

Mortality Due to Nutritional Deficiencies: What Does the Data Tell Us? The Case of The Colombian Caribbean

Rusvelt Franklin Vargas Moranth¹

rusveltf.vargasm@unilibre.edu.co

<https://orcid.org/0000-0002-1014-0969>

Universidad Libre, Seccional Barranquilla

Adalberto Llinás Delgado

adalbertollinas@mail.uniatlantico.edu.co

<https://orcid.org/0000-0003-0665-8180>

Universidad del Atlántico

Nelson Alvis Guzmán

nalvis@yahoo.com

<https://orcid.org/0000-0001-9458-864X>

Universidad de Cartagena

Adalgisa Alcocer Olaciregui

adalgisa.alcocer@unilibre.edu.co

<https://orcid.org/0000-0002-9509-8914>

Universidad Libre, Seccional Barranquilla

Pedro Llinás Burgos

pellinas@uninorte.edu.co

<https://orcid.org/0009-0009-9605-6781>

Universidad del Norte

ABSTRACT

Nutritional deficiencies are a public health problem, with a high mortality burden and important economic and social consequences. Colombia has different sources of information to analyze this data; however, the mortality registry is one of the most efficient and reliable, so this article analyzes trends in one of the most important regions of the country: the Caribbean region, with results that show discrepancies between the departments of the region.

Keywords: mortality; children; nutritional deficiencies

¹Autor principal.

Correspondencia: rusveltf.vargasm@unilibre.edu.co

Mortalidad Debida a Deficiencias Nutricionales: ¿Qué nos Dicen los Datos? El Caso del Caribe Colombiano

RESUMEN

Las deficiencias nutricionales son un problema de salud pública, con una elevada carga de mortalidad e importantes consecuencias económicas y sociales. Colombia cuenta con diferentes fuentes de información para analizar estos datos; sin embargo, el registro de mortalidad es uno de los más eficientes y confiables, por lo que este artículo analiza las tendencias en una de las regiones más importantes del país: la región Caribe, con resultados que muestran discrepancias entre los departamentos que conforman la región.

Palabras clave: mortalidad; desnutrición; deficiencias nutricionales

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INTRODUCTION

Nutritional status during the first years of life is critical to future health (1). Malnutrition and nutritional deficiencies in general not only cause weight and height delays, affects the biochemical status of the child too. Many children die from nutritional deficiencies. Around the world, about 45% of deaths in children under five in 2016 were related to malnutrition, mostly from low- and middle-income countries (2).

According to UNICEF (United Nations Children's Fund), about half of the deaths of children under five could be attributed to undernourishment (3). Economic and social conditions determined by inequities have a negative effect, especially on vulnerable populations. These problems are consequence of factors like war, climate change, global economic crisis, and eating habits (4).

A Public Health Problem

In recent years most Latin American countries made significant progress in improving their living conditions (5), but there has been a regression in social welfare (6). Infant mortality due to malnutrition is still considerable and its presence is related to contexts of persistent poverty (7).

Micronutrient deficiencies represent the most widespread form of malnutrition in the world. The most frequent are deficiencies of iron, iodine, and vitamin A, which especially affect children and women. Malnutrition and micronutrient deficiency are public health problems in developing countries due to the impact they have on the health and well-being of the population (8). The conditioning factors are related to the food transition, which has promoted the migration of the population from the countryside to the cities (9). It is estimated that around two billion people in the world suffer from different deficiencies (10). There are several causes for this: insufficient intake, inadequate absorption, or increased requirements.

Child malnutrition is one of the most serious problems facing the world with consequences like the loss of cognitive ability and school dropout that cause lower labor productivity (11,12). They generate an increase in infant morbidity and mortality rates. In 2015, the World Health Organization (WHO) (13) reported that malnutrition causes 45% of deaths in children under 5 years of age (42% of these in Africa and 29% in the Southeast Asia region) (14).

Nutritional deficiencies in the Colombian Caribbean Region

The Colombian Caribbean Region is in the north of the country. It's conformed by Departments of: Atlántico, Bolívar, Córdoba, Magdalena, Cesar, La Guajira, Sucre and the Archipelago of San Andrés and Providencia. Between 1979 and 2009, around 500,000 deaths in children (43.4% in girls) were reported in Colombia (almost 9% of the total mortality). Mortality due to malnutrition in children under five years of age in the country decreased between 2005 and 2014, with rates of 14.87 to 6.82 deaths per 100,000 children under five years of age, respectively. The departments that had mortality rates due to malnutrition above the national rate were Guainía, Amazonas, Putumayo, Sucre, Magdalena, La Guajira, Chocó, Cesar, and Bolívar, with Vichada having the highest rate: 91 deaths per 100,000 children under five years of age in 2014 (15).

The Caribbean region had improvements in Food and Nutritional Security between 2005 and 2010. However, the malnutrition rate in the region is one of the highest in the country: 58.5% of households experience a situation of food insecurity; paradoxically, four departments of this region have the highest food production: Bolívar, Córdoba, Magdalena, and Sucre, but have highest rates of food insecurity in the region: 61.7%, 60.2%, 61.4%, and 62.9%, respectively (16).

In 2010, iron deficiency anemia affected between 16.0% and 38.9% of children between 0 and 5 years of age in the Caribbean region (16), with serious biological and psychological effects (17,18). In addition to anemia, in the Caribbean region, 41.5% suffer from zinc deficiency (19), which can affect essential metabolic processes for the activity of the organism (20), with negative effects on growth and development, and increased risk of morbidity and mortality, in addition to delayed sexual maturity and decreased appetite (20). In Cartagena (21), it was found that 56% of children from poverty families had problems of acute malnutrition.

In 2011, 28.4% of children aged 1 to 4 years in the Caribbean region had vitamin A deficiency (19), whose deficiency can cause blindness, growth limitation, decreased immune system, increased risk of occurrence of infections, and increased risk of mortality (22).

The 2015 ENSIN (National Nutritional Situation Survey) found that 13.2% of children under five years of age suffer from chronic malnutrition, a value that is 5 percentage points above the Sustainable Development Goals (SDG) target (23,24).

In 2017 (25), the national gross mortality rate due to and associated with malnutrition was 4.6 per 100,000 children under five years of age; being Vichada, Barranquilla, Guainía, La guajira, Chocó, Cesar, and Santa Marta the territorial entities that presented the highest mortality rate; the median weight at the time of death was 5.2 kg and height 59 cm, 42% were not breastfed and more than 90% had severe or moderate acute malnutrition, as well as stunting or risk of stunting.

Trends in mortality due to nutritional deficiencies

The reduction of Infant Mortality is a tracer indicator of progress in the health of people (26) and is one of the goals of the Millennium Development Goals (MDG), replaced by the Sustainable Development Goals (SDG) (27). Colombia has promoted policies and implemented strategies to improve child health; however, the decrease in this indicator seems to be accompanied by an increase in the gaps between population groups (28).

The Infant Mortality Rate (IMR) is a key indicator of well-being and development (29). It is one of the indicators of the fourth Millennium Development Goals (MDG), whose purpose was to reduce by a third the IMR and the mortality rate in children under five years of age for Colombia, between 1990 and 2015 (30). That is why the IMR shows the social, economic, environmental conditions in which children live and the state of health services, accessibility, among other indicators (31).

Despite its importance, the IMR and related data in Colombia have been subject to considerable inconsistency between records and estimates. The National Department of Statistics (DANE) published a registered IMR of 13.69 deaths per 1,000 live births (LB) for 2009 (32), while Profamilia, reported in the National Demographic and Health Survey (ENDS) in 2010 an IMR of 16 per 1,000 LB, for the period 2005-2010 (33).

According to DANE, the data on previous years imply greater disparities between the reported and registered IMR and the rate of decline over time, so the Ministry of Social Protection (MPS) suggests that the IMR prior to 1998 is not comparable, because the sources of information on births are different (34).

METODOLOGY

Using the DANE mortality database, in the period 2000 to 2019, deaths in children under five years of age were selected with the basic cause codes: E40 to E64 for ICD10 for the departments of the Caribbean Region. Denominators (total newborns) were taken from the DANE live birth records for the study period. This information is freely accessible and is available to the public, in a disaggregated and anonymized manner.

The entire population of the period was used by five-year age groups in each of the three five-year periods from 2000 to 2019. The adjustments made to the information for the mortality base included the imputation of the department of residence for the department of occurrence in deaths without information on the usual place of residence, cases residing abroad and deaths without age information were excluded.

RESULTS

From 2000 to 2004 to 2015-2019, the percentage distribution (concerning the total number of deaths in the country) of mortality due to nutritional deficiencies in children under 5 years of age in the Caribbean Region increased from 38.7% to 53.6 %, although in most departments it decreased, the notorious increase in La Guajira and Cesar made this increase possible (Table 1).

Table 1. Deaths due to nutritional deficiencies in children under 5 years of age in the Colombian Caribbean Region, 2000 to 2019.

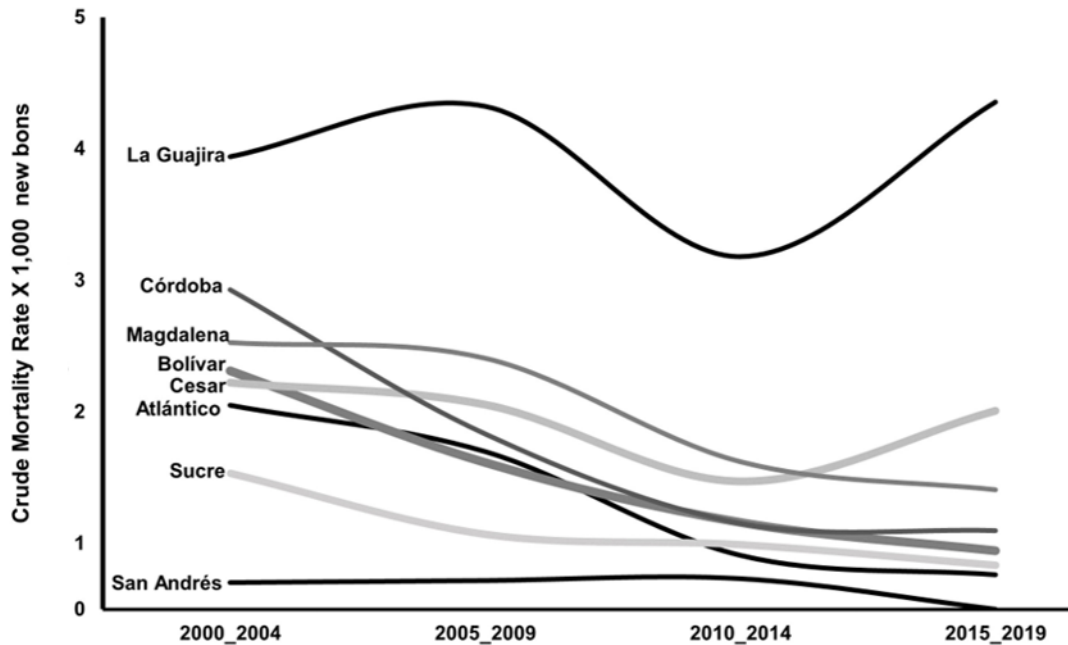
	Quinquenniums				%Total (n=9391)
	%2000 - 2004 (n=3798)	%2005 - 2009 (n=2486)	%2010 - 2014 (n=1505)	%2015 -2019 (n=1602)	
Atlántico	8,5	9,8	5,2	3,4	7,5
Bolívar	7,2	7,2	7,7	4,9	6,9
Cesar	4,2	6,5	6,6	10,2	6,2
Córdoba	7,6	6,7	5,8	4,9	6,6
La Guajira	4,5	9,5	11,8	22,0	10,0
Magdalena	4,9	8,4	8,4	6,6	6,7
Sucre	1,8	1,8	2,5	1,6	1,9
San Andrés y Providencia	0,0	0,0	0,1	0,0	0,0
Total Caribbean Region	38,7	49,9	48,1	53,6	45,8

DANE, 2022

Regarding crude mortality rates per 1,000 live births, La Guajira had the highest during the 4 five-year periods observed; This department and Cesar had an increasing trend from 2010 to 2019, going from

2.68 to 3.85 and from 0.97 to 1.51, respectively. In the rest of the departments, the trend is downward (Figure 1).

Figure 1. Crude mortality rates due to nutritional deficiencies (per 1,000 live births) in children under 5 years of age in the Colombian Caribbean Region during 2000 to 2019.



DANE, 2022

DISCUSSION

Malnutrition can be misleading since it is traditionally related to low weight, but the increase in the prevalence of overweight and obesity can be virtual since it is not certain that the population is consuming enough calories and protein intake, minerals, and vitamins (16).

Within the Social Determinants of Health (SDH) (35) infant mortality is one of the most important indicators and has been related to access and quality of health services, housing conditions, extreme maternal age, schooling it lowers, among others, institutional fragility, and social and economic development, as well as cultural factors (ethnic discrimination and the subordinate position of women).

The second 2030 goal consists of ending hunger and ensuring access for all people to healthy, nutritious, and sufficient food throughout the year and the third goal seeks to put an end to preventable deaths of newborns and minor children 5 years old (36).

Nutritional deficiencies are not always considered in the selection of the basic cause of death, because in some cases they behave as contributing causes, intervening causes, or related to the causes that,

according to doctors, start the chain of death. events leading to death. By using the basic cause, the importance of these deficiencies can be reduced, since it only becomes evident when the study of mortality is approached under the multiple cause approach, in which all those noted in the certificates are considered (37).

To reduce infant mortality, almost forty years ago, UNICEF (38) suggested growth and development monitoring, oral rehydration, breastfeeding and immunizations, the use of food supplements for mothers and their children, and family planning. Also, improving health interventions aimed at women before and during pregnancy, sanitary conditions, and increasing breastfeeding are needed (39).

Martínez (40) estimated malnutrition by municipalities in children under five using information from the Census and the ENDS to target and prioritize food programs in areas of greatest need. He used three anthropometric measures of malnutrition: the delay in weight and height for age and the delay in weight for height. The first two indicators show that the municipalities of the Caribbean and the department of Nariño present greater malnutrition, while the third indicates the municipalities in the north of Antioquia and Nariño and the south of the Valley. This makes it important to study different measures of malnutrition simultaneously.

In Colombia, although the Health Situation Analysis of the country (15) describes the mortality rates due to nutritional deficiencies in children under 5 years of age, this information is from the year 2005 and not from 2000 as proposed, but the ASIS does not show the behavior of deaths by sub-causes, regions or place of occurrence, health system, among others, and the rates are not calculated every five years.

Malnutrition is usually measured using two types of indicators: anthropometric and biochemical. The former compares the height and weight of the child with standard values according to their age and sex, produced by the WHO. These values are tests that are done through blood tests and seek to find deficiencies of vitamins and minerals. The prevalence of anemia is of great interest, which is generated when the child has a low concentration of hemoglobin in the blood.

The timeliest information on malnutrition in the country comes from the ENSIN, carried out in 2005, 2010, and 2015 by the Colombian Institute of Family Welfare (ICBF). These data have been used to study malnutrition over time and between regions of the country. There are still regional gaps, both in

anthropometric and biochemical indicators. Gaviria and Hoyos (41) found that children with anemia are more likely to stay longer in school, so the suggestion is that nutrition policies have an approach that tends to reduce deficiencies of specific micronutrients.

In the Caribbean Region, there have been changes in mortality due to nutritional deficiencies in children under 5 years of age, but these data must be analyzed in a disaggregated manner, by department, since each one has different social and economic characteristics and special attention deserves La Guajira.

CONFLICT OF INTEREST DECLARATION

The authors declare that they have no conflict of interest.

REFERENCES BIBLIOGRAPHIC

Marrugo C, Moreno D, Castro R, Paternina Á, Marrugo V, Alvis N. Sociodemographic Determinants of child nutrition in Colombia. *Salud Uninorte*, 2015;31(3):446–57.

World Health Organization. Malnutrition. 2018. From

<http://www.who.int/mediacentre/factsheets/malnutrition/es/> Data accessed: september 2022.

UNICEF. The state of The World's children 2016. Geneva, Switzerland; 2016:70-83.

World Health Organization. Media Centre. World hunger again on the rise, driven by conflict and climate change, new UN report says. Geneva, Switzerland; 2017.

<http://www.who.int/mediacentre/news/releases/2017/world-hunger-report/es/>. Data Accessed: november 2020.

Mercer R. Salud y pobreza en la Argentina: dime cómo ha sido tu cuna y te diré cómo serás. *Voces en el Fénix*, 2013; 22(1):88–97.

FAO. Panorama de la Seguridad Alimentaria y Nutricional en América Latina y el Caribe. Hambre en América Latina y el Caribe: acercándose a los Objetivos del Milenio, 2013. 2014: 2-30.

Longhi F. Mortalidad infantil por desnutrición y condiciones de pobreza en Tucumán (Argentina): Magnitudes, manifestaciones espaciales y acciones familiares en los primeros años del siglo XXI. *Papeles Geogr* 2017; 63(1):91–112.

Centers for Disease Control and Prevention. Malnutrition and micronutrient deficiencies among Bhutanese refugee children--Nepal, 2007. *Morb Mortal Wkly Rep*, 2008;57(14): 370-373.

Taboada N. El zinc y el cobre: micronutrientes esenciales para la salud humana. *Acta Médica del*

- Centro, 2017;11(2):79–89.
- Fajardo G, Loaiza G, Maya M, Vera S, Sotomayor A. Déficit de micronutrientes en niños de 3 a 7 años. Conf Proc, 2017;1(1):6–9.
- Hunter P. Have We Substantially Underestimated the Impact of Improved Sanitation Coverage on Child Health? A Generalized Additive Model Panel Analysis of Global Data on Child Mortality and Malnutrition. PLoS One, 2016;11(10): e0164571.
- Martínez R. El costo del hambre: impacto social y económico de la desnutrición infantil en Centroamérica y República Dominicana. CEPAL y Programa Mundial de Alimentos. CEPAL, editor. Santiago de Chile; 2007:33-47.
- UNICEF. Under-five mortality. Diciembre de 2021. Tomado de: <https://data.unicef.org/topic/child-survival/under-five-mortality/>. Date Accessed: march 2022.
- World Health Organization. Child mortality and causes of death. The Global Health Observatory. From: <https://www.who.int/data/gho/data/themes/topics/topic-details/GHO/child-mortality-and-causes-of-death>. Date Accessed: april 2022.
- Ministerio de salud y protección social. Análisis de Situación de Salud [ASIS] Colombia, 2016, Bogotá; 2017. https://www.minsalud.gov.co/sites/rid/Lists/BibliotecaDigital/RIDE/VS/ED/PS_P/asis-colombia-2016.pdf. Date Accessed: october 2020.
- Lissbrant S. Seguridad alimentaria y nutricional en la región Caribe: consecuencias de la desnutrición y buenas prácticas como soluciones. Investig Desarro, 2015;23(1):117–38.
- Camaschella C. Iron-deficiency anemia. N Engl J Med, 2015;372(19):1832– 43.
- Gupta P, Perrine C, Mei Z. Iron, anemia, and iron deficiency anemia among young children in the United States. Nutrients, 2016;8(6):330.
- Gobernación del Atlántico. Caribe sin hambre. Informe Final. BID. Desarrollo BI de, editor. Barranquilla; 2011. https://www.atlantico.gov.co/images/stories/rendicion/caribe_sin_hambre_version_final.pdf. Date Accessed: June 2023.
- Candan N, Cakmak I. Zinc-biofortified seeds improved seedling growth under zinc deficiency and drought stress in durum wheat. J Plant Nutr Soil Sci, 2018;181(3):388–95.

- Moreno D, Picón M, Marrugo C, Marrugo V, Alvis N. Determinantes socioeconómicos del estado nutricional en menores de cinco años atendidos en el Hospital Infantil Napoleón Franco Pareja. *Rev la Univ Ind Santander*, 2017;49(2):352–63.
- Manson J, Brannon M, Rosen C. Vitamin D deficiency-is there really a pandemic? *N Engl J Med*, 2016;375(19):1817-1820.
- Instituto Colombiano de Bienestar Familiar (ICBF). Resumen ejecutivo de la Encuesta Nacional de Situación Nutricional en Colombia (ENSIN). Bogotá; 2017.
https://www.icbf.gov.co/sites/default/files/resumen_ejecutivo_ensin.pdf. Data Accessed: june 2022.
- Wisbaum W. La Desnutrición Infantil: Causas, consecuencias y estrategias para su prevención y tratamiento. UNICEF Editors. 2011.
<http://disde.minedu.gob.pe/bitstream/handle/20.500.12799/3713/La%20desnutrici%C3%B3n%20infantil%20causas%20consecuencias%20y%20estrategias%20para%20su%20prevenci%C3%B3n%20y%20tratamiento.pdf?sequence=1&isAllowed=y>. Data Accessed: June 2022.
- Instituto Nacional de Salud. Mortalidad por y asociada a desnutrición en menores de cinco años. Colombia 2017. Bogotá; 2018.
<https://www.ins.gov.co/buscador-eventos/Informesdeevento/MORTALIDAD%20POR%20Y%20ASOCIADA%20A%20DESNUTRICION%20EN%20MENORES%20DE%20CINCO%20A%C3%91OS%202017.pdf>. Data accessed: July 2022.
- Jaramillo M, Chernichovsky D, Jiménez J. Determinantes de la mortalidad infantil en Colombia. *Path Análisis. Revista de Salud Pública*, 2018; 20(1):3-9.
- De la Casa J, Caballero S. La comunicación de los Objetivos de Desarrollo Sostenible en las organizaciones de la Economía Social. CIRIEC-España. *Revista de economía pública, social y cooperativa*, 2021; 101(1):165-191.
- Vera M, Mazariegos J. Análisis de las tasas de mortalidad por “ira” [j00-j22] en menores de cinco años en Colombia 2005-2015. *Revista Médica de Costa Rica y Centroamérica*, 2021;84(626):87-93.
- Martínez C, Montañés A. Convergencia en tasas de mortalidad infantil: el caso de las regiones

- españolas. *Papeles de Población*, 2021;27(109):13-32.
- Departamento Nacional de Planeación. *Pobreza monetaria y multidimensional en Colombia (2010-2013)*. DNP, editor. Bogotá; 2014: 2-48.
- Profamilia. *Mortalidad Infantil y en la niñez*. In: *Encuesta Nacional de Demografía y salud*, 2013. <http://www.profamilia.org.co/encuestas/00resumen/01general.htm>. Data Accessed: may 2022.
- DANE. *Ficha Metodológica Estadísticas Vitales*. 2008. http://200.69.105.197/redatam/SDPDO/DEFUN/ficha_vitales.pdf. Data Accessed: october 2020.
- Organización Mundial de la Salud. *Subsanar las desigualdades en una generación. Informe final. Datos científicos, acciones y actores*. WHO. Buenos Aires, Argentina; 2009: 25-71.
- Cividanes J, Gil D, Diez R, Gil A. *Midiendo los Objetivos de Desarrollo Sostenible*. Alicante, España; 2018:57-77.
- Secretaría de Salud de México. *Aspectos relevantes sobre la estadística de deficiencias de la nutrición*. *Salud Publica Mex*, 1998;40(1):206–15.
- UNICEF. *The State of the World's Children 1982-1983*. UNICEF, editor. New York; 1982:7-17.
- Jiménez M, Del Popolo F, Bay G. *La reducción de la mortalidad infantil en América Latina y el Caribe: avance dispar que requiere respuestas variadas*. *Desafíos*, 2007;6(1):1–12.
- Letois F, Mura T, Scali J, Gutiérrez L, Feart C, Berr C. *Nutrition and mortality in the elderly over 10 years of follow-up: the Three-City study*. *Br J Nutr*, 2016;116(5):882–9.
- Thomson K, Hillier-Brown F, Todd A, McNamara C, Hujits T, Bambra C. *The effects of public health policies on health inequalities in high-income countries: an umbrella review*. *BMC Public Health*, 2018;18(1):1-21.
- Martínez H. *Desnutrición a nivel municipal en Colombia, Censo de 2005*. 2009. (Archivos de Economía). Report No.: 361. <https://colaboracion.dnp.gov.co/CDT/Estudios%20Economicos/361.pdf>. Data Accessed: July 2022.
- Gaviria A, Hoyos A. *Anemia and child education: The case of Colombia*. *Rev Desarro y Soc*, 2011;68(1):47–77.