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HEALTH AND NUTRITION DAY: A NUTRITIONAL SURVEY OF CHILDREN LIVING IN THE SEMI-ARID AREA AND LAND-REFORM SETTLEMENTS IN NORTHEAST BRAZIL

Reports in Social Development, in the original version, *Cadernos de Estudos - Desenvolvimento Social em Debate,* is a series that aims to publicize research findings, to disseminate results, and to provide inputs for discussions and evaluations of social-welfare policies and programs. The present volume presents the results of a survey entitled “Health and Nutritional Day of children below the age of 5 years living in Semi-arid areas and in land-reform settlements in the Northeast region and the north of Minas Gerais”. The survey was conducted during the 2nd National Immunization Day of 2005, with the support of municipal and state governments, public universities, and the United Nations Children's Fund (UNICEF). This publication presents articles from the participating states, that were invited to provide their own perspectives on the analyses of the results, through an ongoing dialogue on combating poverty, within the scope of the Zero Hunger *(Fome Zero)* program.

Ministry for Social Development and Fight against Hunger

HEALTH AND NUTRITION DAY: A NUTRITIONAL SURVEY OF CHILDREN LIVING IN THE SEMI-ARID AREA AND LAND-REFORM SETTLEMENTS IN NORTHEAST BRAZIL

Brasília, 2007

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This is a technical publication of the Secretariat for Evaluation and Information Management.

The texts in this notebook, originally published in Portuguese, are based on the "Health and Nutrition Day for children below the age of 5 years living in the semi-arid area and in land-reform settlements in the Northeast region and the north portion of Minas Gerais", carried out during the 2nd round of the 2005 Vaccination Campaign, in partnership with 1,100 municipal governments, 10 state governments, the United Nations Children's Fund (UNICEF) and 12 public universities.

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Preface

The quality of food a child receives in early childhood has a decisive influence upon its subsequent growth and development. Measuring nutritional indices and other child-health indicators is important, not only because it enables an assessment of the quality of life of the population, but also because it makes it possible, indirectly, to appraise levels of social and economic development throughout the country.

It is for this reason that, during the 2nd round of the 2005 National Vaccination Campaign, the Ministry for Social Development and Fight Against Hunger (MDS). in partnership with the Ministry of Health (MS), conducted the "Health and Nutrition Day for children below the age of 5 years living in the semi-arid area and in land-reform settlements in the Northeast region and the north portion of Minas Gerais". Since 1996 no study of this type had been conducted in Brazil. The present survey is important because, besides furnishing a diagnostic analysis of the status of malnutrition, it also provides a means of appraising the effect of social-welfare policies targeted at Brazil's poorest communities. From the findings of this survey we learn that malnutrition rates among children have declined over the past ten years, from 17.9% for the Northeast region as a whole, to 6.6% for the Semi-arid region. The survey also enables an evaluation of the impact of the *Bolsa Família* program on this decline. By controlling socioeconomic variables among beneficiaries and non-beneficiaries, it is possible to observe the positive effect that *Bolsa Família* has had upon reducing growth deficits. Such information is of inestimable worth when making decisions as to how best to target public policies in the social area.

The Nutritional Assessment gathered anthropometric data (weight and height), information on the socioeconomic status of families, breastfeeding practices, and access to healthcare services and social-welfare programs. Approximately 19,000 children up to the age of 5 years were surveyed, in 307 municipalities of the Semi-arid areas and in rural land-reform settlements throughout the Northeast region and North of Minas Gerais. Support was received from 1,100 municipal administrations and 10 state governments, under the Pact for "A World Fit for Children and Adolescents in the Semi-arid region", coordinated by the United Nations Children's Fund (UNICEF), 12 public universities and 10 state health secretariats.

Disseminating the results of this survey marks another important step. Firstly, because it is in line with principles of transparency and accountability in public policies; and also because it serves as an input for the necessary debate on

social policies by providing consistent and precise information. Thus, now in its 5th edition, and published for the first time in English the results of this innovative action enable us to update and expand the data on the nutritional status of Brazil's children. ***Cadernos de Estudos - Desenvolvimento Social em Debate*** series is published by the Secretariat for Evaluation and Information Management (SAGI) in partnership with UNICEF.

This publication describes the methods and procedures used in the survey and presents the overall findings on the nutritional status of children in Brazil's semi-arid areas, followed by specific approaches for each state. The authors of articles were able to use the data to construct, from their own perspectives, analyses of the prevalence of nutritional deficits among children below the age of 5 years in their states, thereby contributing to the ongoing dialogue on actions for reducing poverty and combating hunger. The Health and Nutritional Day comprises a strategy of the Zero Hunger (*Fome Zero*) program, and will serve to guide decision making and the formulation of the Brazilian Federal Government's food security policies.

Patrus Ananias de Sousa
Minister for Social Development and Fight against Hunger

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1. Introduction

Brazil stands out among other countries in the world for having approved the Child and Adolescent Statute, a highly progressive law for the protection of children and adolescents. As a consequence of this law, children and adolescents are regarded as subjects of rights who have absolute priority in public policies. The law is in effect throughout Brazil and applies to all children and adolescents, regardless of social, economic, cultural, ethnic, or racial status.

The mission of the United Nations Children's Fund (UNICEF) is to ensure that these rights are effectively realized. To meet this challenge, UNICEF provides support for actions targeted at promoting, protecting, and ensuring equal and universal rights to each child and adolescent, in compliance with the Statute. UNICEF is engaged in partnerships with governmental organizations at the municipal, state, and federal levels, with other agencies of the UN system, and with civil society and private sector organizations. These partnerships provide support for public policies to fulfill, respect and protect the rights of each and every child and adolescent, and to monitor the impact of these policies in their lives to ensure that the Millennium Development Goals (MDGs) become a reality for all.

In order to guarantee the rights to survival, development, protection and participation, it is necessary that public policies are in place to ensure their realization. One of the ways in which UNICEF contributes toward a better targeting of public policies is by providing support for studies and research that provide data on the living conditions of children and adolescents and the violations of their rights. This information ensures a better understanding of their situation and of the scope of problems affecting them. UNICEF uses the findings of such studies to promote mobilization among civil society, municipal, state and federal governments, the private sector, and the media, as well as a basis for advocacy campaigns, conferences, debates, and publications.

It is against this background that the Ministry of Social Development and Fight Against Hunger (MDS), in partnership with the Ministry of Health (MS) and UNICEF, carried out the '*Health and Nutrition Day on children below the age of 5 years living in Semi-arid areas and in land-reform settlements in the Northeast region and the north of Minas Gerais*'. This survey compiled anthropometric data on children living in these regions and collected information on the socioeconomic status of their families, breastfeeding practices, and access to healthcare services and social welfare programmes, thereby providing an important tool for the formulation and enhancement of public policies.

It is with great satisfaction that UNICEF joins MDS in disclosing the results of the '*Health and Nutrition Day*' to the public in the form of articles in English that had formerly been published only in Portuguese, thus making data from the survey available to a broader audience. It is our hope that this important instrument will contribute positively towards actions aimed at ensuring effective compliance with the Statute of the Child and Adolescent in Brazil, and development of the effectiveness and sustainability of social policies.

Marie-Pierre Poirier
UNICEF Representative in Brazil

2. Background to nutritional issues in Brazil's semi-arid areas

Malaquias Batista Filho[1]

Geographical factors (sparse and irregular rainfall, recurrent drought, and poor soils), historically unfavorable economic and social factors (with over half the local population living below the poverty line), and persistent anachronistic political models, make the Semi-arid the region of Brazil at highest risk for food insecurity, and for general and specific nutritional deficiencies.

Poverty in the region is exacerbated by environmental, economic, and social factors that seriously impact various aspects of collective living conditions. These are further aggravated by striking asymmetries in the standards of living of families in the so-called Polygon of Drought (*Polígono das Secas*), an area that encompasses parts of 8 states in the western portion of Brazil's Northeast region (not including Maranhão), and 85 municipalities in the north of Minas Gerais, in Brazil's Southeast region.

According to one of the most renowned scholars of the physical and human geography of the region, Professor Manuel Correia de Andrade, the semi-arid region comprises 900,506 square kilometers, whereas the Polygon of Drought covers an area of 1,085,187 square kilometers. Thus, 10.6% of Brazil is located within the semi-arid region, and 12.7% in the polygon afflicted by irregular rainfall or drought. It is within these areas that the greatest risks of food shortages and nutritional insecurity occur and, figuratively speaking, they comprise "the cartography of hunger".

Most alarmingly, at the very center of the semi-arid portion of Brazil's Northeast region, spreading threateningly over a large portion of the southeast of the State of Ceará, the east of Piauí, the north of Bahia, central and western portions of Pernambuco, and certain areas of Paraíba and Rio Grande do Norte, are huge areas described as "susceptible to desertification". This phenomenon, according to researcher Fernando Barreto, must be considered within a broader context, since mapping of the region's ecosystems reveals areas of 'low' and 'very low' environmental viability, encompassing areas that, collectively, amount to almost 354.000 square kilometers. Such areas amount to over one third of the entire semi-arid region, implying severe limitations to farming and livestock in much of Brazil's Northeast, since prospects for sustainability are extremely low. With population densities ranging between 15 and 20 persons per square kilometer, much of the land is severely degraded and unable to sustain further anthropogenic impacts. It is hardly surprising that the region is a source of emigration, producing

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constant and increasing outflows of emigrants to the cities and to other less hostile environments, both within and beyond the limits of the semi-arid region.

Given that farming and livestock raising (the traditional occupations that originally enticed people to settle in the region) are subject to serious physical limitations posed by fragile soils and adverse climatic conditions, unquestionably, prospects for creating jobs and generating income in semi-arid areas are more remote than in any other major region of Brazil. Among the reasons why the Northeast semi-arid (Sertão) is so dependant upon farm incomes, according to professor Aldomário Rodrigues, is the fact that over 41% of the population ekes out a living from the land. This proportion is very high when contrasted with the population dependant upon farm incomes in the South (30%), in the Central-West (22%), in the Southeast (12%), and in the North (7%). Moreover, in the semi-arid region, even the performance of activities normally considered as being typically urban (i.e., industry and services) tend to bear very close links with the performance of the farm sector. Metaphorically speaking, they are viscerally-articulated economic and social metabolisms, with rural areas acting as the driving force behind the process.

What then are the characteristics and vulnerabilities of this region? Over the past four decades, there has been a sharp decline in the share of the region's farm-sector toward GDP, which dropped from around 30.5% in 1960, to 9.1% in 2000 (Aldomário Rodrigues, 2001). A second (and more emblematic) characteristic is the fact that the most stable and significant source of incomes in the rural areas are the benefits paid out by Social Security: i.e., old-age pensions, and incapacity benefits paid to heads of households and other family members. The irony of this situation should not pass unremarked: the predominant economic activity is remunerated inactivity in the form of retirement benefits.

A third characteristic element that reflects economic and social fragilities of the semi-arid region can be perceived in the extreme disparities of income among geographic areas and social groups, and in unequal access of the population to the means of production. In Pernambuco (according to Virgolino and Monteiro 2001) per-capita incomes range wildly, from US$ 5,829 in the Recife Metropolitan Region; and US$ 1,340 in the Zona da Mata; to US$ 764 in the Sertão do Moxotó; and US$ 378 in Sertão de Araripina.

Such disparities are likewise (or perhaps even more starkly) reflected when one of the most crucial contributing factors to fragilities of the farm sector in the semi-arid region is considered, namely, land tenure. A study (Sampaio and Pessoa 1987) that examined six different food-production systems found that no less than 39.4% of registered land holdings (System 1) and no more than 66.2% (under Systems 2 and 5) are accounted for by farmers with holdings of less than 10 hectares, whereas averages range from 3.2 to 7.5 hectares in System 1 (livestock/

general food crops), and in System 5 (livestock/beans/general food crops) respectively. From a general perspective, land holdings of less than 50 hectares, (i.e., micro and small holders) accounted for between 81% and 91% of the total number of properties registered, in counterpoint to large landowners who, while representing only around 1% of land titles, hold one third of all available land in the semi-arid region.

This is a very adverse land-tenure profile, since it reflects successive subdivisions into ever-smaller holdings, through inheritance over various generations. This situation has become critical, in view of the fact that, using current production technologies and taking into account current market demand, it is highly unlikely that farms in the semi-arid region with less than 150 hectares can produce monthly family incomes equivalent to one minimum wage per head.

The context thus revealed is one of environmental, physical, economic, and social adversities, that exacerbate potential risks and present a particularly vulnerable food and nutritional security scenario in drought-prone areas of Brazil's Northeast.

* * *

Half a century ago, Josué de Castro, in his classic work *Geografia da Fome* [Geography of Hunger] described the hinterlands of the Northeast as being, in normal years, one of the best parts of Brazil, in terms of food and nutrition. This pastoral idyll, however, would vanish completely in periods of drought, which brought on total crop failures and decimation of herds of cattle, goats, sheep, pigs and poultry. Such climatic cataclysms did not spare human populations, but descended upon them in the form of famine. In 1877, reports of drought and famine in the semi-arid areas of Brazil's Northeast shocked the world. Indeed, in the State of Ceará, including Fortaleza, half of the entire population died, owing to absolute lack of food, and outbreaks of epidemic diseases associated with nutritional deficiencies and water shortages. Thus the Northeast was afflicted by a cycle of pandemics (plague, hunger and war) of biblical proportions. It should be remembered that the drought of 1877 also marks the onset of a cycle of banditry (*ciclo do cangaço*) that only came to a close in 1938. Another emblematic event of this period was the epic and mystic War of Canudos (1896-1897) in the *Sertão* of Bahia.

It must be stressed that, today, in the Northeast region, whereas vast human tragedies brought on by drought no longer kill hundreds of thousands of people as they did in the past, nonetheless, even in the most favorable years when the rains do not fail, the population of the region is not spared from food shortages and nutritional deficiencies. Dramatic outbreaks of famine have, in little more

than 50 years, been replaced by less visible, more silent and subtle manifestations of endemic deficiencies. Without the protective context of closed production and consumption systems (the peculiar *oikos sertanejos*), and with borders now open to the vicissitudes of a free market economy, the semi-arid region has begun to reveal systemic weaknesses of its traditional production and consumption models.

Thus, as the traditional separation between the drought-prone areas (*Sertões secos*) and the better-watered *Zona da Mata* and *Agreste* have begun to disappear, a convergence of epidemiological trends becomes perceptible among the various climatic areas of the Northeast. As this trend progresses, malnutrition, anemia, and vitamin A deficiencies, on the one hand, and the growing pandemic of overweight/obesity and related morbidities on the other, have begun to manifest a scenario quite different from that portrayed by Josué de Castro, Orlando Parahym, José Nivaldo, and other observers of the nutritional status of Northeastern populations in the past.

A recent review of the literature produced over the past 15 years (Batista Filho, 2005), i.e., since 1990, despite limitations and poor statistical representativeness of studies available, reveals certain aspects leading up to the more recent scenario. Thus, prevalences of biochemical vitamin A deficiency ranged from 16.1% to 55.1%; whereas anemia among different groups (< 6 years old and school-age children) ranged between 22.3% and 46.5%. With respect to protein energy malnutrition in children, the data is even more conflictive. Thus, when applying the inferences of a predictive model to each of the 867 municipalities of the semi-arid region referenced so far, it would appear that there is an average height deficit of 31.3% (< -2 z scores in height/age) in children below 5 years of age. Another more recent study (UNICEF, 2005) of children below the age of 24 months in 1,289 municipalities of the semi-arid region, portrayed a very different situation: the modal group for height deficit (4 to 10%) corresponded to 48.5% of the municipalities investigated, with 14.3% presenting a "good" condition (i.e., a height/age deficit below 4%).

At the end of the day, confronted with such disparate results, what is the most realistic expression of the anthropometric status of children in the region?

* * *

This question is crucial, not only for specialists on food and nutrition problems that monitor the economic and social status of dry areas of Brazil's Northeast and their health implications, but especially for policymakers and managers of human-development programs targeted at the semi-arid region.

Now, however, thanks to the study on child malnutrition in Brazil's semi-arid region: prevalence, social distribution, secular trends, and impact of income-transfer programs, undertaken by the Ministry of Social Development and Fight Against Hunger, with cooperation from the Ministry of Health, the question has, to a great extent, been elucidated, through examination of an issue that has assumed paradigmatic dimensions, namely, protein energy malnutrition among children, as measured by anthropometry. Metaphorically speaking, it has become an "exchange indicator" of nutritional status, in view of its virtual "convertibility" for assessment of other health and nutritional problems afflicting children, and has come to symbolize an expression of the development status of society as a whole.

The 2005 Health and Nutrition Day, taking advantage of the fact that practically all children converge upon the health services on National Immunization Days, took the opportunity to assess the anthropometric status (height and weight) of 16,239 children below the age of 5 years in 277 municipalities in 9 Brazilian states, including semi-arid areas of Minas Gerais. By incorporating such variables as "socioeconomic status of the family, mother's schooling level, participation in social programs, monitoring of the child's growth, occurrence of symptoms of common childhood diseases, and breastfeeding", among others, the survey produced a wealth of data which, after a preliminary analysis for this report, makes interesting revelations with respect to the current nutritional status of children in the region.

It should be stressed, initially, that the National Immunization Day strategy is an efficient method for massive employment of a public-health technology created in Brazil. Initially viewed with skepticism by writers of normative vaccination manuals, National Immunization Days are now acknowledged as a valid strategy, currently in use in various countries. The Health and Nutritional Day is another Brazilian innovation. It was first deployed for rapid assessment of the anthropometric status of children, and subsequently successfully employed to assess breastfeeding patterns in all of Brazil's state-capital cities and, finally, it was tested in the town of Ribeirão (Pernambuco) as a strategy for evaluating multiple aspects of health and nutrition (determining the nutritional status of children and mothers by measuring weight and height, determining hemoglobin levels, breast-feeding status, compliance with prenatal care, child growth and development surveillance, recent occurrence of diseases, and participation in food-support programs). This model was tested, under an initiative of the Ministry of Health's National Epidemiology Center (CENEPI) in 12 municipalities in different Brazilian states. Thus, the success of its large-scale deployment (in 277 municipalities in 9 states) represents validation of a strategy which could, evidently, be replicated in other countries, since it offers an enhancement of instruments available for the conduct of studies in the field of epidemiology, and for evaluation of services and activities in the health sector, and in other areas.

More than merely interesting, the Health and Nutrition Day has produced results that are instigating. It is surprising, for example, to find that the prevalence of malnutrition in children declined to 6.6% in the semi-arid areas, as measured by the height/age ratio, precisely the indicator that takes longest to reverse. When examined from a time perspective, despite certain inadequacies acknowledged by the authors of the report, it points toward a singular and surprisingly bright prospect: malnutrition rates have declined from 47.8% in 1974-75, to 6.6% in 2005. Moreover, this 30-year series indicates that the rate of decline has accelerated progressively, with annual declines of 3.1% between 1975 and 1989; of 4.9% between 1989 and 1996; and 7.0% between 1996 and 2005.

Evidently, it is not possible to guarantee that these results are strictly valid, however, the results of the prevalence survey match data from another study (UNICEF 2003/2004), which revealed an interval of prevalences of height deficit somewhere between 4% and 20%, and thus represents a reference for validation that merits due consideration.

This population must be considered as poor, since almost 75% of the families are classified as belonging to classes D and E, nonetheless, despite this overall characterization of structural poverty, striking progress can be perceived in relation to various aspects, such as prenatal care coverage (above 95%), access to electricity in the home (almost 95%) schooling levels of mothers (less than 4% are illiterate), access to treated drinking water (around 90%), alongside other items, such as longer periods of exclusive breastfeeding .

It is indeed probable that these surprisingly favorable developments in the nutritional status of children have, to a great extent, been conditioned by rising schooling levels, better primary healthcare, improved sanitation, a decline in low birthweights, and (perhaps) even more by rational management of household budgets, with a sharp reduction in the number of dependents per family as a consequence of plummeting fertility rates and, consequently, smaller numbers of children. Such factors are cited in the international literature, and advocated by UNICEF and the World Health Organization (WHO) as feasible strategies of fundamental importance for protecting child health and nutrition.

The data leads us to the observation that, having effected the appropriate statistical adjustments to account for effects directly attributable to these interventions, the child beneficiary of the *Bolsa Família* Program presents a 30% lower occurrence of low height/age ratios, i.e., the indicator selected as the epidemiological predictor of malnutrition in children. The most encouraging finding, however, is that this beneficial effect reflects, under logistical regression analysis, a 62.3% reduction in the occurrence of malnutrition among children from 06 to 11 months old, which is precisely the biological segment at greatest risk for growth retardation among Brazilian children. This is an exceptionally

positive finding. Moreover, worldwide, few interventions in similar epidemiological contexts have produced such significant outcomes.

Also featured in the report is a briefing on the nutritional status of children of rural families living in land-reform settlements in semi-arid areas of Brazil's Northeast and in the north of Minas Gerais. It is worth noting that, in these settlements, prevalence of height deficits is two and a half times greater than generally encountered in the semi-arid region, and that the data on these areas reflects other atypical situations in relation to the latest and most representative situations portrayed, both in the Northeast and in Brazil as a whole: the predominant frequency of the weight/age ratio deficit among girls and (even more atypically), occurrence of roughly 7% of cases below -2 z scores in the weight/height ratio, which is incongruent with all studies published over the past 20 years. Is the situation in the rural settlements really so anomalous? The question raises disturbing implications.

* * *

Considering limitations imposed by climatic and soil factors, harsh economic and social conditions, low expectations on the part of low-income populations, low schooling and, lastly, high child-malnutrition prevalence estimates foreseen by predictive models based upon an assortment of risk variables, the results of the 2005 Health and Nutrition Day are surprisingly upbeat.

This apparent paradox contains lessons that require deep reflection as to the dynamics and swiftness of the recent epidemiological decline in malnutrition rates and their implications for the transition underway throughout Brazil, encompassing the semi-arid region of Brazil's Northeast, including rural areas. All consolidated time-bound and geographic trends, referent both to Brazil and to Latin America as a whole, point to the semi-arid areas of Brazil's Northeast as being among the continent's most problematic areas, owing to the persistence of intractable adverse factors that, in the short term, would appear to be very hard to resolve.

If the predictive models failed to foresee the improvement, it is because of at least three highly significant items revealed in the new child-nutritional scenario: 1) the rapid rate of decline of prevalence in the 1996-2005 period (7% per year) that surpasses all results so far detected in the transitional process underway in Brazil; 2) the presumed 30% reduction, attributed to effects of the *Bolsa Família* Program, in the height deficit among children and, especially, the 62.3% impact in preventing malnutrition in the 6-month to 1-year age bracket, that have been another noteworthy contribution to the evaluation of nutritional interventions;

3) provided that these findings are indeed reliable and if the trends can be maintained, they would appear to support the thesis that, over the next 5 years, child malnutrition may be brought fully under control, and that rates similar to those reported in such other Latin-American countries as Cuba, Chile, and Jamaica will be achieved. This prospective outlook takes into account two conditioning elements: a) the fact that, in 3 years of execution, the effects of interventions among the under-5 year-old cohort have not yet realized their full potential impact; b) program coverage is extended over time to successive layers of beneficiaries, and that the period of exposure of participants is thus not the same for all age groups .

This bright outlook could also be extended to even more ambitious dimensions. There is evidence that cases of anemia in the semi-arid region might be 30 or 40% lower than those encountered in coastal areas and in the Zona da Mata. For its part, vitamin A deficiency, prevalences of which are currently no less than 2 or even 3 times higher than those of height deficit among children, can be controlled by means of very simple and low-cost interventions. Why not make this goal a priority item on the nutrition agenda for dry areas of the Northeast?

Evidently, this optimistic and feasible short-term goal does not aim to replace the even more legitimate commitment to transformation of the prevailing scenario of structural poverty in the semi-arid areas. More than merely a question of evolutionary progress, such a goal would entail a revolutionary policy; an ethical and cultural agenda, grounded upon economic, environmental, social, and participative parameters that outline the fundamentals of human development. Much remains to be done in this respect in terms of governmental programs and within a doctrine of citizenship.

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3. Development of a methodology for Health and Nutrition Day at the regional level

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Nutritional assessment of communities, carried out systematically on the basis of household nutritional surveys, provide an ideal means to outline the nutritional profile of a given population and to study changes over a period of time. However, the considerable human resources and materials needed to carry out such nutritional surveys make them expensive, and thus rarely feasible. An alternative, tested at the municipal level in Brazil, has been to conduct health and nutrition surveys in combination with National Immunization Days (Malta *et al.*, 1998), which are the object of significant mobilization on the part of the population, and take place within a framework wherein much of the necessary structure is available. Batista Filho and Ferreira (2001) validated the application of nutritional studies with an epidemiological focus carried out in combination with vaccination campaigns. These authors concluded that the strategy is effective, given that it reduces financial and logistical costs, and reduces the time needed to collect data, as compared to similar studies based upon household visits. The largest survey so-far conducted in association with an immunization campaign was held in 1999, in most of Brazil's state-capital cities and in the Federal District, on the prevalence of breastfeeding (Brazil, 2000).

The holding of the Health and Nutrition Day (HND) 2005, associated with immunization campaigns, has proven the feasibility of monitoring nutritional conditions among specific groups on a large scale. It also provides an opportunity for training and updating the skills of professional staff and assistants in the municipalities responsible for nutritional surveillance. Surveys of this type are generally carried out by researchers from research institutes and universities, and thus the participation of technical and support staff from the municipalities in data collection has provided an opportunity for securing their involvement and commitment to the outcomes of the survey.

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1. Sample design

Sample of the semi-arid region

The study was designed as a cross-sectional survey including children below the age of 5 years who attended vaccination posts on August 20, 2005, when the 2nd stage of the National Immunization Campaign was carried out. The universe of this survey encompasses 1,133 municipalities of the semi-arid region (as delimited in 2005 by the Ministry of National Integration) located in 8 States of the Northeast region (not including Maranhão) and the north and northeastern portions of Minas Gerais. This area has an estimated population of 26 million, of which approximately 2.3 million are children below the age of 5 years.

The sample survey aimed to provide independent estimates for each of the States, by means of probabilistic sampling, considering each State as a separate domain (strata). The municipality was the primary unit for sampling and, with the aim of ensuring representativeness when drawing, the IBGE's homogeneous micro-regions in which such municipalities are located were also considered.

In each of the surveyed municipalities, two vaccination posts were selected as secondary sampling units. The aim of including these two posts per municipality was to ensure dispersion among them. Random selection of the vaccination posts was carried out so as to ensure that both rural and urban areas were represented.

At each of the posts, children were systematically selected from the line, and stratified into two age brackets: 0 to 11 months; and 12 to 59 months. A specific interval for the selection of children was calculated for each post, considering the number of children vaccinated, stratified by age bracket, reported for the previous year's National Immunization Day (2004).

Thus, the selection process was broken down into three stages, proportional to the number of children vaccinated in each primary unit. In principle, in each of the 9 States, 30 municipalities should be selected by means of the following steps: (a) obtaining the list of all municipalities that comprise Brazil's semi-arid region (in accordance with boundaries established by the Ministry of National Integration); (b) random selection of 30 municipalities per State, considering IBGE's homogeneous micro-regions; the exceptions were the States of Sergipe and Alagoas, where all municipalities in the semi-arid area were included since there are only 29 in Sergipe and in Alagoas it was not adequate to select 30 of the 38 municipalities from a statistical standpoint; the process resulted in a total of 277; (c) the random selection of 2 vaccination posts per municipality, from among

those that were to operate on the 2nd round of the National Immunization Day; (d) definition of the sample interval, by age group, considering the number of children vaccinated at each post during the 2004 National Immunization Day (systematic sampling).

In calculating sample sizes, prevalence of a weight-for-age deficit of 8.3% in the Northeast region was considered, in accordance with estimates from the latest National Demography and Health Survey (PNDS 1996). The sample size, calculated using Epi-Info 2002 software, was 2,284 children in each State, considering an expected prevalence of 8.3% (± 1.6%), a confidence limit of 95%, and a design effect of 2. This sample size, equivalent to 76 children in each municipality, gives a total of 21,052 children. Taking into account possible losses of samples, it was decided that roughly 80 children per selected municipality in the semi-arid region should be examined.

Sampling in the land-reform settlements

This portion of the survey focused on land-reform settlements located in states of the Northeast region and the northern part of Minas Gerais, on the register of projects of the Institute of Colonization and Land Reform (INCRA) of the Ministry of Agrarian Development (MDA), on June 3, 2005. These included 3,329 projects in the 10 states, where 213,878 families have been settled. The 2000 Census showed that children up to the age of 5 years comprise 9.6% of the Brazilian population. Based on survey conducted by the Ministry of Education (INEP/MEC 2004) at Agrarian Reform Projects, which found that the typical family in these settlements is comprised of the parents and 3 children, it was concluded that the target population amounts to 102,661 children.

The sample was prepared in three stages, so as to ensure participation of all of the States. During the first stage, municipalities were randomly selected; in the second, the settlements were selected; and in the third stage, the children were selected.

To calculate the sample size, the prevalence of a weight-for-age deficit of 9.2% (± 1.7%) was considered for rural areas of Brazil as a whole, in accordance with estimates from the latest national demographic survey (PNDS 1996). The sample size calculated was of 1,426 children, considering a confidence limit of 95%, though this was subsequently expanded to 1,600 (foreseen sample) to account for possible sample losses.

The sample was distributed among 75 settlements, located in 40 municipalities in 10 states, and allocated proportionally among the strata, respecting foreseen minimum and maxim values of 80 and 480 children per state.

The samples were generated on the SAS system, using the SURVEYSELECT procedure. Municipalities and settlements were selected in proportion to the probable numbers of children below the age of 5 years living in the settlements, and thus all children in a given settlement had the same probability of being included. Field researchers selected the children at the settlement, when they were being weighed. They took note of the number of children in the age bracket, after which the children were selected.

Expansion of the sample

Each child in the Health and Nutrition Day (HND) sample represents a given number of children that were vaccinated on the 2nd National Immunization Day in each municipality. Thus, each child was awarded a sample weight or expansion factor which, when linked to the characteristics investigated in the HND (e.g. children weighed and measured) enables calculation of estimates for the universe of the survey. The expansion factors of the sample were calculated by professional statisticians specialized in sampling techniques, based upon conglomerate sampling principles.

2. Data gathering

Data gathering instruments

For gathering data, a questionnaire developed at a health post in Ceilândia (DF) that had been tested in June 2005 during the 1st stage of the vaccination campaign, was used. This questionnaire, to be filled out by an interviewer based upon answers provided by the person responsible for the day-to-day well being of the child, contained questions relating to: schooling levels of the interviewee and of the head of household; access to basic goods and social benefits; the number of daily meals eaten by the family; monitoring of the child's growth and development; ability to identify symptoms of common childhood diseases (acute respiratory infection and diarrhea); breastfeeding practices; compliance with prenatal care; etc.

Data gathering logistics

At the policy level, the decision to conduct the HND was approved by all the governors of the states of the Northeast region, and by 1,100 mayors that signed the Pact for "A World Fit for Children and Adolescents in the Semi-arid Region" under a partnership with the United Nations Children's Fund (UNICEF). The proposal had been presented and debated in Thematic Chamber 2 on Nutrition and Health of the National Food and Nutritional Security Council (CONSEA), and certain of the council members participated in preparatory meetings and in execution of the HND.

Official letters were dispatched from the Ministry for Social Development and Fight Against Hunger, and from the Ministry of Health to municipal authorities, informing them that the survey was to be conducted, and requesting technical and logistical support. At the state level, a coordination structure was assembled, comprising one professor from a Federal or State University, and a staff member of the State Secretariat of Health responsible for issues relating to food and nutrition. Among the responsibilities of the survey's State Coordination Units were: recruitment and selection of professionals or undergraduates of courses in the health area to perform the role of multiplying agents in the municipalities; capacity building for multiplying agents; establishing and maintaining contact with Municipal Secretariats of Health for recruitment of health professionals, technical and support staff to comprise the local teams responsible for data gathering; and awareness building for municipalities to ensure that they provide logistical support for multiplying agents and supervision for field work on the day of the HND. The preparations for the HND also led to the establishment of a hitherto unprecedented data gathering network.

Selection and trainning of interviewers

As has been described, training teams were set up, comprised of multiplying agents, health professionals or undergraduates in health-related courses, to provide capacity building for local data-gathering teams, made up of health professionals, technical and support staff of the municipalities.

The State Coordinators participated in strategic meetings, with the aim of standardizing training procedures, after which they proceeded with the work of training the professionals responsible for conducting activities in the municipalities. With a view to ensuring standardized training and, consequently, consistent data gathering procedures, the following manuals and handbooks were produced:

- Training Manual – general guide for filling out questionnaires
- Training Manual – guide for anthropometric examinations
- Handbook for training local teams

Training for multiplying agents took place in early July 2005, and field trips and training of local teams followed immediately thereafter, in July and August. The training schedule varied from one state to another, depending upon distances and the number of municipalities involved. Training of municipal terms lasted 2 to 3 days, depending upon the performance of local team members during training, and was carried out by a pair of multiplying agents. Of the 307 municipalities that comprise the HND sample (in the semi-arid region and in the settlements) training was provided for approximately 2,800 health professionals and technical and support staff for local teams.

Two teams, each comprised of 5 local technical staff members, participated in the training, and the responsibilities of each team member were designated during the training, depending upon the aptitude of each individual (see the section on the structure of field work and supervision). Training content was divided into theory and practice. The training program encompassed presentation of the Project, a general introduction to HND, the importance of standardized data-gathering procedures, field logistics, standardized selection of children in the vaccination line, filling out of questionnaires, and practical advice on standard anthropometric practice.

When holding training in the municipalities, multiplying agents demonstrated the use of instruments employed in conducting anthropometric procedures. These included pediatric and anthropometric weighing scales from the local health services, and the infantometers and stadiometers to be used on the HND. All scales used were verified during training in the municipalities, using 5-kilo packets of rice that had been pre-checked on scales at the Universities, and in several cases municipal authorities were requested to replace faulty weighing scales.

The pair of multiplying agents, after providing training for local teams, submitted a "Local Team Training Report" for each municipality, containing information on: (a) training and designation of tasks among local team members; (b) identity of local team members; (c) description of training stages; (d) performance of the local team; (e) structural conditions at vaccination posts to be operated on the 2nd National Immunization Day; (f) condition of anthropometric equipment available at the vaccination posts. Upon conclusion of the training in each locality, this report was dispatched by e-mail to the State and National Coordination Units. These reports served as a reference for measures needed and substitution / procurement of equipment required to enable gathering of data on August 20.

Structure of of field work and supervision

Field work is based upon the municipality, and was entrusted to two teams, each comprising 5 members with distinct responsibilities. Local data-gathering teams were structured as follows:

- 1 team supervisor - responsible for team supervision and support during data collection;
- 1 line organizer - responsible for selecting children according to the predefined interval;
- 1 interviewer - responsible for applying the questionnaire to the caregiver responsible for the child;
- 2 anthropometrists – responsible for gathering anthropometric data on the child;

All members of the data-gathering team wore distinctive t-shirts as identification.

Gathering of data in the semi-arid region took place on August 20, 2005, on the occasion of the 2nd National Immunization Day, from 8 am. to 5 pm., the period when the vaccination posts were open to the public. The children were selected as they waited in line for vaccination, whereupon, with acquiescence of the person (caregiver) responsible, they were identified with a colored ribbon on their wrists, signifying that they were participants in the survey. After they had received vaccination, the interviewer filled out the questionnaire with responses provided by the caregiver, after which an anthropometric examination was conducted.

In the interests of quality control, all state and national coordinators participated in the monitoring of the field work, and multiplying agents engaged in supervision at the municipal level on the HND. Additionally, in some states the gathering of data at all or most vaccination posts was supervised by health professionals and/or specially trained nutrition students. On the days immediately prior to the survey and on the HND itself, the Ministry for Social Development and Fight Against Hunger (MDS) set up a help desk with four telephone lines to field enquiries from the municipalities.

A similar strategy was adopted in the settlements, with supervision of multiplying agents and members of the State or National Coordination Units. In some of the settlements children were not randomly selected, since the total number of resident children was equal to the size of the sample. The date for gathering of data was determined by the vaccination calendar for rural areas of municipalities, in August 2005.

Anthropometric evaluation

For measuring babies CARCI wooden infantometers with a measuring range of 10 - 99 cm and graduation of 5 mm, were used. For measuring the height of children SECA 206 Microtoise stadiometers, with frontal reading and a measuring range of 0 to 2 meters and graduation in millimeters, were used in almost all the states, except Ceará, Minas Gerais and Maranhão, where AlturaExata stadiometers, with a measuring range of 2.13 meters and graduation in millimeters were used. Especially for the HND, the Ministry of Health procured 560 infantometers and 560 stadiometers, which were subsequently transferred to the municipalities.

For weighing children, anthropometric weighing scales (with 150 kg capacity and intervals of 100g), and for weighing babies, pediatric scales (with 16 kg capacity and intervals of 10g) were used, both of which are available at the municipal health services. As mentioned earlier, to ensure their accuracy, all scales were

checked during training in the municipalities, using 5 kg packets of rice that had been previously weighed on scales at the Universities.

Anthropometric weight and height measurements were carried out by a pair of anthropometricists, one of whom was responsible exclusively for weight readings and the other for height readings. Each child was weighed and measured twice. No approximations were made, meaning that the measurements taken were written down to the nearest decimal place, i.e., to the nearest gram or millimeter.

3. Ethical issues

The HND protocol was approved by the ENSP/FIOCRUZ Ethics Committee. Caregivers responsible for the children were informed in advance, in clear and simple language, of the objectives of the survey, of the way in which the data was to be gathered, on the confidentiality of the information, possible discomfort, their right to refuse to participate or withdraw consent during the process of gathering the data, publication of the results of the survey, and that the identities of the children and of their caregivers would be preserved. Data was gathered only after the persons responsible for the children had given their consent and signed a Term of Informed Consent and Clarification.

After conducting the anthropometric examination, the weight and height of the child was recorded, and the parents or caregiver informed of its nutritional status. Children diagnosed as having a nutritional deficit (Weight-for-Age < percentile 3) were provided with a term of referral, referring them to the nearest health service. Information on these children was also recorded on a more detailed social survey form, including references for locating their addresses. At the end of the survey, this information was delivered to the local Social-welfare Secretariat (or corresponding bodies) in each municipality.

4. Data treatment and analysis

Codifying and digitalization of data

The questionnaires were codified by 10 specially trained undergraduate nutrition students, and 30% of these questionnaires for each state were checked by a team of 5 nutritionists with vast experience in nutritional surveys and fieldwork. The questionnaires were then scanned (front and back) and stored in a digital format.

A critique of data consistency was carried out by the Center for Epidemiological Research in Nutrition and Health of the University of São Paulo (NUPENS/USP).

Critiques of data consistency

The critique of data consistency began during the phase of codifying questionnaires, by means of rigorous supervision and verification of the plausibility of values attributed to each variable. This critique was thus carried out at the time of codification and after digitalization of the questionnaires, and by returning to scanned questionnaires, when necessary, to check for possible digitalization errors.

Once having set up the database, the NUPENS/USP research team responsible for analyzing the data took further measures to verify consistency of the data. Initially, the most relevant distributions of frequency of variables were observed, with the aim of detecting unusual values, the proportion of unreported values, and harmonization of variables that effectively describe the same information (for example: "did the mother attend prenatal care?" *versus* "in which month did the mother initiate prenatal care?"). In cases in which the information was incomplete or inconsistent, the original form was consulted, either to confirm or alter the information.

The final phase of consistency analysis addressed the anthropometric data. Differences between the values reported for each of the two measurements taken were calculated. In the case of height, pairs of measurements with absolute differences of over 1 cm (172 cases) were considered imprecise. In the case of weight, pairs of measurements with absolute differences of over 0.2 kg (213 cases) were considered imprecise. The most acceptable value for a pair of imprecise measurements was determined by means of the following procedure. Modeling was carried out by polynomial and linear regression, and excluding the imprecise measurements, to verify average height and weight measurements against age. Then, from these average values, the averages of pairs of the measurements considered imprecise were subtracted, and the lower absolute value obtained from the subtraction was considered the best expression of the average of the pair. Finally, these cases were reintroduced into the database for subsequent analyses.

Data processing and analysis

To assess the nutritional status of children analyzed on the basis of their physical growth, anthropometric Height-for-Age, Weight-for-Age and Weight-for-Height calculations were effected. This calculation used a CDC/WHO-1978 reference population, which reproduces the distribution of measurements for height, weight, and Weight-for-Height ratios observed in populations taken from various anthropometric surveys carried out in the United States (Hamill *et al.* 1979). The anthropometric indices were expressed as standard deviations (z scores) of the reference population and submitted to "biological plausibility" criteria, in

accordance with procedures recommended by the World Health Organization (WHO 1986, 1995). According to this criteria, children with standard-deviation values in relation to the reference population of -5 or greater than +3 z scores in the case of Height-for-Age; less than -5 or greater than +5 z scores in the case of Weight-for-Height, and less than -4 or greater than +5 in the case of Weight-for-Height, are considered "biologically implausible" and removed from analyses involving child-nutrition status. When applied to the HND data, this criterion indicated biologically implausible Height-for-Age in 157 children (0.9%); Weight-for-Age in 65 children (0.4%); and Weight-for-Height in 124 children (0.7%). Among these there were cases of biologically implausibility for more than one of the criteria used.

To calculate nutritional indices in accordance with the CDC/WHO-1978 reference population, "Epi Info 2002" software was used. Classification of the nutritional status of children analyzed was in accordance with international criteria recommended by the World Health Organization (WHO, 1986). Children with standard-deviation values two times lower than the median value for the reference population were considered as having a nutritional deficit on the item in question. Children with Weight-for-Height standard-deviation values two times higher than the median value of the reference population were considered as having excess Weight-for-Height.

Finally, a variable known as "samplea" was generated, in which a value of 1 indicates children with complete and biologically plausible anthropometric data. In the sample of posts of the semi-arid region, 16,239 children out of 16,934 (95.9%) fulfilled all these requisites; in the sample of settlements in the semi-arid region, 1,305 out of 1.373 (95.1%) children fulfilled all these requisites. This variable was incorporated into the database to enable reproduction of the analyses by other researchers.

All of these analyses took into account the sample outline (strata, conglomerates and expansion factors) used to obtain the data. To test the hypothesis of equality among the proportion of those inscribed and not inscribed, observing the various socio-demographic strata, a binomial, bi-caudal test was used with a significance level equal to 5%.

To compare the impact of income-transfer programs on the nutritional status of children of families benefited, a logistical analysis was conducted to equate Height-for-Age deficit and participation in income-distribution programs (*Bolsa Família*, *Bolsa Alimentação*, *Bolsa Escola* or *Cartão Alimentação*). Variables for control of this link were: quantity of household goods, number of years of schooling of the mother or person responsible, and number of years of schooling of the head of the household. Given that the measure of impact of participation in income-distribution programs proved to vary significantly among the various

age groups analyzed, the decision was taken to stratify the analysis into the following age brackets: 0 to 5, 6 to 11, 12 to 35, and 36 to 49 months.

The tests and other statistical procedures carried out are indicated or briefly described in footnotes to the tables presented. The calculations were carried out using a Stata statistical packet, version 9.

5. Municipalities sampled

The municipalities sampled in the Health and Nutritional Day represented the semi-arid region and rural settlements in the following states:

Alagoas: Água Branca, Arapiraca, Batalha, Belo Monte, Cacimbinhas, Canapi, Carneiros, Coité do Nóia, Craibas, Delmiro Gouveia, Dois Riachos, Estrela de Alagoas, Girau do Ponciano, Igaci, Inhapi, Jacaré dos Homens, Jaramataia, Lagoa da Canoa, Major Isidoro, Maravilha, Mata Grande, Minador do Negrão, Monteiropólis, Murici, Olho D'água das Flores, Olho D'água do Casado, Olivença, Ouro Branco, Palestina, Palmeira dos Índios, Pão de Açucar, Pariconha, Piranhas, Poço das Trincheiras, Quebrangulo, Santana do Ipanema, São José da Tapera, São Luis do Quitunde, Senador Rui Palmeira, Traipu.

Bahia: Araci, Boa Vista do Tupim, Bom Jesus da Lapa, Casa Nova, Cravolândia, Euclides da Cunha, Feira de Santana, Guanambi, Iguaí, Inhambupe, Ipirá, Iraquara, Itapetinga, Jacobina, Jequié, Juazeiro, Lençóis, Mairi, Morro do Chapéu, Mucuri, Nova Canaã, Novo Triunfo, Oliveira dos Brejinhos, Paulo Afonso, Pé de Serra, Piripá, Riacho de Santana, Santanópolis, Serra do Ramalho, Serra Dourada, Sobradinho, Souto Soares, Tucano, Uauá, Vitória da Conquista, Xique-Xique.

Ceará: Acopiara, Assaré, Barbalha, Boa Viagem, Brejo Santo, Canindé, Cariús, Carnaubal, Caucaia, Cratéus, Crato, Frecheirinha, Graça, Guaraciaba do Norte, Horizonte, Icapuí, Iguatú, Independência, Ipueiras, Itapipoca, Jaguaruana, Juazeiro do Norte, Massapê, Mauriti, Morada Nova, Orós, Quixadá, Quixeramobim, Santa Quitéria, Sobral, Tamboril, Tauá.

Maranhão: Amarante do Maranhão, Balsas, Barreirinhas, Bom Jesus das Selvas, Caxias, Codó, Coroatá, Lajeado Novo, Monção, Presidente Sarney, São Mateus do Maranhão, Turilândia.

Minas Gerais: Almenara, Araçuaí, Berilo, Berizal, Bonito de Minas, Caraí, Curral de Dentro, Divisopólis, Espinosa, Francisco Sá, Gameleiras, Grão Mogol, Ibiracatu, Itacarambi, Itaobim, Jaíba, Janaúba, Januária, Jequitinhonha, Mato Verde, Novo Cruzeiro, Padre Paraíso, Pedra Azul, Porteirinha, Rio Pardo de Minas, São

João das Missões, São João do Paraíso, São João da Ponte, Taiobeiras, Verdelândia, Virgem da Lapa.

Paraíba: Água Branca, Bananeiras, Barra de Santa Rosa, Boqueirão, Cajazeiras, Campina Grande, Catingueira, Catolé do Rocha, Cubati, Dona Inês, Esperança, Itabaiana, Lagoa Seca, Monteiro, Nazarezinho, Patos, Pedra Branca, Piancó, Picuí, Pitimbu, Pocinhos, Queimadas, Salgado de São Felix, Sta Cecília, São Bento, São Francisco, São José de Piranhas, Soledade, Sousa, Sumé, Teixeira.

Pernambuco: Afrânio, Alagoinha, Amaraji, Araripina, Arcoverde, Belém de São Francisco, Belo Jardim, Brejo da Madre de Deus, Calçado, Caruaru, Casinhas, Garanhuns, Goiana, Gravatá, Ipubi, Lagoa dos Gatos, Lagoa Grande, Lajedo, Ouricuri, Passira, Petrolândia, Petrolina, Riacho das Almas, Santa Maria da Boa Vista, Santa Terezinha, São Bento do Una, São João, São Joaquim do Monte, São José do Belmonte, Serra Talhada, Sertânia, Surubim, Tabira.

Piauí: Bom Jesus, Buriti dos Lopes, Canto do Buriti, Castelo do Piauí, Colônia do Gurguéia, Curimatá, Dom Inocêncio, Fartura do Piauí, Geminiano, Inhuma, Itainopólis, Itaueira, Joaquim Pires, Joca Marques, Marcolândia, Massapê do Piauí, Monsenhor Hipólito, Oeiras, Paes Landim, Palmeira do Piauí, Patos do Piauí, Pedro II, Picos, Piracuruca, Rio Grande do Piauí, Santa Cruz dos Milagres, São João da Serra, São João da Varjota, São João do Piauí, São Miguel do Tapuio, Simões, Vila Nova do Piauí, Wall Ferraz.

Rio Grande do Norte: Açu, Afonso Bezerra, Apodi, Barcelona, Caicó, Campo Redondo, Cerro Corá, Cruzeta, Currais Novos, Encanto, Grossos, Itajá, Jaçanã, João Câmara, José da Penha, Lajes, Macaíba, Monte Alegre, Mossoró, Olho D'água dos Borges, Pau dos Ferros, Pendências, Pureza, Serra Negra do Norte, Serrinha, Tangará, Touros, Triunfo Potiguar, Várzea, Venha-Ver.

Sergipe: Amparo de São Francisco, Aquidabã, Canhoba, Canindé de São Francisco, Carira, Cedro de São João, Cumbe, Feira Nova, Frei Paulo, Gararu, Gracho Cardoso, Itabi, Lagarto, Macambira, Monte Alegre de Sergipe, Nossa Sra. Aparecida, Nossa Sra. da Glória, Nossa Sra. das Dores, Nossa Sra. de Lourdes, Pedra Mole, Pinhão, Poço Redondo, Poço Verde, Porto da Folha, Propriá, Ribeirópolis, São Miguel do Aleixo, Simão Dias, Telha, Tobias Barreto.

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4. Analysis of the 2005 Health and Nutritional Day

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This article seeks to underscore the initial results of analyses carried out on the wealth of data obtained from the 2005 Health and Nutritional Day (HND). This analysis has provided estimates of the prevalence of nutritional deficits among the child population of the semi-arid region of Brazil, and on the socioeconomic distribution of these deficits, aside from furnishing valuable insights into the secular trend of malnutrition in the region, and the impact of income-transfer programs on child nutrition. All the estimates presented took into account the complex design of the sampling of the survey, and used the necessary weighting factors to represent the universe of the children studied.

Indicators of adverse socioeconomic conditions were common in the sample of children studied in the semi-arid region. The great majority belong to classes D (41.6%) and E (33.1%), whereas only one in five of the children belong to class C, and one in 20 to classes A or B. Illiteracy and low schooling levels (1 to 4 years) were common among family members of these children: 12% and 29.8% respectively for heads of household, and 3.4% and 25.4%, for the mothers of the children. Mothers who declared their color/race as non-white accounted for 77.2% of the total. In 7.4% of cases, families reportedly ate less than three meals per day (Table 1).

Satisfactory levels of access to electricity supply (95.4%) were reported for the sample studied; but the proportion of households connected to public water mains (76.3%) remains undesired. Satisfactory levels of coverage were also reported for prenatal care, achieving 97.2% of mothers; moreover 80.5% reported that they had attended five or more prenatal care visits, and 82% that they had initiated prenatal care in the first trimester of pregnancy. Also fairly satisfactory was the proportion of children whose birth had been registered (96%); that had a Children's Health Card (99.7%); and whose weight had been monitored and recorded on the card in the previous three months (64.5%) (Table 2).

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Table 1 – Distribution (%) according to socio-demographic variables by location of the household. Children below the age of 5 years in municipalities of the semi-arid region of Brazil, 2005.

Variables	Total (n= 16,239)	Location of the household	
		Urban (n= 13,626)	Rural (n= 2,613)
Sex:			
Boys	48.4	48.5	47.2
Girls	51.6	51.5	52.8
Age (years):			
0	19.8	19.0	26.4
1	22.0	21.9	22.6
2	21.4	22.2	15.5
3	18.6	18.8	16.9
4	18.2	18.1	18.6
Color/Race:			
White	22.8	23.5	17.0
Brown	70.9	70.2	76.7
Black	5.5	5.2	5.2
Asiatic	0.6	0.4	0.4
Indigenous	0.2	0.7	0.7
Sex of the head of the household:			
Male	74.2	74.0	76.0
Female	25.8	26.0	24.0
Schooling level of the head of household:			
No schooling	12.0	11.3	17.0
1 – 4 years	29.8	28.0	44.4
5 – 8 years	30.9	31.9	23.1
9 years and over	27.3	28.8	15.4
Mother's schooling level:			
No schooling	3.4	3.3	4.4
1 – 4 years	25.4	23.3	42.5
5 – 8 years	47.3	47.9	33.9
9 years and over	24.8	25.5	19.3
Socioeconomic classification (ABIPEME):			
A	0.4	0.4	0.0
B	5.5	5.9	2.2
C	19.4	20.0	14.2
D	41.6	42.4	35.2
E	33.1	31.2	48.3
Electricity in the household			
Yes	95.4	95.3	95.8
No	4.6	4.7	4.2
Connected to public water supply:			
Yes	76.3	79.5	50.9
No	23.7	20.5	49.1
Access to treated drinking water:			
Yes	90.4	91.7	79.9
No	9.6	9.3	19.1
Number of family meals per day :			
1	0.5	0.6	0.1
2	6.9	5.8	15.5
3	41.2	40.8	44.8
4	51.3	52.8	39.6

Source: HND Field Survey – MDS/MS, 2005.

Table 2 – Coverage indicators of public services, healthcare and social programs, by location of the household. Children below the age of 5 years in municipalities of the semi-arid region of Brazil, 2005.

Indicators	Total (n=16,239)	Location of the household	
		Urban (n=13,626)	Rural (n=2,613)
% with:			
Birth registry (reported)	96.0	96.4	93.2
Children's Card (reported)	99.7	99.7	99.9
Children's Card (in hand)	98.1	98.0	99.1
Weight recorded on the card in the past 3 months	64.5	63.1	75.9
% of mothers who:			
Received prenatal care	97.2	97.3	96.7
Attended 5 or more prenatal care sessions	80.5	80.5	81.1
Initiated prenatal care in the first trimester	82.0	83.7	77.8
% whose family receives social benefits:			
*Bolsa Família**	35.2	33.6	48.3
PETI	1.8	1.8	1.7
Vale Gás	15.9	14.8	24.4
BPC	1.7	1.6	2.6
Projeto Cisterna	0.6	0.5	1.5
Other programs	3.2	3.3	2.8
At least one of the above	44.5	42.6	60.0

Source: HND Field Survey – MDS/MS, 2005.

*Also includes *Bolsa Escola*, *Bolsa Alimentação* and *Cartão Alimentação*.

The prevalence of chronic forms of malnutrition, identified by measuring the stunting (low height for age) was 6.6%. The weight-for-height deficit, which identifies certain acute forms of malnutrition, was rarely found among the children studied (2.8%), which is only a little higher than the "normal" accepted limit of 2.3% for this indicator. Marked differences between social strata were evidenced in relation to prevalence of height-for-age deficit, but not with regard to prevalence of weight-for-height deficit, thereby confirming the epidemiological non-relevance of acute forms of malnutrition in this study, which had already been noted in other previous studies. The prevalence of chronic forms of malnutrition (height-for-age deficit) varied intensely in relation to socioeconomic indicators, reaching, for example, 10.1% of children in class E; 6.9% in class D; and only 3.3% in classes A to C. Children of illiterate mothers accounted for 14.8% of stunted children; whereas among children whose mothers had received between 1 to 4 years of schooling the figure was 8.4%; of those with 5 to 8 years of schooling, 6.8%; and of those whose mothers had received and 9 or more years of schooling, the prevalence dropped to 3.3% (Table 3).

Table 3 – Prevalence (%) of anthropometric deficits according to socio-demographic variables. Children below the age of 5 years in municipalities of the semi-arid region of Brazil, 2005.

Variable	Height-for-Age Deficit (n=1.105)	Weight-for-Age Deficit (n=650)	Weight-for-Height Deficit (n=271)
Total	6.6	5.6	2.8
Sex:			
Boys	6.1	4.6	3.1
Girls	7.1	6.6	2.6
Age (years old):			
0	4.7	2.2	1.8
1	11.0	7.4	3.4
2	5.1	5.4	2.2
3	5.9	7.5	4.6
4	5.9	5.5	2.3
Location of the household:			
Urban	6.5	5.8	2.9
Rural	7.2	4.2	2.3
Color/Race:			
White	4.4	3.2	3.0
Brown	7.6	6.8	3.0
Black	4.6	1.3	0.3
Other	3.5	2.9	1.0
Sex of the head of the household:			
Male	5.4	4.8	2.5
Female	9.8	8.1	3.8
Schooling level of the head of the household:			
No schooling	10.9	8.7	5.5
1 – 4 years	8.5	5.0	0.9
5 – 8 years	6.5	6.1	2.5
9 years and over	2.8	4.4	4.2
Mother's schooling level:			
No schooling	14.8	10.5	8.6
1 – 4 years	8.4	7.3	1.6
5 – 8 years	6.8	6.2	3.3
9 years and over	3.3	2.1	2.5
Socioeconomic classification (ABIPEME):			
A or B	0.9	0.7	4.1
C	2.4	6.4	4.5
D	6.9	5.4	2.4
E	10.1	6.3	2.7
Number of family meals per day :			
Less than 3	16.2	15.7	2.8
3 or more	5.8	4.9	2.8

Source: HND Field Survey – MDS/MS, 2005.

Estimating the secular trend of child malnutrition in Brazil's semi-arid region is not a simple task, since no earlier specific and comprehensive surveys have focused upon the region. A crude means of assessing changes in malnutrition in the semi-arid region would be to compare the estimates of the 2005 HND survey with those for the entire macro-region of the Northeast, where the vast majority of municipalities of the semi-arid region are located (Table 4). Such estimates are to be found in three national household surveys

designed to represent all of Brazil's macro-regions, held in 1974-1975, 1989, and 1996. Declining prevalence of height-for-age deficits among the under-5 year old population were estimated based upon these three surveys: 47.8% in 1974-1975; 27.3% in 1989; and 17.9% in 1996. These figures points to a 3.1% per-year decline between 1975 and 1989, and to a 4.9% per-year decline between 1989 and 1996. If we take the stunted children prevalence of 17.9% reported in 1996 throughout the Northeast region, and the prevalence of 6.6% reported in 2005 in the semi-arid region under the HND, we can estimate a decline over the period of 7% per year, which represents a considerable acceleration in the rate of decline of malnutrition in relation to the immediately preceding period. However, as was indicated earlier, this is a crude comparison, and only by repeating surveys focused specifically on the semi-arid region will it be possible to monitor malnutrition trends in this specific region of Brazil. On the other hand, a new household survey on under-5 year old child health and nutrition, scheduled to be carried out in Brazil in 2006, will enable a more precise assessment of the recent trends in malnutrition in Brazil and in Brazilian macro-regions.

Table 4 – Prevalence (%) of anthropometric deficits in the Northeast region and IN municipalities of the semi-arid region of Brazil. Cridren below the age of 5 years: 1975, 1989, 1996 and 2005.

Survey and year	Region	Height-for-Age Deficit	Weight-for-Age Deficit	Weight-for-Height Deficit
ENDEF 1975	Northeast	47.8	27.0	NA
PNSN 1989	Northeast	27.3	12.8	2.4
PNDS 1996	Northeast	17.9	8.3	2.8
Health and Nutrition Day 2005	Semi-arid	6.6	5.6	2.8

Source: HND – MDS/MS, 2005.
For estimates relating to the ENDEF, PNSN and PNDS, see Monteiro CA (org). *Velhos e novos males da saúde no Brasil: a evolução do país e de suas doenças*. 2ª ed. Aumentada. São Paulo: Hucitec/NUPENS-USP, 2000.
NA = not available.

The final aspect discussed in this article is the impact of income-transfer programs on child malnutrition. Initially, it should be remarked that 35.2% of the families of children studied were inscribed in the *Bolsa Família* Program (which also includes those inscribed in the older *Bolsa Escola*, *Bolsa Alimentação* and *Cartão Alimentação* Programs).

Table 5 – Distribution (%) according to socio-demographic variables for families inscribed in the Bolsa Família Program. Children below the age of 5 years in municipalities of the semi-arid region of Brazil, 2005.

Variables	Not inscribed in *Bolsa Família* (n= 7,963)	Inscribed in *Bolsa Família* (n= 6,220)*
Total		
Sex:		
Boys	49.6	46.7
Girls	50.4	53.3
Age (years):		
0	21.8	16.2
1	23.9	18.2
2	19.9	23.5
3	18.2	20.1
4	16.1	22.0
Color/Race:		
White	25.7	17.7
Brown	67.3	76.7
Black	6.3	4.8
Asiatic	0.6	0.6
Indigenous	0.2	0.2
Sex of the head of the household:		
Male	25.7	26.3
Female	74.3	73.6
Schooling level of the head of the household:		
No schooling	9.3	17.0
1 – 4 years	25.1	38.3
5 – 8 years	31.0	31.3
9 years and over	34.7	13.4
Mother's schooling level:		
No schooling	2.6	4.9
1 – 4 years	19.0	37.4
5 – 8 years	47.2	44.9
9 years and over	31.2	12.8
Socioeconomic classification ABIPEME:		
A – C	33.7	10.0
D	40.4	43.6
E	25.9	46.4
Electricity in the household		
Yes	95.8	94.6
No	4.2	5.4
Connected to public water supply:		
Yes	76.8	76.1
No	23.2	23.9
Access to treated drinking water:		
Yes	91.5	88.2
No	8.5	11.8
Number of family meals per day :		
1	0.07	0.03
2	5.3	9.5
3	38.4	44.9
4	55.6	44.3

Source: HND Field Survey – MDS/MS, 2005.

*Also includes *Bolsa Escola*, *Bolsa Alimentação* and *Cartão Alimentação*.

As expected, coverage of the *Bolsa Família* Program is concentrated among the lower socioeconomic strata of the population, and thus the socioeconomic profile of children inscribed in the program tends to be less favorable than the profile of those not inscribed (Table 5).

In view of this, it would be inappropriate to make a direct comparison of the prevalence of malnutrition among those inscribed and those not inscribed in the Program. To skirt this problem, adjusted estimates of the prevalence of height-for-age deficits were calculated for those inscribed and those not inscribed in the expanded *Bolsa Família* Program (Table 6).

Table 6 – Adjusted prevalence* (%) of anthropometric deficits by age bracket, inscribed in the Bolsa Família / Alimentação / Escola and Cartão Alimentação Programs. Children below the age of 5 years in the semi-arid region of Brazil, 2005.

Deficit/ age bracket	Not inscribed (a)	Inscribed (b)	Percentage change attributable to the program (a-b/a*100)	p – value for adjusted Comparison between inscribed and not inscribed*
Height-for-Age:				
Total	6.8	4.8	29.4	0.280
0 – 5 months	2.5	2.4	4.0	0.964
6 – 11 months	5.3	2.0	62.3	0.036
12 – 35 months	8.5	6.1	28.2	0.451
36 – 59 months	6.2	4.6	25.8	0.468
Weight-for-Age:				
Total	4.4	4.0	9.1	0.751
0 – 5 months	1.1	0.3	72.7	0.067
6 – 11 months	1.8	1.4	22.2	0.749
12 – 35 months	6.5	5.6	13.8	0.719
36 – 59 months	2.1	2.6	-23.8	0.580
Weight-for-Height:				
Total	3.1	1.3	58.1	0.023
0 – 5 months	1.2	0.2	83.3	0.043
6 – 11 months	2.4	0.6	75.0	0.108
12 – 35 months	2.3	1.5	34.8	0.265
36 – 59 months	1.3	0.5	61.5	0.083

Source: HND Field Survey – MDS/MS, 2005.
*Adjusted for distribution of socioeconomic variables (number of goods in the household and years of schooling of the head of household and of the mother of the child) observing those inscribed and those not inscribed in the *Bolsa Família* program.

These estimates were obtained on the basis of multiple logistical regression models which essentially "equalize" the distribution of socioeconomic variables among those inscribed and those not inscribed in the distribution observed among

the population as a whole (those inscribed plus those not inscribed). In this way, differences in adjusted prevalences among those inscribed and those not inscribed can be attributed to whether or not they are inscribed in the program, rather than to socioeconomic differences between the two groups of children.

For children below the age of 5 years as a whole, the adjusted prevalences indicate that participation in the program determines a reduction of almost 30% in the frequency of stunting (from 6.8% without the program, to 4.8% with the program). For children between 0 and 5 months of age, the adjusted prevalences indicated a virtual absence of the problem, both for children inscribed and for those not inscribed (2.4% and 2.5%, respectively), which proves consistent with lower vulnerability of this age group to malnutrition, among other reasons, probably related to the benefits of breastfeeding. The greatest benefit of the program would appear to be for children between the ages of 6 and 11 months, for whom the reduced prevalence of stunting attributable to the program was 62.3% (from 5.3% to 2%). More modest benefits were observed for older children: a 28.2% reduction of malnutrition among children between the ages of 12 and 35 months (from 8.5% to 6.1%) and a 25.8% reduction for children between the ages of 36 and 59 months (from 6.2% to 4.6%). This less intense benefit of the program for older children may stem from the fact that at least a portion of them may not have enjoyed the benefit when it was feasible to reverse the retarding of growth, which supposedly means in the first two years of life. Regrettably, lack of knowledge of the time span since the family's enrollment in the program makes it impossible to arrive at a definitive assessment of this issue.

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5. Analysis of the Health and Nutrition Day of rural land-reform settlements in the northeast region and in the north of Minas Gerais

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The present study is part of the 2005 Health and Nutritional Day survey (HND). It underscores efforts of the Ministry for Social Development and Fight Against Hunger (MDS) which, with support from the Ministry of Health (MS) and other partners, investigated the prevalence of malnutrition among children whose families comprise the populations of rural land-reform settlements in 10 Brazilian states. This study, the first of its kind in Brazil, entailed probabilistic sampling of children below the age of 5 years, in August 2005, in all of the states of Brazil's Northeast region, and in the northern portion of the State of Minas Gerais.

The areas covered by the study were selected based upon a listing of Settlement Projects, dated June 2005, provided by the Institute for Colonization and Agrarian Reform (INCRA) of the Ministry of Agrarian Development (MDA). As Figure 1 shows, Maranhão was the state with the largest number of families living in land-reform settlements (37.5% of the sample), followed by Bahia (15.2%) and Ceará (9.7%) (see chapter 2 for sampling details).

The HND of Rural Land-Reform Settlements followed the same procedures as the 2005 HND, and its target population was children below the age of 5 years who attended vaccination posts in the selected municipalities.

The findings of the study include assessments of socioeconomic and demographic conditions, of the status of healthcare services, of the coverage of social programs, and of the prevalence of nutritional deficiencies among the target population.

Data from the study show that these children live in highly unfavorable conditions. Indeed, 90.8% of the children in the study were categorized as belonging to socio-economic class E; 7.9% to class D; only 1.3% to class C, and none of them were from families in classes A and B.

Factors that exacerbate these precarious living conditions are illiteracy (30.7%) and less then 5 years schooling (50.7%) of the head of household. Of the

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mothers of these children, 6.7% are illiterate, and over half (62.1%) have between 1 and 4 years of schooling.

The great majority of the target population (84.4%) when asked their color/race, stated that they were non-white. It was found that 19.9% of the families have less than three meals per day. The status of public services delivered to the home was also found to be lacking: almost half of the families (45.6%) did not have electricity in the home; household access to water mains is very low (7.5%); and a significant proportion of the families in the study (54.1%) did not treat the drinking water provided for their children (Table 1).

Figure 1 – Map of Brazil showing municipalities where the Health and Nutritional Day of Rural Land-Reform Settlements in the Northeast region and in the north of Minas Gerais, 2005.

Source: HND Field data – MDS/MS, 2005.

Table 1 – Socio-demographic characteristics of the population of rural land-reform settlements in the semi-arid region. Children below the age of 5 years in Rural Land-Reform Settlements in the Northeast region and in the northern portion of Minas Gerais, 2005.

Characteristics	Total (n= 1,305)
Sex:	
Boys	53.9
Girls	46.1
Age (years):	
0	12.2
1	24.1
2	22.2
3	19.3
4	22.3
Color/race:	
White	15.3
Brown	79.9
Black	4.0
Asiatic	0.6
Indigenous	0.1
Sex of the head of household:	
Male	86.5
Female	13.5
Schooling level - head of household:	
No schooling	30.7
1 – 4 years	50.7
5 – 8 years	13.2
9 or more years	5.5
Mother's schooling level:	
No schooling	6.7
1 – 4 years	62.1
5 – 8 years	25.6
9 or more years	5.6
Socioeconomic status (ABIPEME):	
A-C	1.3
D	7.9
E	90.8
Electricity in the home:	
Yes	54.4
No	45.6
Access to public water mains:	
Yes	7.5
No	92.5
Treated drinking water:	
Yes	45.9
No	54.1
Number of family meals per day:	
1	1.8
2	18.1
3	65.1
4	15.0

Source: HND Field data – MDS/MS, 2005.

The social indicators in table 1 show that the families living in rural land-reform settlements comprise a socially underprivileged population and, for this reason, should be given priority under redistributive policies targeted at promoting social equity. Currently, only 38.9% of the families of these children receive benefits under the *Bolsa Família* Program, a coverage level considered insufficient (Table 2).

Table 2 – Coverage of social welfare programs. Children below the age of 5 years living in Rural Land-Reform Settlements in the Northeast region and in the northern portion of Minas Gerais, 2005.

Indicators	Settlements (n=1.305)
% of children whose families receive social-welfare benefits:	
Bolsa Família	38.9
PETI	2.7
Vale gás	18.6
BPC	1.5
Projeto Cisternas	4.9
Others	3.8

Source: HND Survey – MDS/MS, 2005.

Very few studies have been carried out on underreporting of births in rural areas, and few estimates exist as to the numbers of unregistered children above the age of one year. Previous research, carried out in different locations in Brazil, estimated numbers of unregistered children below the age of one year by measuring differences in age levels among the populations studied to establish a rough comparison. Generally, these studies found underreporting of births to be higher in the Northeast region (68.4% in Piripiri-PI in 1983/84; 17.9% in Natal-RN in 1987; and 35.3% in Centro Novo-MA in 2002); and lower in the South region (9.1% in Maringá-PR in 1989, and 5.3% in Londrina-PR, in 1994) (Cardoso *et al*, 2003).

The 7.9% of children without birth registration revealed by the present study (Table 3) would appear fairly favorable, in view of the stark realities facing poor populations of the Northeast region and especially of children in rural areas. Nonetheless, it should be stressed that a birth certificate, aside from being the document that entitles an individual to citizenship, is also an important instrument for calculating a variety of health indicators, among them, child-mortality rates (Laurenti *et al*, 1985).

Findings based on healthcare indicators revealed quite favorable results, nonetheless, coverage levels are still well below those recommended for universal access to primary healthcare services. Though the interviews revealed that a very high percentage (99.5%) of the children have a Child's Health Card, only on 45.5% of such cards had the child's weight been recorded in the six-month period prior to the survey, thereby revealing a need to develop specific strategies to incentive growth monitoring, an action regarded as being of fundamental importance for improving the status of child nutrition and health.

A majority of the mothers of these children (93%) had received prenatal care, nonetheless, only 61.7% had completed the recommended 5 prenatal care sessions, and only 63.5% had begun their prenatal care in the first trimester of pregnancy. (Table 3).

Table 3 – Healthcare indicators. Children below the age of 5 years living in Rural Land-Reform Settlements in the Northeast region and in the northern portion of Minas Gerais, 2005.

Indicators	Settlements (n=1.305)
% of children with:	
birth registration (declared)	92.1
Child's Card (declared)	99.5
Child's Card (in hand)	95.2
weight recorded on the Card	45.5
% of children whose mother:	
received prenatal care	93.0
attended 5 or more prenatal care sessions	61.7
began prenatal care in the first trimester of pregnancy	63.5

Source: HND Filed Data – MDS/MS, 2005.

It is a consensus among specialists that the practice of introducing foods other than breast milk into a child's diet prior to the sixth month of life jeopardizes the child's nutritional health. Breastfeeding stimulates growth and development of the child, protecting it against chronic diseases and infections, thereby helping reduce infant mortality (WHO, 2001). The World Health Organization recommends exclusive breastfeeding during the first 6 months of life and continued breastfeeding, in association with other complementary foods, at least up to the age of 2 years (WHO, 2006).

In Brazil, indices of exclusive breastfeeding (children that receive no other nourishment, not even tea or water) and of total duration of breastfeeding are well below the ideal. In recent decades, programs sponsored by the Brazilian

Government have placed great emphasis on breastfeeding, with the aim of attaining the levels recommended by international standards. Analyses of the data for the 1970s and 1980s show that average duration of breastfeeding (whether exclusive or not) for all children was 2.5 months in 1975, rising to 5.5 months in 1989, and to 7 months in 1996 (Venâncio, *et al*, 2002).

In 1996 average Brazilian exclusive breastfeeding rates were around 30 days, and were significantly higher among mothers residing in urban areas of São Paulo and of the South region, and also among mothers of all regions of Brazil with over 12 years of schooling (BEMFAM, 1997).

Data on breastfeeding in the present study indicate that Brazil's less socially-advantaged populations are still a long way from achieving the desired goals. Among the children in the study, average duration of exclusive breastfeeding was 58 days (or 1.8 months). Average total duration of breastfeeding was found to be 232 days, also well below **twelve** months (Table 4).

With regard to exclusive breastfeeding, it was found that 78.9% of babies are fed nothing but breast milk in the first month of life; 55% up to the fourth month; and only 33% are exclusively breastfed up to the age of six months. Figures on total duration of breastfeeding indicate a need to concentrate efforts on persuading mothers to continue breastfeeding their children throughout the first and second years of life. Only 15.7% of the children were still receiving breast milk between the 12th and 24th months of life; 37.5% between the ages of 6 and 12 months; and 68.8% between 0 and 6 months (Table 4).

Table 4 – Exclusive and total breastfeeding, by age and duration. Children below the age of 5 years living in Rural Land-Reform Settlements in the Northeast region and in the northern portion of Minas Gerais, 2005.

Exclusive and total breastfeeding – age (days - average)	
Exclusive breastfeeding rates*	58
Total duration of breastfeeding	232
Exclusive breastfeeding *:	
< 1 month	78.9
< 4 months	55.0
< 6 months	33.0
Total breastfeeding:	
0 to 6 months	68.8
6 to 12 months	37.5
12 to 24 months	15.7

*Children fed exclusively on breast milk (not even water or tea).
Source: Field Research from the Nutritional Survey – MDS/MS, 2005.

In view of their vulnerability to nutritional deficiencies, children constitute the best group with which to portray problems relating to malnutrition. Generally speaking, child malnutrition indicators reflect the poor status of living conditions among a population (Tonial, 2001).

Earlier Brazilian nationwide studies revealed much worse nutritional conditions among the social strata living in rural areas and in adverse conditions. Monteiro (1993, 1995, 1997a, 1997b) has shown that, despite a significant drop in the prevalence of malnutrition reported in three Brazilian nationwide studies, the decline has been uneven in different parts of Brazil, intensifying disparities among regions, socio-economic strata, and between urban and rural areas.

Data in the present study reveal a greater prevalence of chronic malnutrition, evidenced by a 15.5% growth deficit (low Height-for-Weight) indicating that the most prevalent type of malnutrition among Brazilian children results from repeated and continuous exposure of this age group to adverse living, health, and nutritional conditions. For the indicator of the most acute form of malnutrition (low Weight-for-Height) the prevalence was of 7.3% (Table 5).

When these findings are compared with those for children resident in Brazil's semi-arid region, the growth deficit among children living in the land-reform settlements is approximately 1.5 times greater, whereas for acute malnutrition the difference is roughly twice as great. This shows that among the target population of this study, adverse living conditions and poor nutrition persist, and that, for this reason, targeted policies are required.

Table 5 – Prevalence of anthropometric deficits according to demographic variables. Children below the age of 5 years living in Rural Land-Reform Settlements in the Northeast region and in the northern portion of Minas Gerais, 2005.

Characteristics	Height-for-Age Deficit (n=202)	Weight-for-Age Deficit (n=112)	Weight-for-Height Deficit (n=95)
Total	15.5	8.6	7.3
Sex:			
Boys	20.6	6.1	8.5
Girls	9.6	11.6	5.9
Age (age - years):			
0	4.3	1.5	7.5
1	23.2	7.6	16.0
2	13.1	13.0	8.1
3	14.2	3.9	1.1
4	16.6	13.4	2.2

Source: Field Research from the Nutritional Survey – MDS/MS, 2005.

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