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Social inequalities and complementary feeding in Latin America and the Caribbean

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Abstract *This study evaluated the role of social inequalities in complementary feeding patterns between and within countries in Latin America and the Caribbean. This ecological study employed aggregate data from population-based surveys. The units of analysis were all 16 countries in Latin America and the Caribbean for which information was available in the Demographic and Health Surveys (DHS) and Multiple Indicator Cluster Surveys (MICS) databases. The outcomes selected were the prevalences indicated by the "introduction of solid, semi-solid or soft foods" (ISSSF), "minimum dietary diversity" (MDD), "minimum meal frequency" (MMF) and "minimum acceptable diet" (MAD) standardised complementary feeding indicators recommended by the WHO and available in UNICEF databases. The differences in prevalences between the wealthiest and poorest income quintiles were calculated in absolute and relative terms. Comparing the four indicators of complementary feeding, the ISSSF showed best performance, returning prevalence above 80% in 10 of the 11 countries evaluated. The indicator showing worst performance was the MAD, with prevalence above 60% in only one of the eight countries evaluated. In almost all countries, by all indicators, prevalences of complementary feeding were lower in the poorest population groups than in the wealthiest.*

Key words *Complementary feeding, Social determinants of health, Public health, Nutrition policy*

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Introduction

Complementary feeding can be understood as the process that begins when breastfeeding alone is no longer sufficient to meet the child' nutritional needs and it becomes essential to introduce other foods to complement breast milk. This process should begin in the sixth month of life and continue until the 24th and should consist of foods in appropriate quantity, frequency, variety and consistency[1]. Inappropriate feeding practices during this period are associated with malnutrition and obesity, developmental deficits and increased infant mortality, especially among disadvantaged populations[2,3] and may result in poor intellectual performance and work capacity in the long term[4,5].

Social inequalities may be one cause of insufficient access to safe, quality food by the poorest. They are associated with higher levels of household food insecurity, malnutrition and infant mortality and are aggravated particularly in developing economies undergoing demographic and nutritional transition[6-8].

The hypotheses of this study are that patterns of complementary feeding differ among countries and that, in each country, social inequalities determine that the poorest population groups have less access to adequate and healthy complementary feeding than the wealthiest. This study aims to assess the role of social inequalities within and between Latin American and Caribbean countries in complementary feeding patterns.

Methods

This ecological study used data from population-based surveys in two databases: Demographic and Health Surveys (DHS) and Multiple Indicator Cluster Surveys (MICS). The aggregate data were obtained from the public-access UNICEF website[9].

The DHS and MICS research subjects are women of childbearing age (15 to 45 years old) and their children up to five years old. Both surveys collect standardised data in developing countries using questionnaires translated into local languages and applied with varying frequency. The topics addressed by the questionnaires include breastfeeding and complementary feeding. Assuming that DHS and MICS are sufficiently similar in questionnaire design and in quality of implementation between countries and over time, direct comparisons can be made between the surveys.

Also, both DHS and MICS use complex three-stage sampling frames, stratifying by region and by urban and rural areas, using each country's census clusters and taking the household as the unit of analysis. Households in each stratum are selected randomly from enumeration lists based on census tracking information. Data were obtained from DHS and MICS cycles conducted between 2008 and 2016.

For this study, the unit of analysis was countries, for which prevalences measured by complementary feeding indicators were obtained, by wealth quintiles, as well as socioeconomic and demographic information, such as total population and percentage urban population, per capita income, Human Development Index (HDI) and Gini coefficient. Complementary feeding indicators were not always available for all 16 countries.

Based on the complementary feeding indicators recommended by the WHO[10], the following were selected from those available in the UNICEF databases: "Introduction of solid, semi-solid or soft foods" (ISSSF), "Minimum Dietary Diversity" (MDD), "Minimum Meal Frequency" (MMF) and "Minimum Acceptable Diet" (MAD).

The ISSSF indicator was calculated as the proportion of 6-8 month old children who received solid, semi-solid and soft foods, divided by the total number of children in this age group. The MAD indicator was calculated as the proportion of 6-23 month old children who received foods from 4 or more of the 7 food groups defined by the WHO, divided by the total number of children in that age group. Calculation of the MMF involved the following seven food groups: Group 1 – grains, roots and tubers; Group 2 – legumes and nuts; Group 3 – dairy products (milk, yogurt, cheese); Group 4 – meat foods (meat, fish, poultry and liver/offal); Group 5 – eggs; Group 6 – fruits and vegetables rich in vitamin A; and Group 7 – other fruits and vegetables.

The MMF indicator was calculated as the proportion of breastfed and non-breastfed, 6 to 23 month old children who received solid, semi-solid and soft foods (but also including dairy foods for non-breastfed children). The minimum is defined as: twice a day for breastfed infants aged 6 to 8 months; 3 times for breastfed infants aged 9 to 23 months; and 4 times for non-breastfed infants aged 6 to 23 months[10].

The MAD composite indicator was calculated as the proportion of breastfed children aged 6 to 23 months who had met the minimum dietary diversity and minimum meal frequency criteria during the previous day, divided by total breastfed

children aged 6 to 23 months, and the proportion of non-breastfed children aged 6 to 23 months who received at least two milk feeds and met the minimum criteria for minimum dietary diversity, not including dairy foods, and minimum meal frequency during the previous day, divided by total non-breastfed children aged 6 to 23 months[10].

Social inequality can be defined as a product of social and economic relations between groups in society and can be measured by income ranges in which the averages of the wealthiest are compared with those of the poorest[11-13]. Thus, in analysing social inequality, this study considered not only wealth quintiles, but HDI, GINI coefficient and per capita income.

Wealth quintiles obtained using the Wealth Index were used as an exposure variable, with the poorest quintile as reference. These quintiles are based on scores derived from principal component analyses of a list of consumer goods and household characteristics. The first quintile (Q1) represents the 20% poorest households and the last quintile (Q5) represents the 20% wealthiest households.

The HDI, a summary measure that takes into account wealth, literacy, education, life expectancy, birth rate and other dimensions, is intended to assess the well-being of a population, especially children. HDI levels range from 0 to 1 (the closer the HDI is to 1, the greater the human development). The GINI coefficient is a summary measure of inequality that can range from 0 (perfect equality) to 1 (maximum inequality)[14]. Per capita income, an average given by dividing gross national product by total population, is a socioeconomic indicator that assesses the degree of economic development of a given territory[15].

Correlations between the selected socioeconomic indicators and complementary feeding indicators were estimated using Spearman's correlation – which measures the strength of the relationship between the variables, returning values from -1 (perfect negative correlation) to +1 (perfect positive correlation) – with a 95% confidence interval. A value of 0 (zero) indicates that there is no correlation between the variables. The closer to the extreme values (-1 or +1), the stronger the association between the variables[16]. In this study, values ≤ 0.20 were taken to indicate absence of correlation.

The prevalences measured by the ISSSF, MDD, MMF and MAD indicators were tabulated, by country and by wealth quintiles. The differences in the prevalences between the wealthiest and poorest quintiles were calculated in absolute form (subtracting the extreme values, prevalence among the "wealthiest" minus the prevalence among the "poorest") and in relative form (prevalence ratio between the "wealthiest" and "poorest")[17].

Pursuant to CONEP Resolution No. 510 of 7 April 2016, as this study analysed publicly available, secondary data without personal identifiers and obeyed the relevant ethical principles, it was exempt from evaluation by a research ethics committee.

Results

Of the 24 Latin American and Caribbean countries tracked by DHS and MICS, consistent information on complementary feeding was available for only 16. These were Argentina (2011-12), Belize (2011), Bolivia (2008), Costa Rica (2011), El Salvador (2014), Guatemala (2014-15), Guyana (2014), Haiti (2012), Honduras (2011-12) Jamaica (2011), Mexico (2015), Panama (2013), Paraguay (2016), Peru (2012), Dominican Republic (2014) and Suriname (2010).

Of the socioeconomic indicators for the countries studied, the percentage urban population varied greatly among countries: in Argentina, 91.1% of the population resided in urban environments; in Guyana, 28.5%. HDI and the GINI index profiles were homogeneous among countries, with Haiti the country with the worst results. Per capita income ranged from $10,610 in Argentina to $750 in Haiti (Table 1). However, no correlations were found between these socioeconomic indicators and the complementary feeding indicators in the countries studied: Spearman coefficient values were close to zero.

As regards the introduction of solid, semi-solid and soft foods (ISSSF) in the 11 countries studied, prevalences ranged from 79.8% in Guatemala to 96.6% in Argentina, a maximum difference of 16.8 percentage points between the countries. Comparing the wealthiest to the poorest population in each country, the absolute and relative intra-country difference in the prevalence of ISSSF was greatest in Guyana, followed by Peru, El Salvador, and Bolivia. The countries with the smallest absolute differences were Haiti and Argentina. In Guyana, prevalence of food introduction among the wealthiest was 61% higher than among the poorest, while in Argentina, prevalence of food introduction among the wealthiest was 2% lower than among the poorest (Table 2).

With regard to minimum dietary diversity (MDD), in the 11 countries examined, prevalence ranged from 25.4% in Haiti to 82.2% in Peru (a difference of 56.8%). Comparing the wealthiest in the population to the poorest, absolute intra-country differences in the prevalence of MDD were more pronounced in Bolivia, Guatemala and Peru. On the other hand, differences were smaller in Guyana, Mexico and the Dominican Republic. Relative intra-country differences in this indicator were highest in Haiti, Bolivia and Guatemala, and lowest in Mexico, Guyana and El Salvador. In Haiti, prevalence of dietary diversity among the wealthiest was 90% higher compared than among the poorest, while in Mexico, the prevalence of dietary diversity in the wealthiest was 17% higher than among the poorest (Table 3).

Prevalence of minimum meal frequency (MMF), varied in the 14 countries studied, from 42.0% in Jamaica to 86.9% in El Salvador (a maximum difference of 44.9% between countries). Comparing the wealthiest population to the poorest, the absolute intra-country differences in the prevalence of MMF were greatest in Haiti, Guyana and Panama. The countries with the smallest absolute difference were Honduras, El Salvador and the Dominican Republic. The relative intra-country difference in MMF was highest in Haiti, Jamaica and Panama, and lowest in Honduras, El Salvador and Guatemala. The prevalence of minimum food frequency in Haiti was 81% higher among the wealthiest than among the poorest in the country, while in Honduras, the minimum food frequency among the wealthiest was only 5% higher than among the poorest (Table 4).

Prevalence of minimum acceptable diet (MAD) in the 8 countries studied ranged from 13.6% in Haiti to 64.5% in El Salvador (a difference of 50.9% between the countries). Comparing the wealthiest population to the poorest, absolute intra-country differences in MAD prevalences were greatest in Guatemala, El Salvador and Honduras. The countries with the smallest absolute difference were Haiti, Guyana and Paraguay. The relative difference was greatest in Haiti, Guatemala and Guyana, and smallest in El Salvador, Mexico and Honduras. In Haiti, the prevalence of minimum acceptable diet among the wealthiest was 141% higher than among the poorest: a smaller difference was observed in El

Table 1. Socioeconomic and demographic variables of the countries studied.

Country	Year	Population	Urban population %	HDI[I]	GINI[II]	Per capita income
Argentina	2011	41656879	91.1	0.822	42.3	10610
Belize	2015	359288	44.0	0.706	53.1[III]	4580
Bolivia	2010	9918242	66.4	0.649	46.1[IV]	1810
Costa Rica	2011	4600474	72.9	0.758	48.7	8060
El Salvador	2014	6281189	66.2	0.678	41.6	3810
Guatemala	2014	15923559	51.1	0.637	48.3	3450
Guyana	2014	763393	28.5	0.638	44.5[V]	4040
Haiti	2012	10289210	54.8	0.483	41.1	750
Honduras	2011	8505646	52.3	0.614	56.2	1900
Jamaica	2011	2289493	53.9	0.725	45.4[VI]	4590
Mexico	2015	125890949	79.2	0.762	43.4[VII]	9860
Panama	2013	3838462	66.0	0.780	51.5	10500
Paraguay	2016	6725308	75.5	0.693[VIII]	47.9	4060
Peru	2012	30158966	77.6	0.731	44.7	5670
Dominican Republic	2014	10405844	78.1	0.718	44.1	6090
Suriname	2010	526103	51.66	0.703	57.60[IX]	8303

[I] Human Development Index; [II] Gini Index; [III] 1999 data; [IV] 2011 data; [V] 1998 data; [VI] 2004 data; [VII] 2011 data; [VIII] 1998 data; [IX] 1999 data.

Source: Authors.

Table 2. Timing of introduction of solid, semi-solid and soft foods into the diet of children aged 6 to 8 months, by wealth quintile and country.

Cowntry	Source	Wealth Index (WI)[I]				Total			
	Year	Quintile 1		Quintile 5				AD[II]	RD[III]
		Prevalence	n	Prevalence	n	Prevalence	n		
Argentina	MICS	97.7	35808	96.0	22195	96.6	148004	-1.61	0.98
	2011/12	(93.3-99.2)		(86.8-98.8)		(94.1-98.1)			
Bolivia	DHS	75.9	118	94.8	59	83.0	406	18.92	1.25
	2008	(65.0-84.2)		(85.8-98.2)		(75.2-90.1)			
El Salvador	MICS	79.8	98	98.9	47	90.3	378	19.09	1.24
	2014	(67.0-88.5)		(91.7-99.9)		(85.9-93.5)			
Guatemala	DHS	74.4	171	82.4	98	80.8	646	7.94	1.11
	2014/15	(64.8-82.2)		(71.1-89.9)		(76.5-84.3)			
Guyana	MICS	56.4	43	90.9	40	80.9	219	34.50	1.61
	2014	(37.7-73.5)		(73.4-97.3)		(72.1-87.4)			
Haiti	DHS	86.4	76	93.1	27	85.3	259	6.70	1.07
	2012	(80.1-92.8)		(88.5-97.3)		(81.3-89.8)			
Honduras	DHS	79.6	125	88.3	76	88.9	525	8.70	1.11
	2011/12	(71.3-86.0)		(74.4-95.1)		(84.4-92.4)			
Mexico	MICS	86.4	93	92.7	35	82.3	369	6.33	1.07
	2015	(71.7-94.1)		(75.5-98.1)		(65.8-91.9)			
Paraguay	MICS	79.4	53	92.1	30	87.1	207	12.72	1.16
	2016	(54.1-92.6)		(75.8-97.7)		(79.1-92.4)			
Peru	DHS	73.7	70	98.5	66	87.2	415	24.80	1.33
	2012	(64.3-79.8)		(92.6-99.7)		(81.6-90.3)			
Dominican	MICS	78.7	359	85.0	153	80.5	1217	6.31	1.08
Republic	2014	(72.1-84.0)		(76.0-91.0)		(77.0-83.7)			

[I] WI: Wealth Index; [II] AD: absolute difference; [III] RD: relative difference.

Source: Authors.

Salvador, where prevalence of minimum acceptable diet among the wealthiest was 33% greater than among the poorest (Table 5).

Comparatively, of the four indicators of complementary feeding studied, ISSSF best performed, with 10 out of 11 countries showing prevalence above 80%. Next, performance by MMF was moderate, with 4 countries out of 14 showing prevalence above 80%. Performance by MDD was intermediate: 4 countries out of 11 showed prevalence higher than 60%. Performance was worst by MAD, with only one country out of eight returning prevalence above 60%.

Discussion

Among the indicators studied, minimum acceptable diet and minimum dietary diversity showed worst performances, with low prevalences among countries and wide disparities between the wealthiest and poorest in each country. This suggested violation of the human right to adequate food for children, although it is the State's obligation to promote conditions to ensure access to, and use of, food and to provide it to individuals or groups unable to obtain it on their own[18]. The indicator of dietary diversity may be more sensitive to non-availability of food, lack of accessibility and lack of stability of access, which consequently interferes with performance as measured by the composite indicator of minimum acceptable nutrition. The indicators behaved similarly to what has been observed in other countries where the food introduction and frequency indicators revealed better performances than the others[19,20].

Spearman's correlation coefficient failed to show a correlation between complementary feeding and HDI, GINI coefficient or per capita income, which may be related to the small number of countries in this study. However, the

Table 3. Minimum dietary diversity in children aged 6 to 23 months, by wealth quintile, by country.

Cowntry	Source	Wealth Index (WI)[I]				Total			
	Year	Quintile 1		Quintile 5				AD[II]	RD[III]
		Prevalence	n	Prevalence	n	Prevalence	n		
Belize	MICS	50.0	184	70.1	113	57.8	764	20.08	1.40
	2015/16	(40.6-59.4)		(59.0-79.2)		(53.4-62.1)			
Bolivia	DHS	50.2	312	87.9	314	70.5	2451	37.70	1.75
	2008	(44.3-56.7)		(81.7-90.3)		(66.9-73.7)			
El Salvador	MICS	66.4	540	81.6	331	72.9	2217	15.22	1.23
	2014	(61.2-71.3)		(74.9-86.9)		(70.3-75.3)			
Guatemala	DHS	49.1	455	78.7	377	62.8	3473	29.60	1.60
	2014/15	(45.3-53.6)		(72.3-83.4)		(59.1-64.3)			
Guyana	MICS	41.2	284	49.8	153	40.3	1048	8.59	1.21
	2014	(35.4-47.2)		(39.1-60.4)		(36.3-44.4)			
Haiti	DHS	21.1	78	40.3	48	25.4	1295	19.20	1.90
	2012	(15.5-27.1)		(34.8-47.8)		(22.1-28.3)			
Honduras	DHS	48.7	734	69.8	437	60.7	3023	21.08	1.43
	2011/12	(45.0-52.4)		(63.2-75.6)		(58.5-62.9)			
Mexico	MICS	58.2	564	67.9	251	59.4	2205	9.79	1.17
	2015	(52.2-63.8)		(57.9-76.5)		(55.8-63.0)			
Paraguay	MICS	41.2	355	64.5	170	52.1	1427	23.35	1.57
	2016	(34.5-48.1)		(55.5-72.6)		(48.4-55.7)			
Peru	DHS	67.3	583	94.5	376	82.2	2518	27.20	1.40
	2012	(63.5-70.9)		(90.7-86.9)		(77.8-83.4)			
Dominican	MICS	44.5	1606	60.6	882	51.3	6227	16.05	1.36
Republic	2014	(41.0-48.0)		(54.0-66.8)		(49.2-53.4)			

[I] WI: Wealth Index; [II] AD: absolute difference; [III] RD: relative difference.

Source: Authors.

population in the poorest quintile of the countries studied was observed to have less access to consistent and diversified complementary feeding than the population in the wealthiest quintile and a socioeconomic gradient was found to exist between these classes. The exceptions were Argentina – where prevalence of introduction of solid, semi-solid and soft foods at the recommended age was lower in the wealthiest quintile of the population than in the poorest – and Haiti – where this indicator showed no variation between the wealthiest and poorest quintiles. This prevalence gradient between socioeconomic levels has also been observed in Asian and African countries, where indicators were worse for the poorest than the wealthiest[19-22].

Several studies have emphasised that, in the poorest populations, family budgets are insufficient to afford a diversified diet. Even when low-income groups develop efficient purchasing strategies, the food budget may not be adequate to obtain the recommended diet[23,24], indicating a direct relationship between social inequalities and diet[23], where wealthier population subgroups are not only healthier, but also have access to better quality diets than poorer ones[24,25]. Another important point is that access to food can be subject to climatic, production and cyclical factors – market fluctuations, for example – that lead to food vulnerability[26].

The introduction of solid, semi-solid, and soft foods (ISSSF), despite being the indicator with the highest prevalence observed among the countries, has low discriminative capacity, because absolute differences between and within countries are small. Nor does this indicator assess the quality of the food offered: studies show an growing number of inappropriate practices for introducing complementary feeding, including offering ultra-processed foods, with high sugar content, which are not recommended, and interrupting breastfeeding[27-29].

In addition to having food introduced at the age recommended by the WHO, children need a

Table 4. Minimum meal frequency of children aged 6 to 23 months, by wealth quintile, by country.

Cowntry	Source	Wealth Index (WI)[I]				Total			
	Year	Quintile 1		Quintile 5				AD[II]	RD[III]
		Prevalence	n	Prevalence	n	Prevalence	n		
Argentina	MICS	58.6	250672	75.1	149410	68.1	930878	16.53	1.28
	2011/12	(52.4-64.6)		(66.5-82.2)		(64.9-71.1)			
Belize	MICS	60.8	160	79.7	87	67.6	613	18.90	1.31
	2011	(51.8-69.0)		(67.4-88.1)		(62.8-72.0)			
Costa Rica	MICS	70.4	211	85.2	93	79.4	688	14.82	1.21
	2011	(59.8-79.2)		(72.1-92.8)		(74.7-83.5)			
El Salvador	MICS	82.7	540	93.2	331	86.9	2217	10.51	1.13
	2014	(78.4-86.3)		(87.5-96.5)		(85.0-88.7)			
Guatemala	DHS	79.1	929	89.6	482	82.4	3473	10.58	1.13
	2014/15	(76.0-81.8)		(85.3-92.8)		(80.9-83.9)			
Guyana	MICS	52.6	284	80.5	153	63.0	1048	27.84	1.53
	2014	(45.4-59.7)		(73.0-86.2)		(58.8-67.0)			
Haiti	DHS	35.4	456	64.2	226	44.2	1295	28.79	1.81
	2012	(30.7-40.4)		(55.8-71.8)		(41.0-47.4)			
Honduras	DHS	83.9	734	88.2	437	86.1	3023	4.25	1.05
	2011/12	(81.0-86.4)		(83.2-91.8)		(84.5-87.5)			
Jamaica	MICS	34.5	118	52.6	78	42.0	482	18.13	1.53
	2011	(25.2-45.2)		(38.3-66.6)		(36.2-48.1)			
Mexico	MICS	70.5	564	86.4	251	81.3	2205	15.94	1.23
	2015	(64.2-76.0)		(75.6-92.9)		(78.0-84.1)			
Panamá	MICS	49.8	34518	75.7	8330	63.5	118433	25.91	1.52
	2013	(42.9-56.7)		(60.4-86.4)		(59.2-67.6)			
Paraguay	MICS	63.9	355	75.1	170	74.7	1427	11.18	1.17
	2016	(56.9-70.4)		(63.7-83.8)		(71.3-77.8)			
Dominican	MICS	69.9	1606	86.3	882	79.8	6227	16.39	1.23
Republic	2014	(66.9-72.8)		(81.5-90.0)		(78.2-81.2)			
Suriname	MICS	49.6	335	72.4	148	64.3	1104	22.77	1.46
	2010	(43.4-55.8)		(61.5-81.1)		(60.6-67.8)			

[I] WI: Wealth Index; [II] AD: absolute difference; [III] RD: relative difference.

Source: Authors.

minimum number of meals and a diverse diet. However, many developing countries, including those studied here, still face the challenge of meeting minimum standards of dietary quality for children[30].

The second best performance was returned by the MMF indicator, absolute differences in which between the countries examined were significant, with the largest relative intra-country difference found in Haiti. This indicator reflects the frequency with which the child receives food as recommended by the WHO, which does not always happen, especially in poorer families, since income also has a direct influence on food availability and the number of family meals. However, it is important to consider that this indicator may find higher prevalences, because scoring may have included snacks, defined as foods that are easy to prepare, that the child consumes between meals and usually alone[10].

Studies in developing countries have also found the prevalence of adequate meal frequency to be higher than those shown by other indicators of complementary feeding, such as minimum dietary diversity[31,32].

The indicator directly related to dietary diversity (MDD) showed worrying results, with low prevalence in most countries, in addition to large absolute differences between countries and large distances between prevalences observed in

Table 5. Minimum acceptable diet for children 6 to 23 months, by wealth quintile, by country.

Cowntry	Source	Wealth Index (WI)[I]				Total			
	Year	Quintile 1		Quintile 5				AD[II]	RD[III]
		Prevalence	n	Prevalence	n	Prevalence	n		
El Salvador	MICS	57.5	540	76.8	331	64.5	2217	19.3	1.33
	2014	(52.3-62.5)		(68.9-83.2)		(61.7-67.2)			
Guatemala	DHS	42.6	929	65.0	482	52.1	3473	22.4	1.52
	2014/15	(38.4-46.9)		(59.1-70.6)		(50.0-54.1)			
Guyana	MICS	26.9	284	40.8	153	27.8	1048	13.9	1.51
	2014	(21.8-32.8)		(31.2-51.2)		(24.3-31.5)			
Haiti	DHS	8.9	456	21.5	226	13.6	1295	12.6	2.41
	2012	(6.3-12.4)		(15.4-29.2)		(11.3-16.2)			
Honduras	DHS	43.9	734	62.8	437	54.8	3023	18.9	1.43
	2011/12	(40.2-47.6)		(56.2-68.9)		(52.4-57.1)			
Mexico	MICS	42.4	564	60.4	251	48.4	2205	18.0	1.42
	2015	(36.1-49.0)		(49.1-70.6)		(44.6-52.2)			
Paraguay	MICS	30.3	355	45.2	170	39.7	1427	14.9	1.49
	2016	(24.3-36.9)		(36.4-54.4)		(36.1-43.4)			
Dominican	MICS	34.8	1606	52.2	882	43.0	6227	17.4	1.50
Republic	2014	(31.5-38.3)		(47.1-57.3)		(41.2-44.9)			

[I] WI: Wealth Index; [II] AD: absolute difference; [III] RD: relative difference.

Source: Authors.

the poorest and wealthiest countries. It is worth noting that the dietary diversity indicator is a count of all food groups consumed, including ultra-processed foods, but does not consider quantities.

Interestingly, in relation to MDD, Haiti showed the lowest prevalence among the countries examined, but also there was less variation between the poorest and wealthiest quintiles than in other countries, indicating poor dietary diversity in all quintiles in Haiti. Ayoya *et al.*[33] (2013) argue that this can be attributed to the impact of natural disasters and poverty.

The indicator that showed the worst performance and considerable variation in absolute differences between countries was MAD, which reflects food diversity and meal frequency. Values above 50% indicated strong determination by the context in which people live in the diversification of food groups consumed. MAD is a composite indicator, implying that children need to receive both a diverse diet and a recommended number of meals, which can be difficult in poorer socioeconomic environments. In Haiti, there was intra-country discrepancy between absolute and relative MAD values: the relative intra-country difference (RP = 2.41) was the largest of any country, while absolute difference was more discrete (12.6%). This can be explained by low prevalences in all wealth quintiles, with only 13.6% of children receiving a minimum acceptable diet. This makes sense considering that Haiti has one of the worst scenarios of child malnutrition and underweight in the Latin American and Caribbean region. Child malnutrition has been a major public health problem in Haiti: a population-based survey in 2005-06 revealed that 2 out of 10 children under 5 years of age were underweight[34].

It can be concluded that the indicators MDD and MAD, relating to diet quality and diversity, highlight two important points: first, that there is a direct association between higher purchasing power and more diversified food consumption; and second, that the context (in this case, the country) in which a person lives can determine the general availability and diversity of food, collectively affecting the wealthiest and poorest, as observed in the absolute intra- and intercountry differences.

Similar findings were also observed by Issaka *et al.*[25] (2015), who used the household wealth index as an indirect indicator of household socioeconomic status, finding significant associations between household poverty and inadequate dietary diversity in Ghana and Nigeria. Other similar negative associations between minimal dietary diversity and low socioeconomic status

have also been found in studies using DHS data conducted in developing countries in Asia and Africa[19,35,36].

Despite the low prevalence of dietary quality and diversity, there are solutions to improve these indicators: Haddad *et al.*[37] (2003) stated that it is widely accepted that, when economies grow and poverty decreases, child nutrition improves due to increased access to food, improved maternal and child care and better public health services. In this regard, Smith and Haddad[38] (2002) showed evidence that economic growth has a positive influence on child nutrition.

However, although the indicators show variations between countries, dietary practices seem sub-optimal even among the wealthiest families. These results thus make it explicit that the household's ability to purchase necessary food is a prerequisite for satisfactory complementary feeding. This shows the need for a more comprehensive understanding of feeding practices, to comprise the dimensions of food and nutritional security relating to regular and constant access to quality food in sufficient quantities without compromising other basic needs and based on health-promoting feeding practices.

Thus, measures of absolute or relative position are important, particularly when considering poverty, which can be defined in an absolute sense by comparing a given income to a static reference point or in a relative sense by comparing a given income to overall income distribution in a population[39,40].

Despite its use of nationally representative data, this study had some limitations. The food introduction indicator does not assess the timing of food introduction or consider children who received food before 6 months. The MDD indicator, which reflects only complementary foods, takes no account of breast milk as a food group. Also important is that the socioeconomic index, obtained by means of a relative wealth ladder generated from principal components, has limitations when discriminating families' real situations. Another limitation of the study was the differences in the years to which the surveys and related socioeconomic indicators relate. Despite these limitations, the study provided substantial evidence on complementary feeding in Latin America and the Caribbean.

It can thus be concluded that only a small proportion of children are benefiting from minimal complementary feeding practices, especially among the poorest quintile of the countries studied, which shows the influence of inequalities on infant feeding. Efforts are needed to improve the nutrition of children for their survival, growth and development. To ensure the right to adequate food and meet the Global Nutrition Targets 2025[41], most countries in Latin America and the Caribbean need to strengthen their efforts to combat malnutrition and reduce social inequalities, as well as strengthening health information systems to enable adequate and continuous monitoring of nutrition indicators. Achieving healthy growth requires more than nutrition-specific interventions. It is recommended to intensify inter-sector public policies focused on complementary feeding as a guarantee of the right to healthy eating.

Collaborations

AUA Cavalcanti and CS Boccolini worked in the conception, planning, analysis, interpretation and writing of the work. Both approved the final version to be published.

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