

## Lessons from the field

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

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**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 north-eastern 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.

Bulletin of the World Health Organization 2008;86:474–479.

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

## 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.<sup>1</sup> 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),<sup>2</sup> and Multiple Indicators Cluster Surveys (MICS), promoted by the United Nations Children's Fund (UNICEF).<sup>3</sup> 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 re-

inforcement of existing initiatives such as National Immunization Days (NIDs) and sub-national immunization days.<sup>4</sup> The importance of these approaches recently gained recognition for being a strategic way to achieve the highest possible coverage in the shortest possible time.<sup>5</sup>

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.<sup>6</sup> Brazil also pioneered integrating vitamin A supplementation into NIDs in 1983.<sup>7</sup> In the 1990s, a few isolated, albeit innovative, initiatives experimented with the incorporation of anthropometric data collection.<sup>8–10</sup>

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doi:10.2471/BLT.07.043638

(Submitted: 13 May 2007 – Revised version received: 6 September 2007 – Accepted: 11 September 2007 – Published online: 12 February 2008)

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

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

HND, Health and Nutrition Days.

NIDs are gaining momentum worldwide: in 1998 they were adopted in 89 countries.<sup>11</sup> By 2005, according to the WHO Supplementary Immunization Activities Calendar, 91 countries employed NIDs or similar mass approaches.<sup>12</sup> 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 north-east (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.<sup>13</sup> 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 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-

tions, and recorded in the questionnaire.<sup>1</sup> Weight was also marked on the child's health card and explained to the parent/guardian. 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 parents 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.<sup>14</sup>

## 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.<sup>13</sup> 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.<sup>15</sup>

An important methodological concern with the obtainment 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

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

Indicator	Population, region		
	Semi-arid, north-east region <sup>a</sup> (%)	Land reform settlements, north-east region <sup>a</sup> (%)	<i>Quilombolas</i> , national <sup>b</sup> (%)
Length/height-for-age deficit <sup>c</sup>	6.6 <sup>d</sup>	15.5 <sup>e</sup>	11.6 <sup>f</sup>
Weight-for-age deficit <sup>c</sup>	5.6 <sup>d</sup>	8.6 <sup>e</sup>	8.1 <sup>f</sup>
Weight-for-length/height deficit <sup>c</sup>	2.8 <sup>d</sup>	7.3 <sup>e</sup>	2.0 <sup>f</sup>
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
Household with electricity	95.4	54.4	79.9
Household with water supply	76.3	7.5	29.6
Household with electricity (PNAD 2005) <sup>g</sup>	92.8 <sup>h</sup>	77.2 <sup>i</sup>	82.5 <sup>j</sup>
Household with water supply (PNAD 2005) <sup>g</sup>	71.9 <sup>h</sup>	19.3 <sup>i</sup>	21.0 <sup>j</sup>

<sup>a</sup> Source: reference 13.

<sup>b</sup> Source: Ministry of Social Development and the Fight Against Hunger. Available at: <http://www.mds.gov.br/sagi/estudos-e-pesquisas/pesquisas/sumarios> [accessed 20 August 2007].

<sup>c</sup> Below –2.0 Z-scores, NCHS reference.

<sup>d</sup> Mean child age = 29.2 months. 95% confidence interval: 27.8–30.6; standard error = 0.711. Source: based on reference 19.

<sup>e</sup> Mean child age = 31.9 months. 95% confidence interval: 28.8–35.0; standard error = 1.556. Source: based on reference 19.

<sup>f</sup> 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.

<sup>g</sup> 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].

<sup>h</sup> Data refers to total north-east region.

<sup>i</sup> Data refers to rural north-east region.

<sup>j</sup> Data refers to rural Brazil.

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,<sup>13</sup> 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-

tions, known for their hardship, are so deprived that their access to public services is much lower than the average among 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 additional compensation 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 16 900 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, and usually lasts 18 months.<sup>16</sup> In Brazil, the 2006–2007 DHS cost US\$ 3.3 million and is expected to collect data on 5000 preschool children at a cost of US\$ 660 per child.<sup>17</sup> MICS costs are modest compared to DHS costs and their 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.<sup>18</sup> 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 is prohibitive, HND can provide such disaggregated data.
- A large number of local health officials are involved in collecting data for an HND and this generates widespread interest in the results as well as commitment to act upon their results, which is not usually the case in large, centrally-planned and implemented surveys.
- DHS and MICS are important tools for ministries of health, whereas data

Table 3. Cost components of the semi-arid region's HND, Brazil 2005

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

<sup>a</sup> Official conversion rate for August 2005 US\$ 1 = R\$ 2.36.

<sup>b</sup> Purchased by the Ministry of Health, Brazil.

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.

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.<sup>19</sup> A similar strategy is adopted by the DHS programme.<sup>2</sup> 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.<sup>3</sup>

A lesson learned from the survey was that the 16 200 children who had nutrition assessment in 2005 represented less than 0.8% of the 2 million children vaccinated on that NID, and this in no way disrupted 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, generating extremely relevant data for public policy managers. These data were 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.<sup>20</sup> ■

### Acknowledgements

At the time of this study, Rômulo Paes-Sousa acted as Secretary of Evaluation and Information Management, Ministry of Social Development and the Fight against Hunger, and Jarbas Barbosa da Silva Junior acted as Secretary of Health Surveillance at the Ministry of Health.

We are grateful to the core HND staff: Flavia Conceição Santos Henrique, Lucélia Luiz Pereira, and Micheli Dantas Soares, all from the Ministry of Social Development and the Fight Against Hunger, as well as to Luciene Burlandy and Maisa Cruz Martins, who coordinated the project at the Universidade Federal Fluminense. We also acknowledge the effort and cooperation of the 35 state coordinators from state health departments and local universities.

**Competing interests:** None declared.

## Résumé

**Journée nationale de la vaccination : une stratégie pour surveiller les indicateurs sanitaires et nutritionnels**

**Problématique** 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 (HND) 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-aride du Nord-est, des implantations établies suite à la réforme agraire, des communautés noires rurales isolées ou *quilombolas* et des municipalités de l'Etat d'Amazonie.

**Modifications pertinentes** 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'HND 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.

## Resumen

**Uso de los Días Nacionales de Inmunización como estrategia para vigilar los indicadores sanitarios y nutricionales**

**Problema** Si se desea alcanzar los Objetivos de Desarrollo del Milenio, es necesario establecer sistemas de vigilancia en tiempo real de bajo costo que puedan aportar retroinformación de manera oportuna a los administradores y los responsables de formular políticas. El sistema considerado óptimo para vigilar la situación nutricional consiste en realizar encuestas domiciliarias. Sin embargo, dichas encuestas entrañan un alto costo en términos de tiempo y dinero y no aportan información sobre unidades desagregadas más pequeñas.

**Enfoque** El Brasil fue el primer país que llevó a cabo Días Nacionales de Inmunización en los años ochenta, y que integró en ellos más adelante la administración de suplementos de vitamina A. En este artículo se analiza la implementación a gran escala de cinco Días de Salud y Nutrición (DSN) en los que se usaron los DNI como plataforma para vigilar la situación nutricional y estimar la cobertura de servicios de salud y asistencia social, incluidas las prestaciones de transferencia monetaria condicionada.

**Contexto local** El Brasil comprende 26 Estados, un distrito federal y 5564 municipios, en los que viven aproximadamente 18 millones de niños menores de cinco años. Se decidió llevar a cabo los DSN entre poblaciones de alto riesgo, a saber, niños de la región nororiental semiárida; asentamientos de reforma agraria; comunidades negras rurales aisladas o *quilombolas*, y municipios del Estado de Amazonas.

**Cambios destacables** Se pudieron extraer conclusiones respecto a casi 3 millones de niños de diferentes subgrupos de poblaciones desfavorecidas a los que nunca se había estudiado de forma tan pormenorizada, incluidos datos de ámbito estatal.

**Enseñanzas extraídas** La implementación de DSN a gran escala coincidiendo con los DNI fue una iniciativa viable en el Brasil y permitió obtener, en poco tiempo y a un costo razonablemente bajo, datos que revisten gran interés para los responsables de formular políticas. Cabe concluir que la experiencia aquí descrita podría reproducirse en todos aquellos casos en que la cobertura de DNI sea muy alta.

## ملخص

**اليوم الوطني للتمنيع: استراتيجية لرصد المؤشرات الصحية والتغذوية**

الصحية وخدمات الرفاه الاجتماعية والتي تشمل المنافع الناجمة عن التمويل المشروط للأموال .

**الموقع المحلي:** تتألف البرازيل من 26 ولاية، ومقاطعة فيدرالية واحدة و5564 بلدية، وفيها ما يقرب من 18 مليون طفل ممن تقل أعمارهم عن خمس سنوات. وانعقد العزم على تنفيذ أيام صحية وتغذوية تستهدف السكان المعرضين لأخطار مرتفعة وهم الأطفال من المناطق التي تعاني من الجفاف في شمال شرق البلاد، والتجمعات السكانية للإصلاح الزراعي، والمجمعات الريفية المنعزلة للسود التي يطلق عليها كويلومبولاس وبلديات ولاية الأمازون.

**التغيرات ذات العلاقة:** كان من الممكن الاستدلال أن ما يقرب من 3 ملايين طفل من مختلف المجموعات الفرعية للسكان المحرومين الذين لم تجر عليهم

**المشكلة:** من الضروري، لبلوغ المرامي الإنمائي للألفية، أن نضع نُظماً للرصد تكون منخفضة التكاليف وتعمل بصورة فورية وتستطيع توفير المعلومات الارتجاعية للمديرين ورسمي السياسات بالسرعة المطلوبة. ويتمثل الأسلوب ذو المعايير الذهبية لرصد الوضع التغذوي في إجراء مسوحات على مستوى الأسرة، إلا أن ذلك يتطلب تكاليف مرتفعة، ويستغرق وقتاً طويلاً ولا يوفر معلومات عن الوحدات الصغيرة المتناثرة.

**الأسلوب:** كانت البرازيل هي الرائدة في مجال الأيام الوطنية للتمنيع في الثمانينيات ثم بإدراج فيتامين A التكميلي منها بعد ذلك. وناقش هذا التقرير تنفيذ خمسة من الأيام الصحية والتغذوية على نطاق واسع مستخدمين الأيام الوطنية للتمنيع منطلقاً لرصد الحالة الصحية ولتقدير التغطية بالخدمات

معطيات وثيقة الصلة لراسمي السياسات، تم جمعها في فترة زمنية قصيرة وبتكاليف منخفضة نسبيًا. ومن المعقول أن نستنتج أن الخبرة المستفادة والمسجلة في هذا التقرير يمكن أن يعاد تنفيذها في كل مكان تكون فيه التغطية بالأيام الوطنية للتمنيع مرتفعة جدًا.

أية دراسة من قبل تتضمن مثل هذه التفاصيل حول المعطيات على مستوى الولاية.

الدروس المستفادة: لقد ثبت أن تنفيذ أيام صحية وتغذوية على نطاق واسع مقترنة بالأيام الوطنية للتمنيع هو أمر ممكن في البرازيل، وقد أدى إلى توفير

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