SALUD COLECTIVA. 2018;14(1):33-50. doi: 10.18294/sc.2018.1176

Child malnutrition in Argentina in the first part of the century: a quantitative approach

La desnutrición en la niñez argentina en los primeros años del siglo XXI: un abordaje cuantitativo

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ABSTRACT Child malnutrition is an important public health problem in Argentina, both as a primary cause of mortality/morbidity and associated with different pathologies that affect children. However, little is known about its magnitude, trends and spatial distribution. This article seeks to detect such situations considering different geographic scales. A quantitative approach was applied, systematizing vital statistics (mortality), hospital discharges (morbidity), and low birth weight (natality) in children 0-4 years of age. Accordingly, the information sources used were mortality statistics (1999-2013), hospital discharge statistical records (2000, 2005-2011) and live birth statistics (1999-2012) provided by the Office of Statistics and Health Information (DEIS) [*Dirección de Estadísticas e Información de Salud*] of the National Ministry of Health. The results show differences according to the scale considered. The conclusions highlight the necessity of integrating the different sources of information analyzed in order to provide a more general overview of a problem that, albeit in decline, still registers high magnitudes in the most vulnerable areas. In this way, certain areas of northern Argentina evidence worse conditions, requiring immediate attention be paid to issues of poverty and child health.

KEY WORDS Malnutrition; Infant Nutrition Disorders; Medical Geography; Poverty; Argentina.

RESUMEN La desnutrición en la niñez conforma un importante problema de salud pública en Argentina, ya sea como causa básica de mortalidad/morbilidad o asociada a distintas patologías que inciden sobre la población infantil. Sin embargo, poco se conoce sobre su magnitud, tendencias y su distribución espacial. Este artículo procuró detectar estas situaciones considerando diferentes escalas geográficas. Se propuso un abordaje cuantitativo mediante la sistematización de estadísticas vitales (mortalidad), egresos hospitalarios (morbilidad), y de bajo peso al nacimiento (natalidad), sobre una población objetivo de 0 a 4 años de edad. Las fuentes de información utilizadas fueron las estadísticas de mortalidad (1999-2013), estadísticas de egresos hospitalarios (2000, 2005-2011) y estadísticas de nacidos vivos (1999-2012) provistos por la Dirección de Estadísticas e Información de Salud (DEIS) del Ministerio de Salud de la Nación. Los resultados advierten comportamientos diferenciados según la escala considerada. Como conclusión, se destaca la necesidad de integrar las vertientes de información analizadas para brindar un panorama más general sobre un problema que, si bien tiende a descender, alcanza magnitudes altas en las zonas más vulnerables. Ciertas áreas del norte presentan las peores condiciones y precisan un abordaje inmediato en materia de pobreza y salud infantil.

PALABRAS CLAVES Desnutrición; Trastornos de la Nutrición del Niño; Geografía Médica; Pobreza; Argentina.

SALUD COLECTIVA. 2018;14(1):33-50. doi: 10.18294/sc.2018.1211

INTRODUCTION

At the end of the first decade of the 21st century, countries in Latin America, in general, and Argentina, in particular, had shown great improvement in their living conditions as compared to the 1990s. This process resulted from an improvement in political and economic conditions that favored the new role performed by the State as regards the development and implementation of public policies.[1] However, in the three-year period of 2011-2013, recent research studies have shown some stagnation and/or setbacks concerning some of the key dimensions of social welfare, including the nutritional status of children.[2]

Nutrition, as a process, is conditioned by different factors. It is well-known that adequate nutrition, during the fetal stage and in the first years of life, is crucial for the growth and development of a child; the consequences of inadequate nutrition are reflected in the short, medium and long-term, both in the individual and in the society to which he or she belongs. Nutritional deficiencies, especially in a person's first years of life, have serious consequences, both for the individual and for the society to which he or she belongs. According to the United Nations World Food Programme, in Latin America malnutrition affects almost nine million children under the age of five (16%).[3] Added to this figure, there are nine million children more at high risk of malnutrition due to the conditions of poverty in which they live. A good proportion of all these children live in countries such as Guatemala, Bolivia and Honduras.

In Argentina, the prevalence of malnutrition seems to be relatively low, in comparison with the Latin American context. Nonetheless, at the beginning of the 21st century, the Food and Agriculture Organization (FAO) already stressed that "although in Argentina the availability of food is sufficient and even surplus to satisfy the energy needs required per person and per day, part of the population has insufficient access to food"[2] [own translation]. Several studies[4,5] show that the forms of malnutrition prevailing in Argentina before the 2000s were low height-for-age (stunting) and chronic malnutrition, the north being the most affected region.[6] On the other hand, the results obtained by the National Nutrition and Health Survey (ENNYS, from the Spanish *EncuestaNacional de Nutrición y Salud*), carried out in 2004-2005, confirmed the information above, surprisingly revealing a huge number of children suffering from anemia (also known as hidden malnutrition), which affected, for example, 36% of children between 6 and 72 months of age in Chaco, while the national value was 16.5%.[7] The worst indicator of malnutrition, that is, low weight-for-age, amounted to 3% of children aged between 6 to 60 months in the northeast of Argentina. All this research, somehow or other, places emphasis on the nutritional problems that affect children in Argentina.

The 2001-2002 crisis may have exerted a negative impact on the country's nutritional status. Currency devaluation, a resurgence of inflation, the deterioration of employment indicators and unequal income distribution paved the way for a sharp worsening of the food situation in the country, which led to a serious crisis in terms of access to food by a large part of the population at the beginning of 2002. It could thus be observed that nutritional problems were far from non-existent and that their effects were becoming, at the dawn of the 21st century, substantial in magnitude for Argentina.

This situation seems to have been gradually reversed since 2003, owing to the strict implementation of programs aimed at reducing malnutrition –for example, the National Food Security Plan (*Plan Nacional de SeguridadAlimentaria*)– and an improvement in the country's economic and social conditions. However, little was known about the magnitude of malnutrition among children in Argentina, and the effects that such policies –considering existing regional inequalities – would bring about.

Therefore, it should be noted that Argentina had, at the end of 2014, the following relevant characteristics, which should be taken into account when analyzing this issue:

SALUD COLECTIVA. 2018;14(1):33-50. doi: 10.18294/sc.2018.1176

a. A wide variety of social policies and programs, often unrelated to one another, aimed at meeting the social needs of large sections of the population that had become vulnerable as a result of the neoliberal policies of the 1990s.
b. Lack of knowledge concerning the annual variation and trends regarding malnutrition rates, and lack of systematic and continuous information on child malnutrition.
c. Unequal access to health, which resulted in profound socio-economic, cultural and environmental inequalities.

Taking this context into account, some questions arose. What has been the incidence of child malnutrition in the past few years? What are its trends? How has its spatial distribution changed and how has it evolved over time? These questions led to the development of specific conceptual and methodological tools, which made it possible to describe and analyze this problem adequately, and to speculate on certain types of answers.

Based on the situation that we have outlined and the questions that consequently arose, we established the following objectives:

a. To describe the pattern of evolution of deaths due to malnutrition among children under five, its incidence and spatial distribution during the period 1999-2013, considering the national, regional, provincial and departmental levels.
b. To explore the pattern of evolution of hospital discharges after malnutrition and associated causes among children under five, its incidence and spatial distribution during the period 2000-2010.
c. To analyze the characteristics of low-birthweight children, in order to define a malnutrition indicator that could complement the previous analysis.

Theoretical and conceptual foundations

Malnutrition is the pathophysiological result of insufficient food intake. This insufficiency is characterized by its temporal continuity and may also be due to processes in which the individual's absorption capacity is diminished or to metabolic defects in which there is inadequate biological utilization of the nutrients consumed.[8] Currently, the concepts of nutrition/malnutrition are believed to be influenced by three dimensions: firstly, by the biological dimension, which understands nutrition as an indispensable process for the maintenance of life; secondly, by the social dimension, which involves cultural factors such as religion, education and eating habits, as well as different economic factors; and lastly, by the environmental dimension, which highlights the importance of sustainable food production and the use of crops as a source of energy, as measures that not only contribute to the nutrition of populations but also to the conservation of the environment.[9]

The determinants of malnutrition can be classified into immediate, underlying and basic (or structural, according to our proposal).[10] Among the immediate determinants there are insufficient diets (in quantity and quality) and some recurrent diseases, the most common of which are diarrheal and respiratory infections and parasites. This situation is compounded by poor immunization.

Underlying determinants include food insecurity, lack of medical care, inadequate healthcare, water supply, and sanitation, as well as poor hygiene, among others. However, the main basic/structural determinant is poverty[10,11] (Figure 1).

An intermediary concept of great importance that affects the incidence and development of malnutrition among children is that of *survival strategies for child care*, which can be defined as certain behavior and skills with which families face some macro and micro institutional conditions that would affect their health. Skills emerge within the family regarding how to meet the needs for maintenance and reproduction of their members with the available resources. Such behavior tends to ensure the biological reproduction of the family, to preserve life and to carry out all those practices, economic and non-economic, which are indispensable for the family

SALUD COLECTIVA. 2018;14(1):33-50. doi: 10.18294/sc.2018.1211

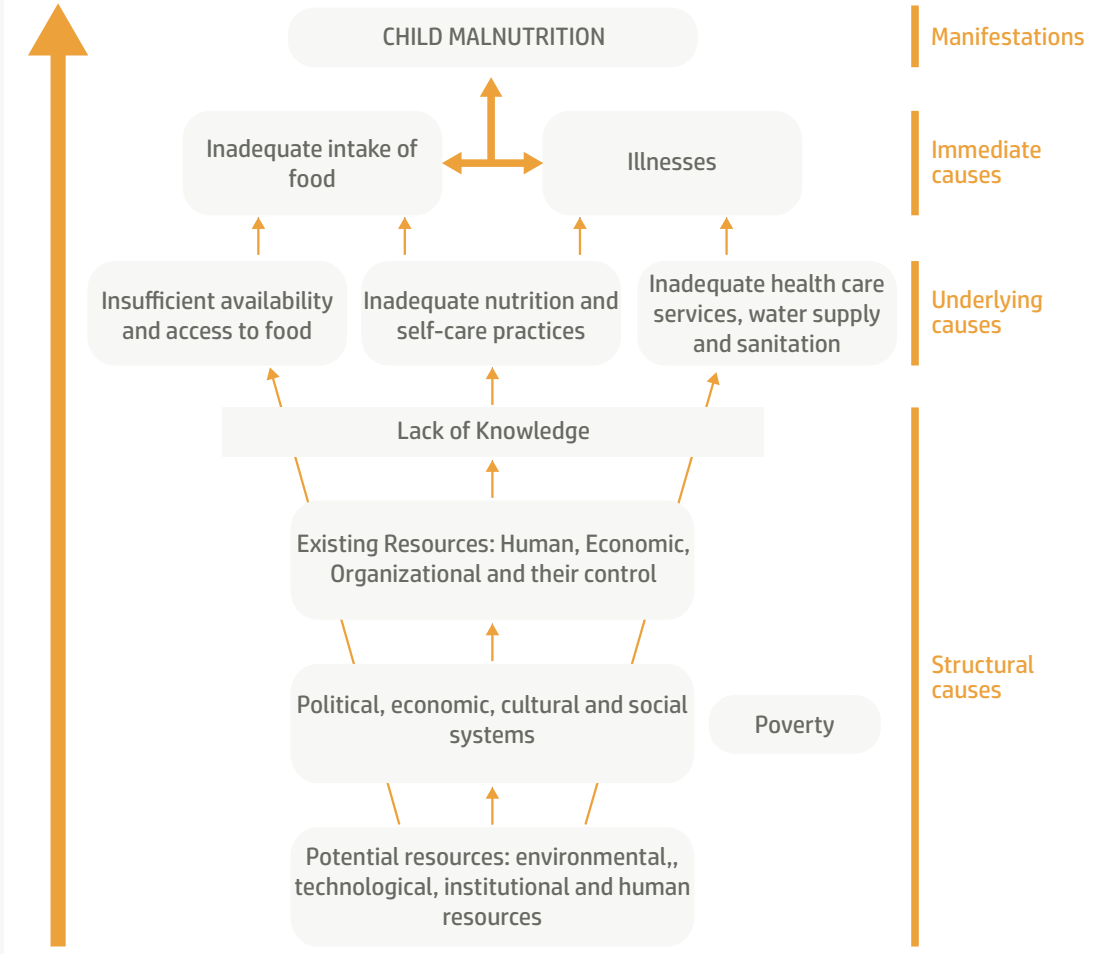

Figure 1. Causes of child malnutrition.

Source: Own elaboration based on data from UNICEF[11].

to earn its livelihood and for the socialization of children.[12] One of these strategies is related to the inclusion of families within a structured and continuous social network. Bronfman[13] highlights the role of these networks, especially in poor families, since he believes that they are often the only type of help that families can count on, and the only support for them to lighten the heavy burdens of daily life. Although the existence of these strategies is not directly linked to the occurrence of deaths, it often prevents accidents and illnesses from leading to fatal outcomes.

According to evidence coming from different sources, there is a close relationship between poverty – in its different forms and manifestations – and malnutrition. This relationship does not determine death, but rather conditions it in an important way and, although this circuit does not necessarily result in death, its negative effects, mainly in children, may lead to serious limitations in their physical, psychological, cognitive and affective characteristics, which, in turn, can then have an impact on poverty levels.

SALUD COLECTIVA. 2018;14(1):33-50. doi: 10.18294/sc.2018.1176

On the other hand, even when malnutrition has not resulted in a person's death, it produces a number of effects or consequences for individuals in adulthood that affect their physical condition, including short stature, reduced muscle mass, limited capacity for work, and increased risk of obesity and chronic diseases. Moreover, evidence concerning the effects of early malnutrition on academic and intellectual performance is also solid.[14] Well-known effects of early malnutrition may include late first grade start, low levels of schooling, and limitations as regards reading and vocabulary. It should be noted that these effects are maintained even after being controlled by confounding factors. Low schooling and the incapacities derived from malnutrition condition career paths and income, even in traditional rural areas.[15]

Between 1969 and 1977, the Institute of Nutrition of Central America and Panama (INCAP, from the Spanish *Instituto de Nutrición de Centroamérica y Panamá*) conducted a diachronic study in eastern Guatemala.[16] It consisted of a community-randomized trial in which people from two villages, a large and a small one, received a nutritional supplement called "Atole", while villagers from other two similar villages received a control drink called "Fresco". Atole was a thick drink that looked like mush and had micronutrients, calories and protein, while Fresco was a drink that provided micronutrients, but was low in calories and had a negligible contribution of proteins. From a biological point of view, this nutritional experiment proved effective as a way to improve dietary intake and stature in children, although the impact on children's growth could only be corroborated in the first three years of life. The first follow-up study of the participants was conducted between 1988 and 1989, which concluded that improved nutrition in the early years of life has important effects on human capital, when it comes to parameters of body size, work capacity and intellectual functioning. However, due to the young age of the participants, the study could not link nutritional intervention with economic productivity.[15]

In this sense, Martínez and Fernández[17] argue that child malnutrition has a series of negative consequences in different areas, especially an impact on: morbidity and mortality, education, and productivity, which becomes one of the main mechanisms for the intergenerational transmission of poverty and inequality. Thus, malnutrition in pregnant women increases the risk of low birth weight and, in turn, increases the risk of neonatal mortality. Babies who are born weighing between 2000 and 2499 grams face a risk of neonatal mortality four times higher than those babies weighing between 2500 and 2999 grams, and 10 to 14 times higher than those weighing between 3000 and 3499 grams at birth. Different studies show that malnutrition is the largest contributor to infant and preschool child mortality[18] (between 50% and 60%). The morbidity rate attributable to malnutrition is 61% in the case of diarrhea, 57% in the case of malaria, 53% in the case of pneumonia and 45% in the case of measles. In addition, malnutrition significantly increases the risk of chronic diseases in adulthood, such as heart diseases, hypertension, diabetes, and communicable diseases such as tuberculosis.[17]

It is thus understood that poverty, the basic determinant of child malnutrition, always refers to the situation in which families find themselves. This situation is not the aggregate of more or less independent dimensions or partial aspects, but rather the structural situation in which families find themselves, as a result of their specific insertion within the socio-productive structure, which determines whether or not it is possible for them to access certain goods and services.[19] We understand that it is in this context that malnutrition originates and develops in childhood.

SOURCES AND METHODS

This research study covers the period 1999 to 2013. The population under study was made up of Argentine children between the

SALUD COLECTIVA. 2018;14(1):33-50. doi: 10.18294/sc.2018.1211

ages of zero and four. According to the 2010 National Population, Households and Dwellings Census (*CensoNacional de Población, Hogares y Viviendas*), a little more than three million people out of the total Argentine population (40 million) were between the ages of zero and four. This population group represented 8.3% of the total.

The study of malnutrition in Argentine children involved addressing a problem that was difficult to approach in general terms, especially when only its extreme expression can be visualized. In this sense, the availability and the characteristics of the sources of information proved to be a substantial determinant for the generation of the methodological tools and the results found. Thus, the information selected to account for the problem should be considered bearing in mind the limitations of the quality of the available data.

The sources of information used were mortality statistics (1999-2013), hospital discharge statistical records (2000, 2005-2011) and live birth statistics (1999-2012) provided by the Office of Statistics and Health Information (DEIS, from the Spanish *Dirección de Estadísticas e Información de Salud*) of the National Ministry of Health. As regards the three sources mentioned, the least solid information came from hospital discharges, since it only refers to discharges from public hospitals and its statistical consolidation is still in progress. Therefore, hospital discharge statistical records still show deficiencies in their level of coverage and completeness as regards the selected period. Moreover, the average population was estimated using the 2001 and 2010 National Population, Households and Dwellings Census.

Mortality statistics were used to create the mortality rate due to child malnutrition (MRCM), an indicator that connects the number of deaths registered due to malnutrition in children under five with the rest of the population under five years of age within the selected area, expressed per 1000 children. The category referred to as *malnutrition and other types of nutritional anemia* is made up of the following ICD-10 pathologies: iron deficiency anemia (D50), vitamin B12 deficiency anemia (D51), folate deficiency anemia (D52), other types of nutritional anemia (D53), kwashiorkor (E40), nutritional marasmus (E41), marasmic kwashiorkor (E42), protein-energy malnutrition (E43-E46), vitamin A deficiency (E50), thiamin deficiency (E51), pellagra (E52), deficiency of other B vitamins (E53), ascorbic acid deficiency (E54), vitamin D deficiency (E55), other vitamin deficiencies (E56), calcium deficiency (E58), selenium deficiency (E59), zinc deficiency (E60), deficiency of other nutritional elements (E61), other nutritional deficiencies (E63) and long-term effects due to malnutrition and other nutritional deficiencies (E64).

This indicator is somewhat extreme given the fact that it considers only death from malnutrition, thus ignoring a great part of the problem. For this reason, other non-traditional sources were employed in the analysis of malnutrition.

Hospital discharge statistical records were consolidated, despite the lack of such a comprehensive data set, in order to provide a baseline for the potential scope of the problem. In their analysis, the same criteria were adopted as for the processing of vital statistics, thus obtaining the relevant aspects related to morbidity.

A third approach involved the development of an indicator that considered low-birth-weight children (less than 2500 grams) born at full-term to poorly-educated mothers, according to birth statistics. In this case, we calculated the proportion of live births from pregnancies that lasted 37 weeks or more, in the case of mothers that had not finished primary education, comparing it with the total number of live births within each geographical area. Low birth weight, when properly registered, constitutes another valuable nutritional indicator, as it summarizes the prenatal care that the mother has received during pregnancy. This indicator can be associated with the mother's nutritional commitment – although, it must be very severe to manifest itself – and, generally, it expresses late and deficient gestational control on the part of the mother.[20] It should be stressed that this is

SALUD COLECTIVA. 2018;14(1):33-50. doi: 10.18294/sc.2018.1176

the extreme manifestation of an even greater problem, given the fact that, in many cases, there is a high level of underrecording or the quality of the information is poor. Examples of this were cases of people who, while there was underlying malnutrition, their cause of death was not registered as such.

Despite limitations in the quality of the records, the problem of death from malnutrition constitutes an important issue regarding mortality in general and, specifically, when it comes to child mortality. Shanghvi and Murray[21] state that malnutrition, even in its less severe form, may be associated with up to 56% of all child mortality.

The indicators derived from these three sources of analysis can be interpreted based on cartographic records, according to their distribution, thus identifying three units of analysis: six geographical regions, the twenty-three provinces in Argentina, and the five hundred and eleven departments or districts that make up the Argentine territory. Calculation of rates differed depending on the geographical scale considered: on a national, regional and provincial scale, a rate was calculated whose denominator consisted of population aged between zero and four. This information was taken from the demographic projections linked to the 2010 series of the Demographic Analysis Program carried out by the National Institute of Statistics and Census (INDEC, from the Spanish *InstitutoNacional de Estadísticas y Censos*). Finally, on a departmental scale, the proportion of deaths in each case was compared with the total number of deaths, hospital discharges or live births, as appropriate (this distinction was necessary given the fact that we do not have departmental population projections for these age groups). For cartographic purposes, the variables were always classified into four categories, so each category represented 25% of the distribution data (quartiles), the first category being the one that represented the jurisdictions where cases related to the analyzed variable were nonexistent. Moreover, thresholds for categories were calculated including data from the three spatial distributions considered. This made it possible to maintain the same thresholds in different maps and provided a basis for comparison in the evolution of these distributions.

In order to account for the trends of the problem during the study period, an annual diachronic analysis was performed on a national, regional and provincial scale. For the analysis on a departmental scale, a five-yearly aggregation of data was used, due to the diversity in the quantity of cases registered in each department. As a result, it was possible to obtain a trend sidestepping the sharp annual fluctuations in the indicator.

Finally, it is important to mention that the design adopted for this research study was observational, descriptive and cross-sectional. In order to achieve this, it was necessary to carry out a systematic collection of data and to develop indicators based on data arising from mortality, morbidity and birth rates associated with child malnutrition, collected on different geographical scales and in different time periods of the first decade of the 21st century. In general terms, the time periods analyzed were 2000-2010 and 1999-2013, depending on the characteristics of each of the sources.

CHILD MALNUTRITION IN ARGENTINA ACCORDING TO DIFFERENT SCALES OF ANALYSIS

The national scale

Figure 2 shows that the distribution of the mortality rate in children under five due to malnutrition and other types of nutritional anemia steadily decreased over the course of the decade, after the crisis of the years 2002 and 2003, when the mortality rate reached a peak of 0.07 per thousand. From the year 2003 onward, there was a constant decrease in mortality until it reached a rate of 0.01 per thousand in the year 2013. On the other hand, the slope of hospital discharges showed significantly higher figures than those related to mortality. In this case, the figures were between 19 and 45 times higher than mortality figures (depending on the year), showing a

SALUD COLECTIVA. 2018;14(1):33-50. doi: 10.18294/sc.2018.1211

declining trend, although not as significant as in the case of mortality.

The proportion of low-birth-weight children (less than 2500 grams) born at full term to undereducated mothers also declined significantly, from 4% in 1999 to 1.5% in 2012. There was a trend break around the year 2007, but after that year the trend line went back to a declining pattern.

It becomes clear that there is a substantial difference between the incidences of each of the indicators, which provides an overview of the potential magnitude of the problem, unknown both in the academic and political fields.

As a result, it is possible to say that, even if there are certain levels of underrecording regarding the deaths caused strictly by malnutrition, the remaining indicators used to analyze the phenomenon show the same trend. Therefore, despite the lack of exact figures due to limitations in the sources, a declining trend with respect to the problem can be clearly identified. Furthermore, it is possible to infer the magnitude of the problem, and also acknowledge the significant impact that, in spite of this decline, the prevalence of malnutrition produces on different aspects of children's health, as well as the persistence of this problem in its less severe manifestations.

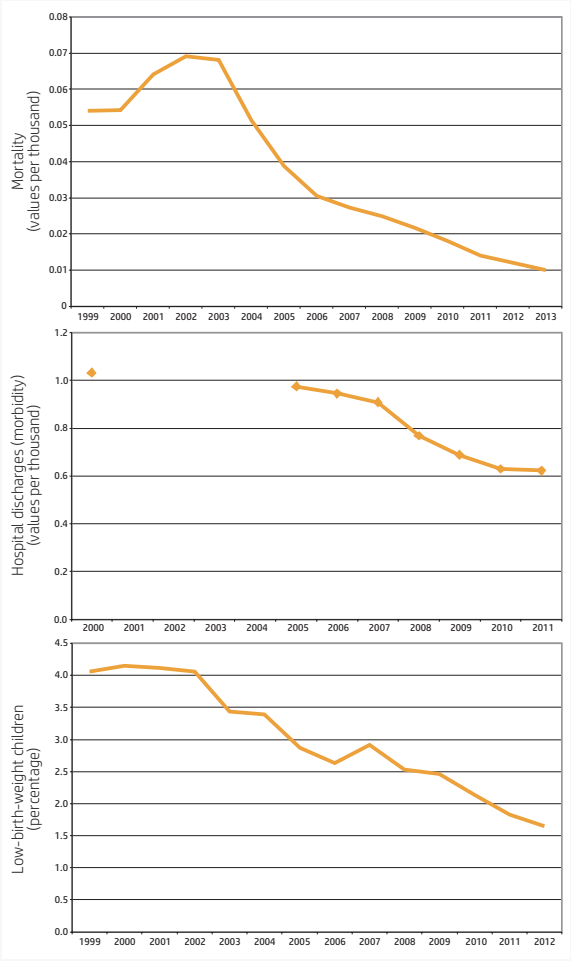

Figure 2. Mortality rate of children under five (1999-2013), hospital discharge rate after malnutrition and anemia (2000-2011), and proportion of low-birth-weight children born at full term to undereducated mothers (1999-2012). Argentina.

Source: Own elaboration based on data from the National Program of Health Statistics, Office of Statistics and Health Information, National Ministry of Health.

The regional scale

There were clear differences at the regional level, both regarding the magnitude and the trends of child malnutrition, as shown by the different sources analyzed in this article (Figure 3). In all cases, northeastern and northwestern Argentina were the regions showing the worst conditions, although each of the manifestations of malnutrition behaved in very dissimilar ways.

While mortality had already been controlled during the 1990s in large parts of the country, in the north it was still an unresolved problem. There were significant improvements in that region during the first decade of the 21st century, particularly after the crisis that hit the country in 2001. By 2013, although the northeastern region showed a considerable difference with respect to the national average, a trend toward convergence at the regional level could be observed.

Morbidity figures showed a much more stable trend line. In addition, the differences observed in mortality rates at regional level were even more evident in this case. The total number of discharges after malnutrition in this period reached 15,684 children under five years of age, representing 0.69% of the

SALUD COLECTIVA. 2018;14(1):33-50. doi: 10.18294/sc.2018.1176

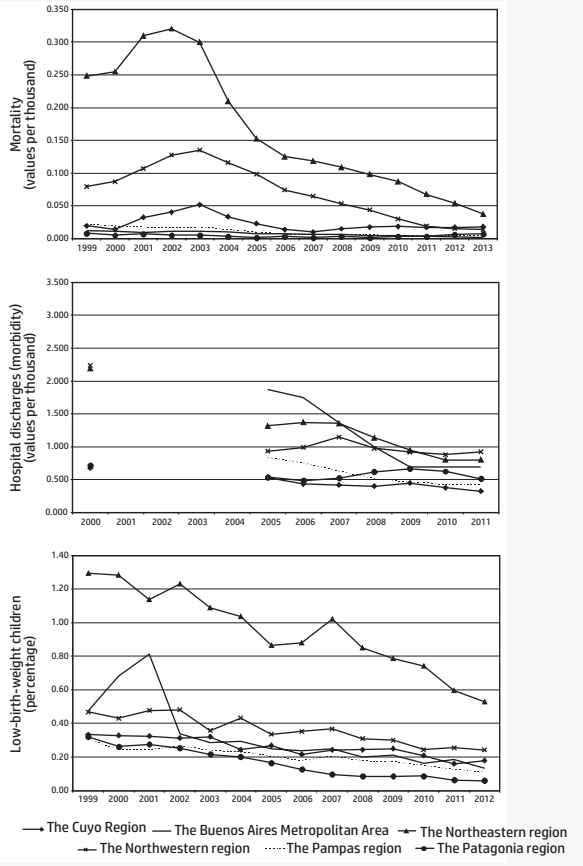

Figure 3. Mortality rate (1999-2013), hospital discharges of children under five after malnutrition and other types of nutritional anemia (2000-2011), and the proportion of low-birth-weight children born at full term to undereducated mothers (1999-2012), grouped by region. Argentina.

Source: Own elaboration based on data from the National Program of Health Statistics, Office of Statistics and Health Information, National Ministry of Health.

total number of hospital discharges of children in that age group. The indicator under analysis showed a facet that was not overt in the traditional indicator, given the fact that in the Buenos Aires Metropolitan Area, the morbidity rate had reached the highest level by the middle of the period, and from that on, it started to decline. As a consequence, this region ranked behind the northeast and northwest as the third region with the highest malnutrition-associated discharge rate in the country. Low birth weight helps understand the magnitude of regional differences better. Although this indicator showed a declining pattern, like the other aspects that we have analyzed before, we can clearly see that the highest values in the country were registered in the northeastern and northwestern regions.

The provincial scale

Figure 4 (child mortality), figure 5 (hospital discharges), and figure 6 (low birth weight) show the behavior of each of the indicators of the problem on a provincial scale. As for child mortality, it should be noted that inconsistency was found in the pattern of the variable, with provinces, such as San Luis, La Pampa, Tierra del Fuego, Santa Cruz, Río Negro, Chubut, Neuquén and the Autonomous City of Buenos Aires where the problem was almost non-existent. On the contrary, the highest values in connection with the mortality rate were registered in provinces in the northeast and northwest, along with the province of San Juan, from the Cuyo region. Most of these provinces evidenced very high values at the beginning of the period, to then follow a declining trend, except for the provinces of San Juan and Santiago del Estero, where the morbidity rate showed a gradual worsening from 2007 onwards.

If we take hospital discharges into account, the insight that we gain after analyzing mortality changes significantly. Firstly, it can be highlighted that those provinces having very low mortality rates due to malnutrition did not exhibit an identical situation regarding hospital discharges. As an example of this, we should consider the provinces in the Pampas region, the Patagonia region and even the Buenos Aires Metropolitan Area, which exhibited high discharge rates, though comparatively lower than the rates in the northeast and northwest. This reveals that malnutrition is a severe problem that, depending on the source analyzed, is not lethal, but constitutes a very important public health issue.

As in the previous analysis, the highest figures were found in the provinces in the

SALUD COLECTIVA. 2018;14(1):33-50. doi: 10.18294/sc.2018.1211

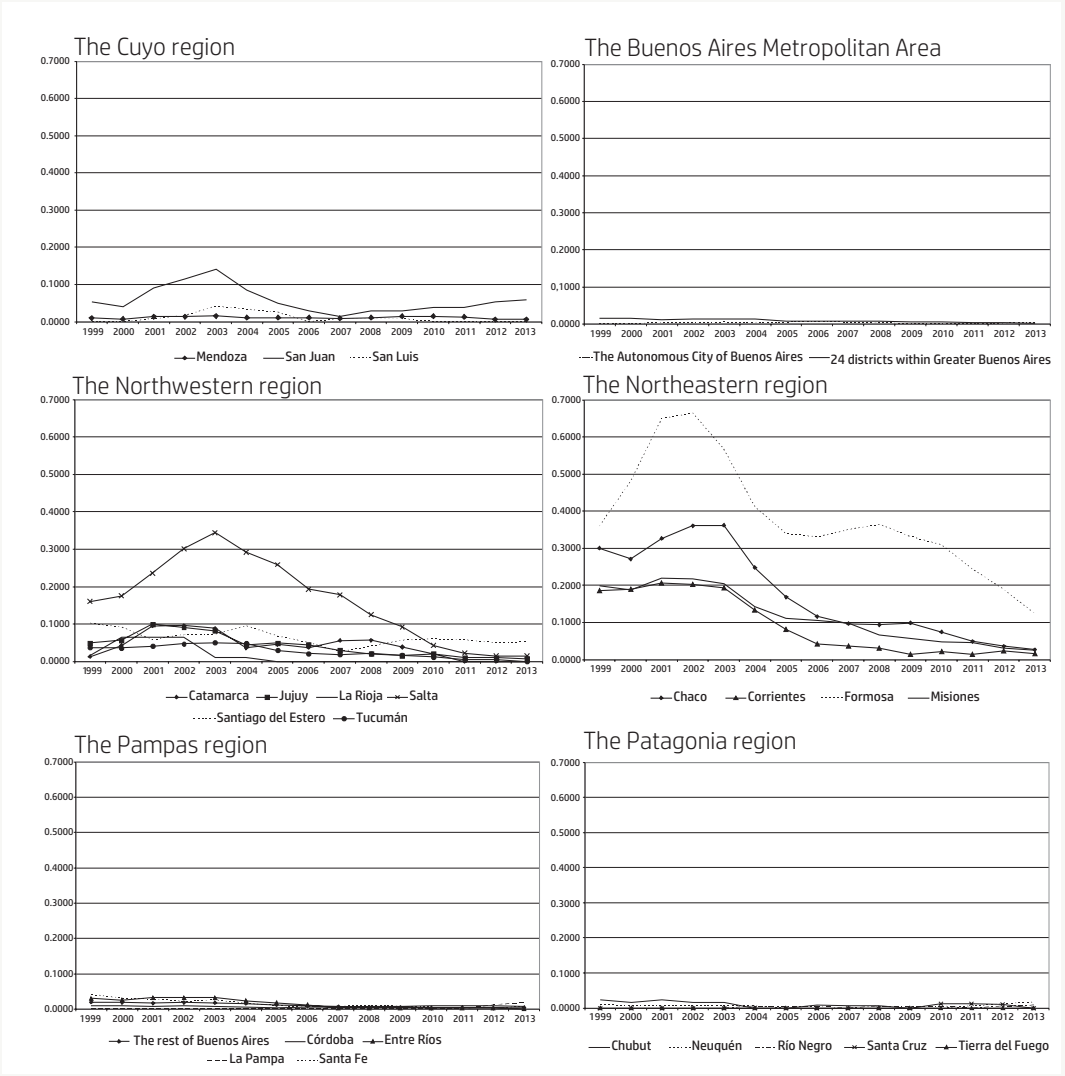

Figure 4. Child mortality rate after malnutrition and other types of nutritional anemia in children under five. Provinces grouped by regions in Argentina, 1999-2013.

Source: Own elaboration based on data from the National Program of Health Statistics, Office of Statistics and Health Information, National Ministry of Health.

northeastern and northwestern regions, with an alarming upward trend in the case of the province of Salta. Another case that caught our attention – both considering its magnitude and its trend – was the case of the province of Neuquén, which showed a considerable difference with the rest of the provinces in the Patagonia region, having rates higher than 1.5 per thousand in 2009-2010, and a total number of 199 discharges after malnutrition during the same period.

Figure 6 shows the analysis of low birth weight on a provincial scale. In this case, there was an interruption of the declining trend, which was replaced by certain stability of the indicator, in all the provinces but those of the northeast. In addition, northeastern provinces showed the highest figures,

SALUD COLECTIVA. 2018;14(1):33-50. doi: 10.18294/sc.2018.1176

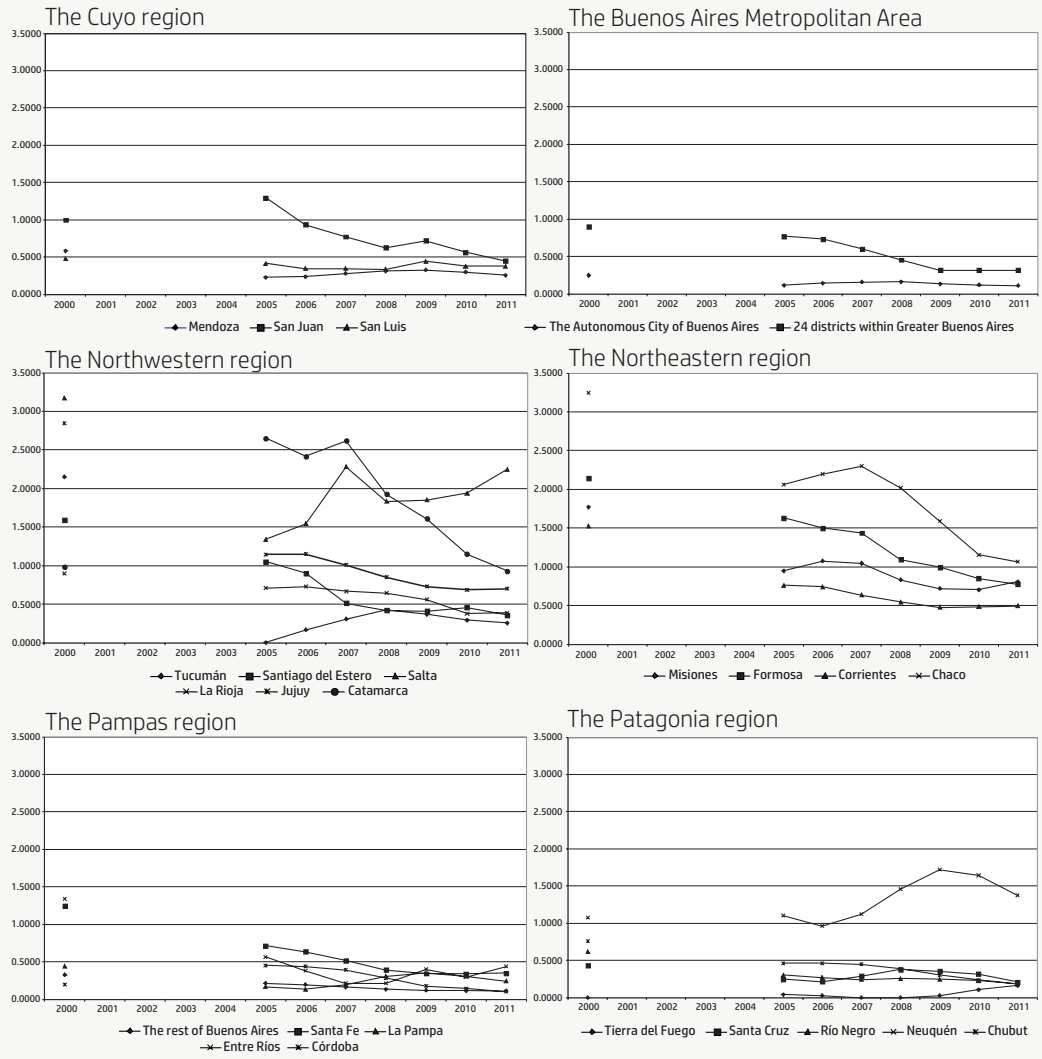

Figure 5. Hospital discharge rate after malnutrition and other types of nutritional anemia in children under five. Provinces grouped by regions in Argentina, 2000-2011.

Source: Own elaboration based on data from the National Program of Health Statistics, Office of Statistics and Health Information, National Ministry of Health.

being the province of Misiones a noteworthy case, where the rates of low-birth-weight live births reached 1.6% in 2007. Special emphasis was placed on the cases of the provinces of Tucumán, the Autonomous City of Buenos Aires and the Buenos Aires Metropolitan Area. Tucumán showed unique characteristics given the fact that, while mortality and hospital discharge rates were low (the lowest in the region) and had a declining trend – in the case of mortality –, or a stable trend – in the case of hospital discharges –, the low-birth-weight rate was much higher and remained almost unchanged over the whole period, the average rate only surpassed by those of the provinces of Salta and Santiago del Estero. This information casts suspicion on the quality of the data that accounts for the

SALUD COLECTIVA. 2018;14(1):33-50. doi: 10.18294/sc.2018.1211

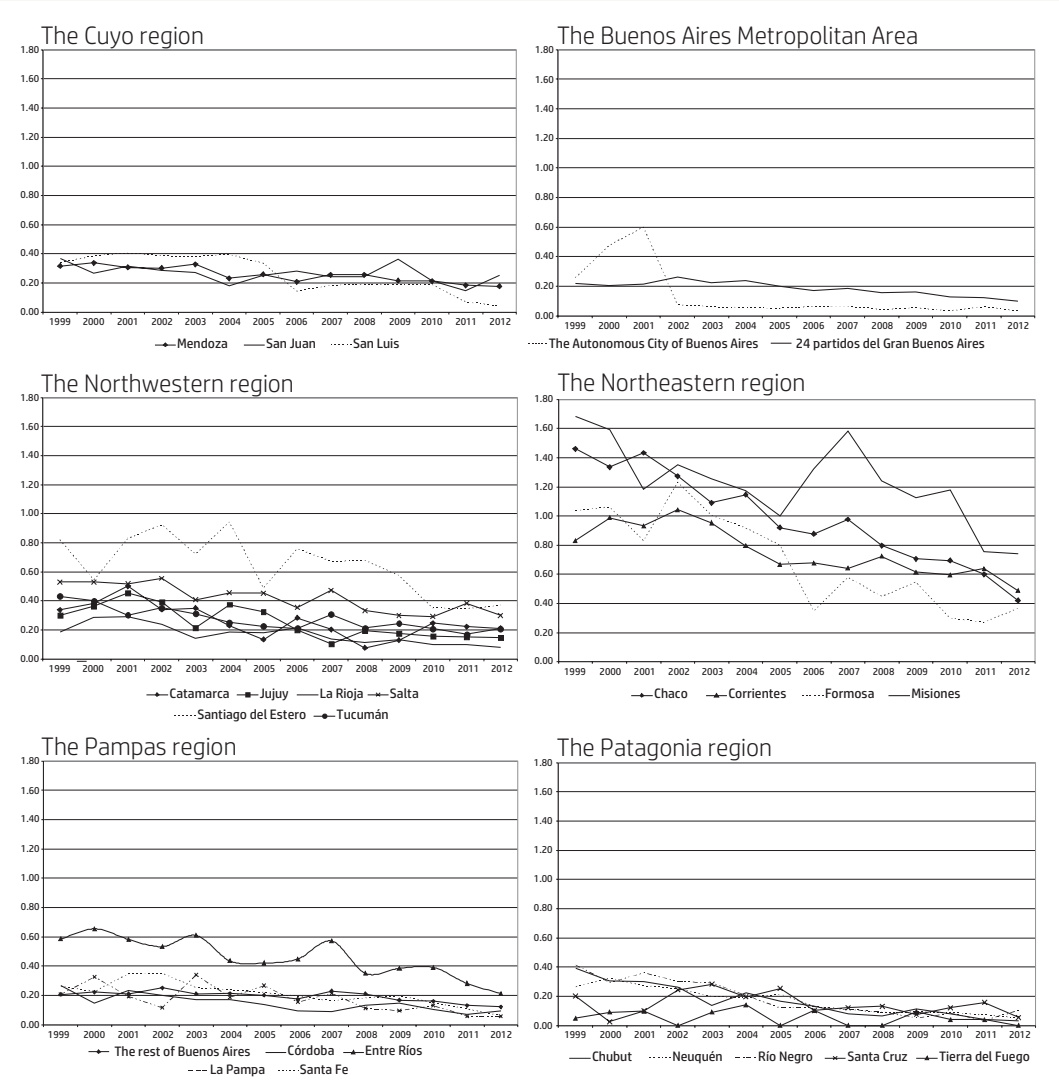

Figure 6. Proportion of low-birth-weight children born at full term to undereducated mothers. Provinces grouped by regions in Argentina, 1999-2012.

Source: Own elaboration based on data from the National Program of Health Statistics, Office of Statistics and Health Information, National Ministry of Health.

magnitude of the problem, which may have not been adequately depicted through the use of vital statistics and hospital discharge statistical records. Moreover, this suspicion is supported by the comments of the people interviewed, who addressed the seriousness of the problem in Tucumán and the difficulties in collecting objective and reliable information. The interviews giving rise to these conjectures are part of a more extensive research study, but they were not analyzed in this article. They are only mentioned here in order to explain the manifest contradiction with the quantitative sources.

In the case of the Autonomous City of Buenos Aires and the Buenos Aires Metropolitan Area, it was possible to observe a very low mortality rate, a low and declining

SALUD COLECTIVA. 2018;14(1):33-50. doi: 10.18294/sc.2018.1176

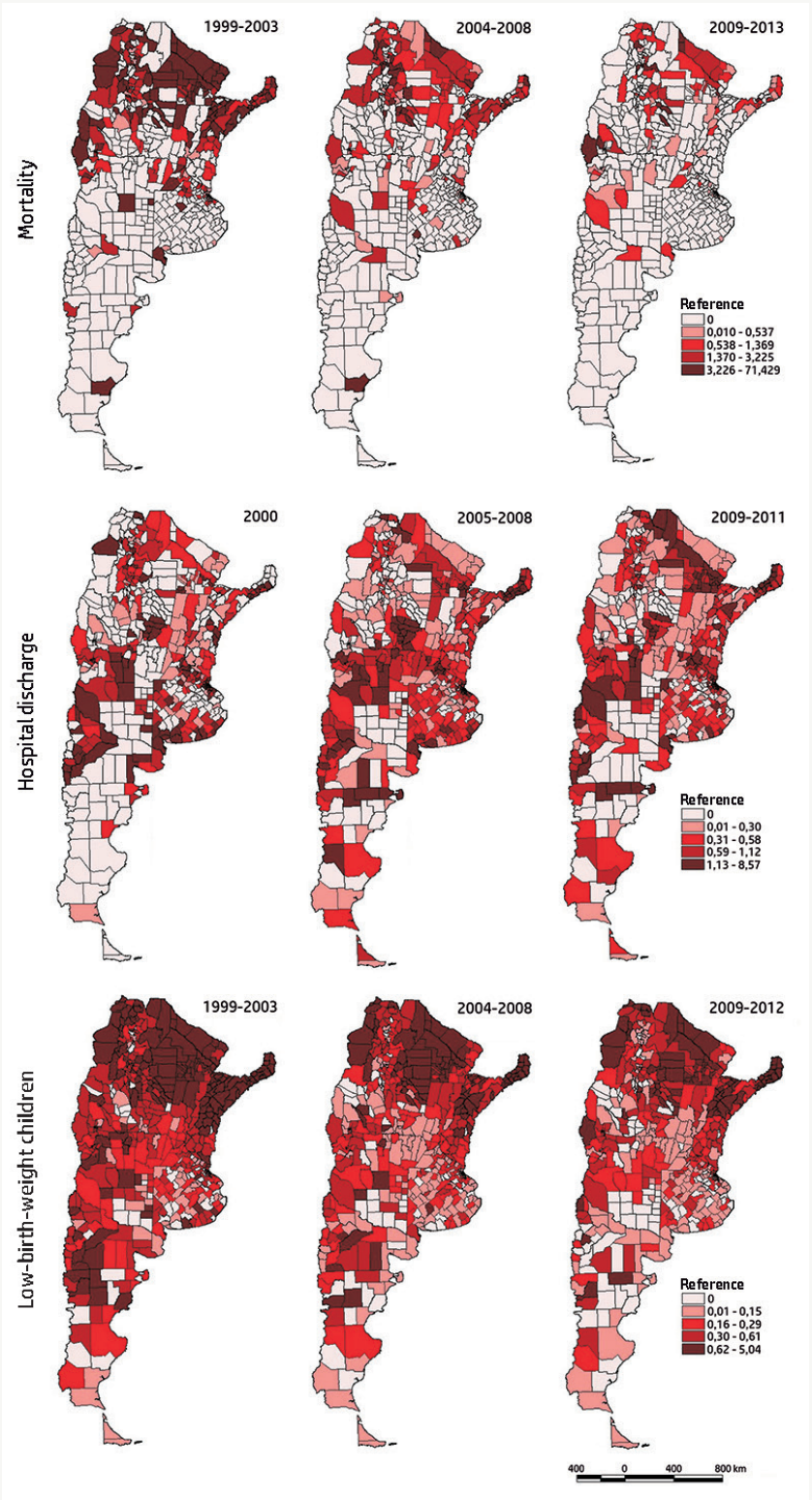

Figure 7. The proportion of mortality in children under five and hospital discharges after "malnutrition and other types of nutritional anemia" grouped by department, and the proportion of low-birth-weight children. Argentina, 1999-2013.

Source: Own elaboration based on data from the National Program of Health Statistics, Office of Statistics and Health Information, National Ministry of Health.

SALUD COLECTIVA. 2018;14(1):33-50. doi: 10.18294/sc.2018.1211

hospital discharge rate, and a low and stable low-birth-weight rate. This situation was less contradictory than in the case of Tucumán, where it was possible to notice the existence of a problem – which had been addressed to a certain extent – with few cases resulting in fatalities.

The departmental scale

Figure 7 shows the proportion of malnutrition-related mortality cases and hospital discharges, as well as the proportion of low-birth-weight children on a departmental scale. The cartographic records helped localize the concentration of this issue in vast areas in the north of Argentina. Regarding mortality rates, it could be observed that, although a declining trend was registered, regions such as the Impenetrable forest located in the Chaco-Formosa border and its eastern area, the valleys of Salta and Jujuy, the Dulce-Salado interfluve area located in Santiago del Estero, and some departments in the Misiones plateau were the areas that had the highest rates and persistence levels of malnutrition in the north. Some departments in the province of San Juan may be added to this list since they had identical conditions as the areas listed above, and evidenced an increase over the provincial rate, as shown by the analysis on a provincial scale.

Hospital discharge figures, on the other hand, showed that the problem was not only confined to the northern provinces. In fact, we could see alarming figures in some departments in the Patagonia region (especially, in provinces such as Río Negro, Chubut and Neuquén) and in the outskirts of the capital city of the province of San Juan, among others. It is evident that the discharge rate did not exhibit a declining trend as clear as in the case of the mortality rate, as shown in Figure 2.

Finally, the analysis of low birth weight was noteworthy due to the widespread prevalence of this variable in the north of Argentina, which coincided, in many cases, with the areas mentioned above. Although we could observe that the problem had been reduced, there were some areas that, in the three five-year periods analyzed, were placed in the fourth quartile. These areas corresponded to the Puna region in Jujuy, the indigenous communities located in Chaco, the peasant region in Santiago del Estero, the cotton production region in Chaco, and the peasant and indigenous community regions in Misiones, which were all areas of concentrated poverty, as identified by Bolsi y Paolasso.[22] Moreover, it is important to note the decline in the concentration of cases of low birth weight in a large area of the Patagonia region as well as several departments of the Cuyo region.

In view of the results found, the following questions arose: How did the problem of malnutrition evolve in Argentina? What are its current rates? What were its dominant trends on a regional and provincial scale? And how did the spatial distribution of malnutrition evolve?

The indicators employed in this research study were able to detect that, during the 1999-2013 period, although great progress – a significant progress if compared with the 1990s – was made in reducing poverty and improving the living conditions of children, there was an important decline in mortality from malnutrition, despite the fact that high levels of morbidity and low birth weight still persisted. While the problem was mitigated at the national level, it could be observed that, when the geographical scale was changed, some regions doubled the initial records, and within those regions, some provinces experienced stagnation and even an increase in the rate. The analysis of low birth weight showed an identical process. Finally, the cartographic analysis made the persistence and seriousness of the problem visible in different areas of the north of Argentina, and helped detect some areas which should receive urgent aid. The departments of Candelaria (Misiones) and Ullum (San Juan), for example, showed figures of 15% and 12%, respectively, of deaths out of the total number of deaths in children under five years of age.

SALUD COLECTIVA. 2018;14(1):33-50. doi: 10.18294/sc.2018.1176

DISCUSSION

The magnitude of child malnutrition, in general, and its spatial distribution, in particular, have not been studied thoroughly in Argentina, and that is why it is difficult to contrast the results presented in this article. However, we highlight the remarkable progress that countries such as Peru, Mexico, Ecuador and the Dominican Republic have achieved in this regard.[21,23,24,25,26]

Nevertheless, it is necessary to draw attention to some important milestones in the geographical approach to the study of child malnutrition, focusing on the Argentine case. One of this contributions was made by Cetrángolo[27] with his "Argentine nutritional map", which was the first national approach to the spatial distribution of the country's nutritional problems. During the 1970s, Escudero et al.[28] held that, although the average caloric intake per capita was optimal, there was a significant level of malnutrition in Argentina. The problem was clearly produced by, according to the authors, inequality in distribution. Despite the high level of underrecording, 924 malnutrition-related deaths were registered in 1969 in Argentina.

In the last decades of the 20th century and the first years of the 21st century, a significant number of research studies were conducted specifically emphasizing the effects of food underconsumption on children's cognitive level, frequently referred to as "child brain damage". During 2002, the problem of child malnutrition in Argentina came under the spotlight in an unprecedented fashion, mainly in the province of Tucumán. Numerous malnutrition cases were brought to light, and published in national and international newspapers, allowing the problem to be "rediscovered."[29]

At the beginning of the 21st century, once the National Health and Nutrition Survey (2004-2005) was carried out, alarming figures regarding the nutritional status of children in Argentina were revealed: 8.0% of stunting, 1.3% of wasting, and 10.4% of obesity; the prevalence of anemia amounted to 16.5% in children under six years of age and 35.3% in children aged between six and twenty-three months. In addition, it was revealed that children belonging to households with a low socioeconomic level showed a higher prevalence of inadequate nutritional conditions.[7] It was evident that the problem of malnutrition was far from being solved, and was reaching, at the dawn of the 21st century, an unbelievable magnitude for Argentina. However, despite the knowledge acquired about malnutrition, little is known at present about the spatial distribution of the problem, its magnitude, and its variations (on a regional, provincial, and departmental scale); that is to say, where the problem is concentrated (whether we consider mortality, morbidity, or low birth weight) and where the problem intensifies, persists or weakens, which provinces have the highest rates and which places can be deemed as the main focus of malnutrition.

For the reasons mentioned above, the purpose of this article was to provide the first local approach to the problem, despite the constraints associated with the creation of an innovative production as regards the spatial analysis of the problem, for instance, our own difficulty in contrasting the results presented by this research study.

FINAL CONSIDERATIONS

Child malnutrition is one of the main causes of deprivation and exclusion and it should be a priority in the development of public policy. There are many obstacles to the analysis and understanding of this problem, which depend, in turn, on the types of geographical scales and sources employed.

In view of the foregoing, it is evident that each of the indicators analyzed proved to be inadequate to account for the problem of child malnutrition, but the joint analysis helped characterize and understand the phenomenon much more clearly. Therefore, this research study purports to lay the foundations for a new approach to the problem of

SALUD COLECTIVA. 2018;14(1):33-50. doi: 10.18294/sc.2018.1211

malnutrition, which does not entail only the aspects here analyzed, but rather paves the way for further studies on this subject matter.

After analyzing the problem, it is possible to assert, almost conclusively, that child malnutrition is far from being part of the past, but rather a very important public health problem still relevant today. The evidence collected shows that malnutrition, despite having declined, presents magnitudes that render it one of the most important public health problems in some Argentine regions, as it exerts great influence on the high child mortality and morbidity rates, as well as the on the prevalence of certain chronic diseases which are difficult to quantify. In addition, the economic and social costs of this disease are also high (hospital expenses, lack of productivity, education expenses, limited work capacity, among others), apart from the irreversible brain damage that it generates, also difficult to quantify, which has deep ethical and moral connotations.

Based on the reasons above, special emphasis is placed on the need to conduct further research in order to delve into the methodological tools presented in this article and their application in the areas selected as a case study, which may integrate the different aspects of the problem used for the study of malnutrition presented here. Cases would be selected on the basis of the cartographic data presented here, which would help shed light on the characteristics of the problem, its progression, regression or persistence, and the concatenation of associated factors.

ACKNOWLEDGEMENTS

The authors would like to thank the support of the National Commission of Health Research [Comisión Nacional Salud Investiga] (National Ministry of Health) through the Research Grant Program "Ramón Carrillo-Arturo Oñativia", category "Multicenter Study", awarded to the research entitled "Child malnutrition in Argentina in the first part of the century" (Registered under IS000917 Register of Health Research Studies [RENIS, from the Spanish Registro Nacional de Investigaciones en Salud]), which was granted in accordance with the ethical approval issued by EscuelaLatinoamericana de Bioética (city of La Plata), institution where this article was conceived. PhD. Fernando Longhi was the coordinator of this research study.

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CITATION
Longhi F, Gómez A, Zapata ME, Paolasso P, Olmos F, Ramos Margarido S. Child malnutrition in Argentina in the first part of the century: a quantitative approach. Salud Colectiva. 2018;14(1):33-50. doi: 10.18294/sc.2018.1176

Recieved: 11 Oct 2016 | Modified: 26 Apr 2017 | Approved: 12 Jun 2017

https://doi.org/10.18294/sc.2018.1176

The translation of this article is part of an inter-departmental and inter-institutional collaboration including the Undergraduate Program in Sworn Translation Studies (English < > Spanish) and the Institute of Collective Health at the Universidad Nacional de Lanús and the Health Disparities Research Laboratory at the University of Denver. This article was translated by Sabrina Bonanno and Paula Didari under the guidance of María Pibernus, reviewed by Anna Edelman under the guidance of Julia Roncoroni, and prepared for publication by Claudia Gómez under the guidance of Vanessa Di Cecco. The final version was approved by the article author(s).