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Using National Immunization Day to monitor health indicators

National Immunization Day: a strategy to monitor health and nutrition indicators

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Une traduction en français de ce résumé figure à la fin de l'article. Al final del artículo se facilita una traducción al español. المقالة لهذه الكامل النص نهاية في الخلاصة لهذه العربية الترجمة.

Problem: To achieve the Millennium Development Goals it is necessary to set up low-cost, real-time monitoring systems which can provide feedback to managers and policymakers in a timely fashion. The gold-standard approach for monitoring nutritional situation is to conduct household surveys. However, they are costly, time consuming and do not furnish information about smaller disaggregated units.

Approach: Brazil pioneered National Immunization Days (NIDs) in the 1980s, as well as their integration with vitamin A supplementation later on. This report discusses implementation of five large-scale Health and Nutrition Days (HNDs) using NIDs as a platform to monitor nutritional status and estimate coverage of health and social welfare services, including conditional cash transfer benefits.

Local setting: Brazil is composed of 26 states, one federal district and 5564 municipalities, with around 18 million children aged under five. It was decided that HNDs would be carried out among high-risk populations: children from the semi-arid north-east region; agrarian reform settlements; isolated black rural communities or *Quilombolas* and municipalities of Amazonas state.

Relevant changes: It was possible to draw inferences for almost 3 million children from different subgroups of underprivileged populations which had never before been studied in such detail, including state-level data.

Lessons learned: Implementation of large scale HNDs in conjunction with NIDs proved to be feasible in Brazil and resulted in data which are very relevant for policymakers, obtained over a short period of time and at reasonably low cost. It is sensible to conclude that the experience reported here could be reproduced wherever NID coverage is very high.

Introduction

To achieve the Millennium Development Goals (MDG) it is necessary to set up low-cost, real-time monitoring systems of nutritional status which can provide feedback to managers and policymakers in a timely fashion. This is especially important for monitoring progress of two MDGs: halving the number of people who suffer from hunger (for which a key indicator is the prevalence of underweight children) and reducing by two-thirds the mortality rate of children under five years of age. The gold-standard approach for monitoring nutritional situation is to collect anthropometric data (height and weight) during household surveys.¹ However, this is limited by several factors including time and financial constraints.

The option adopted by most international and bilateral organizations is to include nutrition objectives in two types of surveys: the Demographic and Health Surveys (DHS), sponsored by the United States Agency for International Development (USAID),² and the Multiple Indicators Cluster Surveys (MICS), promoted by the United Nations Children's Fund (UNICEF).³ Both adhere to high standards of data quality, but are costly, time consuming, only conducted every 5 or 10 years and do not furnish information about smaller disaggregated units, such as states or provinces.

In 1988, the WHO Resolution to eradicate polio globally by the year 2000 led to several delivery strategies, including reinforcement of existing initiatives such as National Immunization Days (NIDs) and sub-national immunization days (SNIDs).⁴ The importance of these approaches recently gained recognition for being a strategic way to achieve the highest possible coverage in the shortest possible time.⁵

Earlier NID experiences in Cuba and the Czech Republic proved the effectiveness of this approach, but it was only with their deployment in Brazil in the 1980s that their role in eradicating the polio virus from a broad geographical area was recognized.⁶ Brazil also pioneered integrating vitamin A supplementation into NIDs in 1983.⁷ Innovative but sparse initiatives throughout the 1990s experimented with incorporation of anthropometric data collection.⁸⁻¹⁰

NIDs are gaining momentum worldwide: in 1998 they were adopted in 89 countries.¹¹ By 2005, according to the WHO Supplementary Immunization Activities Calendar, 91 countries employed NIDs or similar mass approaches.¹² A PubMed literature search (using the keywords: national immunization day) revealed another 10 countries relying on NID strategies, adding up to a total of 101. Considerable time and effort are

involved in setting up NIDs, which represent an excellent opportunity to aggregate other health actions to improve cost-effectiveness.

In January 2003, the Brazilian government launched the Zero Hunger strategy, integrating social programs to eradicate hunger and tackle poverty. *Bolsa Família*, a conditional cash transfer program, is one of the driving forces in this strategy and has reached 11.1 million families since 2006.

At the beginning of Zero Hunger, population-based nutritional data were largely outdated: the last national survey was the 1996 DHS, which was stratified at regional level in five major regions of the country. It was important for policy-makers to obtain estimates disaggregated at state level, as well as data on the baseline nutritional situation of underprivileged children. To address this problem, Brazil implemented five Health and Nutrition Days (HNDs) in 2005–7, using NIDs as platforms to monitor nutritional status and estimate the coverage of health and social welfare services, including conditional cash transfer benefits.

Implementing HNDs for vulnerable Brazilian populations

Brazil is composed of 26 states, one federal district and 5564 municipalities, with approximately 18 million children under five. It was decided that HNDs would be conducted among high-risk populations: children from the semi-arid region of the north-east (which constitutes the largest and most populated poverty-stricken area in Latin America); rural agrarian reform settlements; isolated black rural communities of *Quilombolas* (mostly descendants of runaway slaves of the 19th century) and remote municipalities of northern Brazil. Indigenous groups, also prone to malnutrition, are part of a separate study that is not covered in this paper.

It is necessary to provide some background to the decision-making processes which led to the inclusion of nutritional assessment in NIDs. The initiative to hold the first large HND in 2005 came from the Ministry of Social Development and the Fight Against Hunger (MDS) which coordinates the Zero Hunger strategy. The idea was immediately endorsed by two key sectors of the Ministry of Health (MoH): those in charge of nutrition policy and immunization programs. However, in 2007, the initiative to launch the northern region HND came from the MoH's nutrition coordination, with full support from MDS and UNICEF and even stronger cooperation with the MoH immunization coordination, which recognizes the cost-effectiveness of the strategy.

In 2005–6 surveys were conducted by a research network led by MDS in partnership with the MoH. At the state level, the study was jointly coordinated by 12 public universities and 23 state health authorities. The preparations for the HND led to the establishment of an unprecedented data-gathering network in Brazil. The methodology is available in detail online.¹³ In short, a multi-stage sampling approach was employed and each state was a separate domain; 30 municipalities were selected with consideration for the Brazilian Institute of Geography and Statistics' (IBGE) homogeneous micro-regions in which such municipalities are located. In each of the surveyed municipalities, two vaccination posts were randomly selected as secondary sampling units.

In each post, children were systematically selected from the queue. This resulted in a strict probability sample. State teams spent three days in each selected municipality recruiting and training local teams of ten people (five per vaccination post).

While visiting the municipalities, the training team checked and calibrated anthropometric equipment in local health facilities. Whenever necessary, municipal authorities were requested to replace faulty weighing scales. The MoH procured 560 wooden infantometers and an equal number of Seca stadiometers, which were later transferred to municipal health services.

Data collection took place on NIDs, from 08:00 to 17:00, when vaccination procedures were carried out. NIDs are always held on Saturdays. Children were selected as they waited in line for vaccination, with informed consent sought from the caregiver. After immunization, the anthropometric examination was conducted and the caregiver interviewed. The two-page questionnaire was kept as short as possible, collecting information about years of schooling of both parents; access to basic goods and public services; access to social benefits; breastfeeding; growth monitoring; occurrence of common childhood diseases; compliance with prenatal care. Each child's weight and length/height was measured twice, according to WHO recommendations, and recorded in the questionnaire.¹ Weight was also marked on the child's health card and explained to the mother. There was a team of five HND workers at each vaccination post: two dealt with anthropometry, two interviewed and the fifth coordinated the line and the flow of mothers and children. Both procedures (anthropometry and interview) lasted about 15 minutes.

Questionnaires were coded by trained nutrition students and 30% were double-checked by supervisors. They were then scanned and data were entered. Range and

consistency checks were carried out during the coding stage and after data entry. Nutritional status was assessed using NCHS as a reference.¹⁴

Results and discussion

Table 1 summarizes the main characteristics of HNDs held in Brazil in 2005–6. It was possible to draw inferences for different subgroups of underprivileged children that had never before been studied in such detail, including state-level data from the semi-arid region and information on specific vulnerable populations such as agrarian reform settlements and *Quilombola* communities.

Anthropometric data of 16934 children was submitted to thorough quality assessment. Differences between duplicate length/height measurements of more than 1 cm were considered inaccurate (172 cases, about 1.1%), as well as pairs of weight measures with differences of over 0.2 kg (213 cases, or 1.3%). Biological plausibility was also considered, resulting in 16239 valid observations.

Table 2 shows the type of information, which is extremely useful for local and national policy-makers, obtained during the first three HNDs in Brazil.¹³ In India, a similar survey was reported, aimed at assessment of the nutritional status of under-fives during an NID in the town of Chandigarh.¹⁵

An important methodological concern with obtaining data through HNDs is the possibility of selection bias because respondents are only those who attend vaccination posts. In Brazil, vaccination coverage during NIDs is very high indeed; in August 2005 the estimated polio vaccine coverage was well over 95% of all children under five, thus reducing the likelihood of selection bias. In the last DHS carried out in Brazil in 1996, children who were not fully vaccinated presented undernutrition rates three times higher than those who were vaccinated. In a simulation exercise, we applied this relative risk to estimate population-based prevalence of undernutrition. With this correction, the prevalence estimates shown would increase by 0.7 percent or less. The high coverage of the survey enabled incorporation of sample weights into the database to make inferences about the studied populations.

Table 2 shows, as a comparison, data obtained by household surveys (PNAD 2005) held by the National Institute of Statistics (IBGE). Even though families sampled during the HND in the semi-arid region were concentrated in the lowest socioeconomic classes,¹³ they had adequate access to electricity (95.4%) and reasonable access to water supply (76.3%).

These figures are well in line with those produced by the PNAD 2005 for the north-east region, 92.8% and 71.9% respectively. Similar agreement with PNAD was observed for the Quilombola communities. This comparison could be used as a proxy to 'validate' the sample selected and the accuracy of the information provided. However the same is not true for the population living in rural settlements. Rather than indicating a failure of the HND approach, a far more reasonable interpretation is that these rural populations, known for their hardship, are so deprived that their access to public services is much lower than the average rural populations in the north-east.

Costs of the largest survey in 2005 are presented in [Table 3](#). Government staff (such as coordinators) who participated in the survey received an additional recompense on top of their regular salaries because they had to work longer hours and weekends. The cost per child examined was around US\$ 16. Size and coverage of this survey is comparable to those of DHS or MICS surveys.

As for timeframe, it took four months to receive the 16900 questionnaires from the field, manage data entry and do cleaning and basic processing. Three months later, analysis of the database was complete and ready for press release. Compared to other strategies employing household data collection, the cost of a DHS is around US\$ 3 million, usually lasting 18 months.¹⁶ In Brazil, the 2006/7 DHS cost US\$ 3.3 million and is expected to collect data on 5000 preschool children at a cost of US\$ 660 per child.¹⁷ MICS costs are modest compared to DHS and results are usually available within 18 months; surveys vary in size with an average sample size of around 6300 households. Currently an independent evaluation is being held to calculate costs of MICS.¹⁸ Comparison of HND costs with those of MICS or DHS should be interpreted with caution, because the latter collect a much larger amount of information than HND.

There are three main advantages for using HND surveys.

- In countries where the cost of MICS or DHS disaggregated samples are prohibitive, HND can provide such disaggregated data.
- There is a large involvement of local health officials in collecting data for an HND and this generates wide interest in the results as well as commitment to act upon their results, while this is usually minimal or non-existent in large, centrally-planned and implemented surveys.

- DHS and MICS surveys are important tools to ministries of health, whereas data generated by HNDs are essential to the local level health authorities. It is not proposed that HNDs should replace MICS or DHS, but that, due to their low cost, they should be carried out frequently to provide local information. DHS and MICS results, when these are carried out, can be compared to HND findings to check the validity of the latter, as was done with the PNAD results.

As a general policy of the Ministry of Social Development and the Fight Against Hunger, databases generated by HNDs are made available to the public via the Social Information Consortium.¹⁹ A similar strategy is adopted by the DHS programme.² Regarding MICS, countries are encouraged to sign a Memorandum of Understanding, which emphasizes that databases will be available to the general public after publication of the main report.³

A lesson learned from the survey was that the 16200 children who had nutrition assessment in 2005 represented less than 0.8% of the 2 million children vaccinated on that NID, and this did not lead to any disruption of the vaccination effort. In general there were very few refusals. In 2007, HND surveys were carried out in the north region and in some states under local initiative. The federal government plans to repeat the HND in the semi-arid region in 2008 or 2009.

Implementation of large scale HNDs in conjunction with NIDs proved to be feasible in Brazil, resulting in data which are very relevant for public policy managers, obtained over a short period of time and at reasonably low cost. It is sensible to conclude that this experience could be reproduced wherever NID coverage is very high, linking other health interventions to immunization, as recommended by the Global Immunization Vision and Strategy.²⁰

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Table 1. - Description and scope of Health and Nutrition Days, Brazil 2005–6

Population / Region	Date or period	Sampled states / states in the region	Sampled Municipalities/ Municipalities in the region	Number of 0–5yr old children sampled	0–5 yr old population for which inference was possible
Semi-arid / NE	20 August 2005	9 / 9	277 / 1133	16239	2 300 000
Rural settlements / NE	August/September 2005	10 / 10	40 / 1877	1305	230 000
<i>Quilombolas</i> / National	August/September 2006	22 / 27	60 / 5564	2723	90 000
Amazon state / North	27 August 2006	1 / 7	43 / 62	4280	454 000

^a NE=North-east region

^bNorth=North region

Table 2. - Data derived from the National Health and Nutrition Days and comparisons with household based data. Brazil 2005–6

Indicator	Population / Region		
	Semi-arid North-east ^b (%)	Land reform settlements North-east ^b (%)	Quilombolas National ^c (%)
Length/height-for-age deficit ^a	6.6 ^d	15.5 ^e	11.6 ^f
Weight-for-age deficit ^a	5.6 ^d	8.6 ^e	8.1 ^f
Weight-for-length/height deficit ^a	2.8 ^d	7.3 ^e	2.0 ^f
Child has a birth certificate (informed)	96.0	92.1	93.9
Child has a health card (confirmed)	98.6	95.2	95.6
Weight recorded on the card last 3 months	64.5	45.5	57.6
Mothers with 5+ prenatal care visits	80.5	61.7	74.0
Head of household with <4 years schooling	41.8	81.4	46.1
Families with Bolsa Família Programme	35.2	38.9	51.7
HH with electricity	95.4	54.4	79.9
HH with water supply	76.3	7.5	29.6
HH with electricity (PNAD 2005) ^g	92.8 ^h	77.2 ⁱ	82.5 ^j
HH with water supply (PNAD 2005) ^g	71.9 ^h	19.3 ⁱ	21.0 ^j

^a Below –2.0 Z-scores, NCHS reference

^b Reference 13

^c Source: MDS Available at: <http://www.mds.gov.br/sagi/estudos-e-pesquisas/pesquisas/sumarios> Accessed 20 August 2007

^d Mean child age=29.2 months. CI_{95%} [27.8–30.6] SE =0.711 Source: new analysis from Reference 19

^e Mean child age=31.9 months. CI_{95%} [28.8–35.0] SE =1.556 Source: new analysis from Reference 19

^f Mean child age=29.6 months. CI_{95%} [29.0–30.2] SE =0.308 Source: MDS internal data

^g Pesquisa Nacional por Amostra de Domicílios, PNAD 2005 Available

at: <http://www.sidra.ibge.gov.br/bda/pesquisas/pnad/default.asp> Accessed 20 August 2007

^h Data refers to total north-east region

ⁱ Data refers to rural north-east region

^j Data refers to rural Brazil

HH, household

Table 3. - Cost components of the semi-arid region's Health and Nutrition Day, Brazil 2005

Cost Component (US\$) ^a	Unit cost	Quantity	Total
State coordinators	762.71	18	13728.78
Administrative coordinators	2268.14	2	4536.28
Training teams personnel	1525.42	60	91525.20
Per diems / travel costs (preparatory meetings)	423.70	30 people	12711.00
Local municipal teams	12.71	2200 people	27962.00
Data entry	4237.29	1	4237.29
Data analyses	16949.15	1	16949.15
Anthropometers ^b	84745.76	1	84745.76
TOTAL	-	-	256395.46
COST PER CHILD EXAMINED			15.79

^a Official conversion rate for August 2005 1USD=R\$ 2,36

^b Purchased by the Ministry of Health, Brazil.