Lessons from the field

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

Leonor Maria Pacheco Santos, Rômulo Paes-Sousa, Jarbas Barbosa da Silva Junior & César Gomes Victora

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 policy-makers in a timely fashion. The gold-standard approach for monitoring nutritional situations 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, and later integrated them with vitamin A supplementation. 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 under five years of age. It was decided that HNDs would be carried out among high-risk populations: children from the semi-arid northeastern region; agrarian reform settlements; isolated rural black 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 who 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 policy-makers, 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, it is necessary to set up low-cost, real-time monitoring systems of nutritional status which can provide feedback to managers and policy-makers in a timely fashion. This is especially important for monitoring progress of two Millennium Development Goals: halving the number of people who suffer from hunger (for which a key indicator is the prevalence of underweight children) and reducing the mortality rate of children under five years of age by two-thirds. The gold-standard approach for monitoring nutritional situations is to collect anthropometric data (height and weight) during household surveys. 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: Demographic and Health Surveys (DHS), sponsored by the United States Agency for International Development (USAID), and Multiple Indicators Cluster Surveys (MICS), promoted by the United Nations Children’s Fund (UNICEF). Both adhere to high standards of data quality, but are costly, time consuming, only conducted every five 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 2000 led to several delivery strategies, including reinforcement of existing initiatives such as National Immunization Days (NIDs) and sub-national immunization days. The importance of these approaches recently gained recognition for being a strategic way to achieve the highest possible coverage in the shortest possible time.

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. Brazil also pioneered integrating vitamin A supplementation into NIDs in 1983. In the 1990s, a few isolated, albeit innovative, initiatives experimented with the incorporation of anthropometric data collection.

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NIDs are gaining momentum worldwide: in 1998 they were adopted in 89 countries. By 2005, according to the WHO Supplementary Immunization Activities Calendar, 91 countries employed NIDs or similar mass approaches. A PubMed literature search (using the keywords: “national immunization day”) revealed another 10 countries relying on NID strategies, giving a total of 101 countries. Considerable time and effort is 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 programmes to eradicate hunger and tackle poverty. Bolsa Família, a conditional cash transfer programme, is one of the driving forces of this strategy and has benefited 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 a regional level in five major regions of the country. It was important for policy-makers to obtain estimates that were disaggregated at a 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 2005–2007, 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 years of age. It was decided that HNDs would be conducted among high-risk populations: children from the semi-arid region of the northeast (which constitutes the largest and most populated poverty-stricken area in Latin America); rural agrarian reform settlements; isolated rural black communities of Quilombolas (mostly descendants of runaway slaves from the 19th century) and remote municipalities in 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 on the decision-making processes that 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, which coordinates the Zero Hunger strategy. The idea was immediately endorsed by two key sectors of the Ministry of Health: those in charge of nutrition policy and immunization programmes. However, in 2007, the initiative to launch the northern region HND came from the Ministry of Health’s nutrition sector, with the full support of the Ministry of Social Development and the Fight Against Hunger and UNICEF, and even stronger cooperation from the Ministry of Health’s immunization sector, which recognizes the cost-effectiveness of the strategy.

In 2005–2006 surveys were conducted by a research network led by the Ministry of Social Development and the Fight Against Hunger in partnership with the Ministry of Health. 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.

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 microregions in which such municipalities are located. In each of the surveyed municipalities, two vaccination posts were randomly selected as secondary sampling units.

At 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 10 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 Ministry of Health procured 560 wooden infantometers and the same number of Seca stadiometers, which were later transferred to municipal health services.

Data collection took place during NIDs, from 08:00 to 17:00, while vaccination procedures were carried out. NIDs are always held on Saturdays. Children were selected as they waited in line for vaccination, and informed consent was sought from the parent or guardian. 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; and compliance with prenatal care. Each child’s weight and length/height was measured twice, according to WHO recommenda-

### Table 1. Description and scope of HNDs, Brazil 2005–2006

<table>
<thead>
<tr>
<th>Population, region</th>
<th>Date or period</th>
<th>Sampled states : states in region</th>
<th>Sampled municipalities : municipalities in the region</th>
<th>No. 0–5 year old children sampled</th>
<th>0–5 year old population for which inference was possible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semi-arid, north-east region</td>
<td>20 August 2005</td>
<td>9 : 9</td>
<td>277 : 1133</td>
<td>16 239</td>
<td>2 300 000</td>
</tr>
<tr>
<td>Rural settlements, north-east region</td>
<td>August–September 2005</td>
<td>10 : 10</td>
<td>40 : 1877</td>
<td>1 305</td>
<td>230 000</td>
</tr>
<tr>
<td>Quilombolas, national</td>
<td>August–September 2006</td>
<td>22 : 27</td>
<td>60 : 5564</td>
<td>2 723</td>
<td>90 000</td>
</tr>
<tr>
<td>Amazonas state, north region</td>
<td>27 August 2006</td>
<td>1 : 7</td>
<td>43 : 62</td>
<td>4 280</td>
<td>454 000</td>
</tr>
</tbody>
</table>

HND, Health and Nutrition Days.
Lessons from the field
Using National Immunization Day to monitor health indicators
Leonor Maria Pacheco Santos et al.

Table 2. Data derived from HNDs and comparisons with household-based data, Brazil 2005–2006

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Semi-arid, north-east regiona (%)</th>
<th>Land reform settlements, north-east regionb (%)</th>
<th>Quilombolas, nationalc (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length/height-for-age deficitd</td>
<td>6.6d</td>
<td>15.5e</td>
<td>11.6f</td>
</tr>
<tr>
<td>Weight-for-age deficit</td>
<td>5.6d</td>
<td>8.6e</td>
<td>8.1f</td>
</tr>
<tr>
<td>Weight-for-length/height deficit</td>
<td>2.8d</td>
<td>7.3e</td>
<td>2.0f</td>
</tr>
<tr>
<td>Child has a birth certificate (informed)</td>
<td>96.0</td>
<td>92.1</td>
<td>93.9</td>
</tr>
<tr>
<td>Child has a health card (confirmed)</td>
<td>98.6</td>
<td>95.2</td>
<td>95.6</td>
</tr>
<tr>
<td>Weight recorded on the card last 3 months</td>
<td>64.5</td>
<td>45.5</td>
<td>57.6</td>
</tr>
<tr>
<td>Mothers with &gt; 5 prenatal care visits</td>
<td>80.5</td>
<td>61.7</td>
<td>74.0</td>
</tr>
<tr>
<td>Head of household with &lt; 4 years schooling</td>
<td>41.8</td>
<td>81.4</td>
<td>46.1</td>
</tr>
<tr>
<td>Families with Bolsa Família Programme</td>
<td>35.2</td>
<td>38.9</td>
<td>51.7</td>
</tr>
<tr>
<td>Household with electricity</td>
<td>95.4</td>
<td>54.4</td>
<td>79.9</td>
</tr>
<tr>
<td>Household with water supply</td>
<td>76.3</td>
<td>7.5</td>
<td>29.6</td>
</tr>
<tr>
<td>Household with electricity (PNAD 2005)d</td>
<td>92.8</td>
<td>77.2</td>
<td>82.5j</td>
</tr>
<tr>
<td>Household with water supply (PNAD 2005)d</td>
<td>71.9</td>
<td>19.3</td>
<td>21.0j</td>
</tr>
</tbody>
</table>

c Source: based on reference 19.
d Mean child age = 29.2 months. 95% confidence interval: 27.8–30.6; standard error = 0.711. Source: based on reference 19.
e Mean child age = 31.9 months. 95% confidence interval: 28.8–35.0; standard error = 1.556. Source: based on reference 19.
f Mean child age = 29.6 months. 95% confidence interval: 29.0–30.2; standard error = 0.308. Source: based on reference 19.
g Mean child age = 29.2 months. 95% confidence interval: 27.8–30.6; standard error = 0.711. Source: based on reference 19.
h Mean child age = 29.6 months. 95% confidence interval: 29.0–30.2; standard error = 0.308. Source: Ministry of Social Development and the Fight Against Hunger internal data.
j Data refers to total north-east region.
k Data refers to rural north-east region.
l Data refers to rural Brazil.

Results and discussion

Table 1 summarizes the main characteristics of HNDs held in Brazil in 2005–2006. 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 on 16 934 children were submitted to thorough quality assessment. Differences of more than 1 cm between duplicate length/height measurements were considered inaccurate (172 cases, about 1.1%), as well as pairs of weight measurements with a difference of over 0.2 kg (213 cases, or 1.3%). Biological plausibility was also considered, resulting in 16 239 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. In India, a similar survey was reported, aimed at assessing the nutritional status of children under five years of age during an NID in the town of Chandigarh.

An important methodological concern with the obtaining of 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 years of age, 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% or less. The high coverage of the survey enabled incorporation of sample weights into the database to make inferences about the populations under study.

Table 2 shows, as a comparison, data obtained from household surveys (PNAD 2005) conducted by the Brazilian Institute of Geography and Statistics (IBGE). Even though families sampled during the HND in the semi-arid region were concentrated in the lowest socioeconomic classes, they had adequate access to electricity (95.4%) and reasonable access to water supplies (76.3%). These figures are 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 popula-
Section from the field: Using National Immunization Day to monitor health indicators

<table>
<thead>
<tr>
<th>Cost component</th>
<th>Unit cost (US$)</th>
<th>Quantity</th>
<th>Total cost (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>State coordinators</td>
<td>762.71</td>
<td>18</td>
<td>13 728.78</td>
</tr>
<tr>
<td>Administrative coordinators</td>
<td>2 268.14</td>
<td>2</td>
<td>4 536.28</td>
</tr>
<tr>
<td>Training teams personnel</td>
<td>1 525.42</td>
<td>60</td>
<td>91 525.20</td>
</tr>
<tr>
<td>Per diems/travel costs</td>
<td>423.70</td>
<td>30 people</td>
<td>12 711.00</td>
</tr>
<tr>
<td>(preparatory meetings)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local municipal teams</td>
<td>12.71</td>
<td>2200 people</td>
<td>27 962.00</td>
</tr>
<tr>
<td>Data entry</td>
<td>4 237.29</td>
<td>1</td>
<td>4 237.29</td>
</tr>
<tr>
<td>Data analyses</td>
<td>16 949.15</td>
<td>1</td>
<td>16 949.15</td>
</tr>
<tr>
<td>Anthropometers</td>
<td>84 745.76</td>
<td>1</td>
<td>84 745.76</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>256 395.46</td>
</tr>
<tr>
<td>Cost per child examined</td>
<td></td>
<td></td>
<td>15.79</td>
</tr>
</tbody>
</table>

a Official conversion rate for August 2005 US$ 1 = R$ 2.36.
b Purchased by the Ministry of Health, Brazil.

As a general policy of the Ministry of Social Development and the Fight Against Hunger, databases generated by HNDs are essential for local level 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 with HND findings to check the validity of the latter, as was done with the PNAD results.

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Competing interests: None declared.
Les problèmes Pour réaliser les objectifs du Millénaire pour le développement, il est nécessaire d’établir des systèmes de surveillance en temps réel et peu onéreux, pouvant fournir des informations en retour aux responsables et aux décideurs dans un délai convenable. La démarche considérée comme optimale pour surveiller les situations nutritionnelles consiste à réaliser des enquêtes auprès des ménages. Néanmoins, ces enquêtes sont coûteuses, prennent du temps et ne renseignent pas sur les unités désagrégées de niveau inférieur.

Démarche Le Brésil a été le premier pays à lancer des Journées nationales de la vaccination (JNV) dans les années 80 et à associer par la suite au vaccin une supplémentation en vitamine A. Le présent rapport évoque la mise en œuvre de cinq Journées de la santé et de la nutrition (JND) à grande échelle, utilisant des JNV comme plateforme pour suivre l’état nutritionnel et évaluer la couverture par les services d’aide sanitaire et sociale, y compris les transferts conditionnels d’argent liquide.

Contexte local Le Brésil comprend 26 Etats, un district fédéral et 5564 municipalités, qui comptent environ 18 millions d’enfants de moins de cinq ans. Il a été décidé d’organiser des HDN parmi des populations à haut risque, à savoir les enfants vivant dans la région semi-àriide du Nord-est, des implantations établies suite à la réforme agraire, des communautés noires rurales isolées ou quilombolas et des municipalités de l’État d’Amazonie.

Modification pertinente Il a été possible de tirer des conclusions pour près de 3 millions d’enfants appartenant à différents sous-groupes de populations défavorisées, jamais encore étudiées à ce niveau de détail, et notamment à l’échelle fédérale.

Enseignements tirés La mise en œuvre d’HDN à grande échelle associées à des JNV s’est révélée praticable au Brésil et a fourni des données très intéressantes pour les décideurs, dans un délai court et à un coût modéré. Il est raisonnable de conclure que l’on pourrait reproduire l’expérience rapportée partout où la couverture des JNV est très élevée.
Lesions from the field

Using National Immunization Day to monitor health indicators

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