviour change communication, and income-generating activities to alleviate cultural and economic constraints to improving children's diet as well as through improved agriculture diversification and food systems. Children's first foods and feeding experience matter not only for their immediate survival but also for their potential over a lifetime. With government investments and contributions from multiple sectors in society, good nutrition in the earliest years has the power to shape a more fair and sustainable future.

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DISCLAIMER

J. M. W., F. B., R. K., C. M., and J. K. are staff members of the United Nations Children's Fund. The authors alone are responsible for views expressed in this publication, and they do not necessarily reflect the policy or views of the United Nations Children's Fund.

CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest..

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SUPPORTING INFORMATION

Additional Supporting Information may be found online in the supporting information tab for this article.

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