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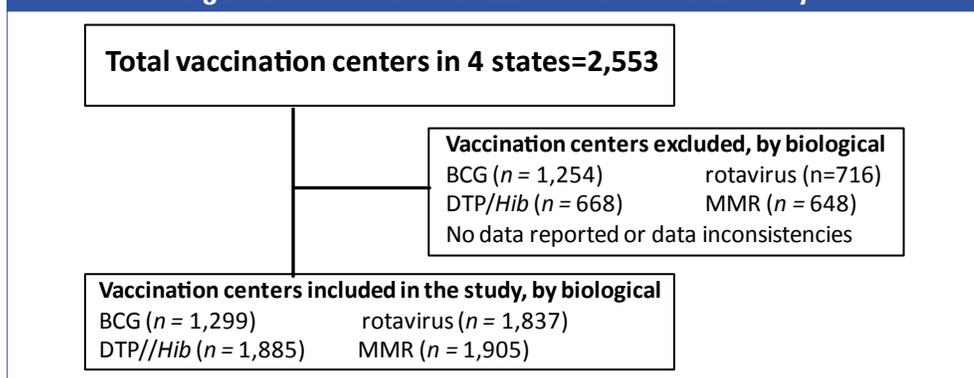
Immunize and Protect Your Family

February 2012



Brazil's Experience with the Development of a Vaccine-Wastage Evaluation System

Figure 1: Selection of vaccination centers for the study



Background

The expansion and extension of Brazil's national Expanded Program on Immunization (EPI) made it necessary to create mechanisms for the management of vaccine distribution and use throughout the country. Inaccurate estimates of vaccine needs are frequently used in procurement planning and distribution of immunobiologicals, which could lead to stock-outs and wastage. In order to address this issue, Brazil's EPI conducted a systematic evaluation to determine the actual vaccine use and the financial costs associated with vaccine wastage.

In 2006, the Information System for Immunobiologicals (AIU in Portuguese) was developed using *Delphi*, with a MS Access database, to meet the needs of a vaccine and supply management system for the EPI. In 2010, the AIU was upgraded to *PostgreSQL*, in keeping with the country's policy of using open source software. This tool is meant to enable the monitoring of vaccine planning, distribution, use of vials, and actual administration and loss of doses of 44 products, including vaccines and syringes. AIU also enabled the systematic calculation of vaccine wastage.

AIU was initially implemented in four states. The data generated were analyzed to estimate wastage and the main causes leading to the loss of vaccines by the level of the immunization program (national, sub-national and local). In short, the AIU provides a more precise vaccine forecasting and needs estimate.

To illustrate, the results of the specific wastage analysis using the AIU system are reported to assess wastage of BCG 10-dose vials, the diphtheria-tetanus-pertussis-*Haemophilus influenzae* type b vaccine (DTP/Hib or tetavalente) 5-dose vials, the oral rotavirus vaccine single dose vial, and the measles-mumps-rubella vaccine (MMR) 10-dose vials. The goal of having de-

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Adherence to Immunization Recommendations by the Health Staff of the American Hospital. Montevideo, Uruguay, 2011

Introduction

Health care workers are a group at risk of acquiring and transmitting infectious diseases, many of which can be prevented by active immunization. Health workers in constant contact with patients and/or body fluids have a higher risk of acquiring or transmitting disease than those who have occasional contact with patients and the hospital environment [1].

People working in the health sector have regular exposure to infectious agents. Hand washing and routine practice of various standard or precautions for patients helps lower the risk of acquiring infectious diseases. Among the elements needed to control infections is the development of an adequate immunization program [2].

In Uruguay, it is mandatory for the entire population to receive the Diphtheria-Tetanus-Pertussis (DTP) vaccine, the Td (diphtheria and tetanus) vaccine every 10 years, as well as hepatitis A, hepatitis B and varicella vaccines [3]. On 19 September 2005, the Decree S/94 established mandatory hepatitis B vaccination as a condition of employment for workers in private and public health facilities [4]. The country also recommended that health workers receive annual influenza vaccination.

The study was conducted at the American Hospital in Montevideo, a tertiary care institution of high complexity, and of national regard in the private subsector. It is a member of the Interior Medical Federation (FEMI) and has a cardiology center of excellence for children and adults, a prostheses trauma center and a wide range of specialized areas. The health facility contains

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tailed information on vaccine distribution and wastage was to guide appropriate decision-making.

Methods

The data used was reported by 2,553 vaccination centers registered in 600 municipalities of the four states where AIU was initially implemented in 2008: Amazonas (AM), Mato Grosso do Sul (MS), Rio Grande do Norte (RN), and Santa Catarina (SC). Several vaccination centers had to be excluded due to incomplete records or inconsistent data. The study finally included data for 1,299 vaccination centers for BCG; 1,885 for DTP/Hib, 1,837 for rotavirus and 1,905 for MMR (Figure 1). Of the vaccination centers, 30% had complete data for the year 2008 (January to December) and 70% had incomplete data (between one and 11

months reported).

Data was collected on vaccine type and presentation (number of doses per vial), financial costs, and percentage of total vial use, total doses administered, wastage of unopened vials (physical losses), and the wastage of open vials.

Physical loss is defined as the total of unused doses in a vial that has expired, broken or where cold chain has been interrupted. Wastage of open vials is the difference between the total doses of open vials and the total doses administered, divided by the total doses of open vials multiplied by one hundred. The data helped calculate the frequency and magnitude of losses. For the purpose of estimating the financial costs associated with wastage, the price of each vaccine dose was considered to be: US\$0.30 (R\$0.5703) for a dose of BCG

vaccine, US\$3.13 (R\$6.0340) for the DTP/Hib, US\$9.27 (R\$17.8587) for rotavirus and US\$3.22 (R\$6.21) for MMR.

Results

The mean vaccine wastage was 74% for BCG (range 64.4% to 79.9%); 23.9% for DTP/Hib (range 10.3% to 32.6%); 3.2% for rotavirus (range 1.3% to 4.8%); and 65.7% for MMR (range, 46.1% to 72.4%). For BCG, the ratio of number of doses in vials opened to number administered was 3.8:1, suggesting that for each child vaccinated, almost 3 doses were wasted. Ratios were 1.3:1 for DTP/Hib; 1:1 for rotavirus and almost 3:1 for MMR. In the four state immunization programs, 1.5 million MMR vaccine doses (150,000 10-dose vials) were used, while only 550,000 MMR doses were administered. The cost per dose administered was US\$9.41 (R\$18.10). The total ex-

Table 1: Technical wastage rate (open vials), used and administered doses and expenditure per vaccine, 4 states in Brazil, 2008

	Doses used	Doses administered	Technical wastage rate (%)	Optimal cost of dose administered per vial	Actual cost of dose administered	Ideal total expenditure of administration (without wastage)	Actual total cost of administration	Difference
BCG								
AM	241,730	75,387	68.8	US\$2.87	US\$0.92	US\$21,656.96	US\$69,280.85	US\$47,668.58
MS	162,100	32,526	79.9	US\$2.87	US\$1.45	US\$9,348.48	US\$46,458.61	US\$37,131.90
RN	45,650	16,256	64.4	US\$2.87	US\$0.81	US\$4,667.81	US\$13,083.26	US\$8,423.79
SC	323,940	76,989	76.2	US\$2.87	US\$1.22	US\$22,102.35	US\$92,841.54	US\$70,773.32
TOTAL	773,420	201,158	74.0	US\$2.87	US\$1.12	US\$57,781.63	US\$221,662.75	US\$164,007.77
DTP/Hib								
AM	210,890	189,255	10.3	US\$3.04	US\$3.43	US\$575,290.39	US\$639,417.36	US\$65,609.13
MS	113,435	83,179	26.7	US\$3.04	US\$4.21	US\$252,816.18	US\$343,934.49	US\$91,752.56
RN	65,240	43,999	32.6	US\$3.04	US\$4.57	US\$133,682.86	US\$197,804.01	US\$64,406.98
SC	319,280	222,848	30.2	US\$3.04	US\$4.42	US\$677,033.21	US\$968,123.95	US\$292,433.62
TOTAL	708,845	539,281	23.9	US\$3.04	US\$4.05	US\$1,638,618.21	US\$2,149,598.22	US\$514,208.75
Rotavirus								
AM	88,622	87,071	1.8	US\$9.00	US\$9.29	US\$782,920.40	US\$795,483.02	US\$13,925.36
MS	53,815	52,549	2.4	US\$9.00	US\$9.34	US\$472,507.36	US\$483,079.99	US\$11,366.42
RN	25,112	23,899	4.8	US\$9.00	US\$9.59	US\$214,986.49	US\$225,422.52	US\$10,891.84
SC	148,134	146,191	1.3	US\$9.00	US\$9.24	US\$1,315,079.38	US\$1,329,821.11	US\$17,446.14
TOTAL	319,850	309,710	3.2	US\$9.00	US\$9.42	US\$2,786,276.73	US\$2,871,340.91	US\$91,035.81
MMR								
AM	341,830	184,387	46.1	US\$3.13	US\$5.88	US\$577,097.94	US\$1,068,394.11	US\$491,411.34
MS	289,650	88,331	69.5	US\$3.13	US\$10.39	US\$276,431.36	US\$903,802.04	US\$628,368.15
RN	82,310	30,551	62.9	US\$3.13	US\$8.54	US\$95,609.24	US\$257,068.91	US\$161,552.90
SC	872,340	241,006	72.4	US\$3.13	US\$11.47	US\$754,210.27	US\$2,722,511.80	US\$1,970,581.65
TOTAL	1,586,130	544,275	65.7	US\$3.13	US\$9.24	US\$1,703,268.37	US\$4,950,631.48	US\$3,251,940.43
GENERAL	3,388,245	1,594,424				US\$6,188,687.25	US\$10,194,499.18	US\$4,022,832.98

Source: SI_AIU, MS

Legend: AM – Amazonas; MS – Mato Grosso do Sul; RN – Rio Grande do Norte; SC – Santa Catarina. BCG (bacille Calmette- Guérin); DTP+Hib (diphtheria, tetanus, pertussis-*Haemophilus influenzae* type b); MMR (measles, mumps and rubella vaccine).

penditure for MMR vaccine in the four states was US\$5.1 million (R\$9.8 million) while cost without wastage would be US\$1.7 million (R\$3.2 million). Table 1 displays detailed data.

Also, the total physical losses were identified by vaccine and state (Table 2). For MMR, the largest proportions of losses were due to electricity issues in the states of SC (35.7%) and AM (41.2%) and more often attributed to "other reasons" in the states of MS (38.6%) and RN (40.4%), suggesting possible registry errors due to lack of understanding of the concept of physical loss. DTP/Hib losses were heterogeneous (Table 3).

Discussion

This is the first study quantifying vaccine wastage and their causes in Brazil. Such a study was made possible by the implementation of a computerized tool. Prior to implementing the AIU, the wastage rate was estimated by adding the number of doses distributed and subtracting the number of doses administered, giving a rate of doses administered and not a wastage rate, considering that not all vaccine distributed was used.

The results of this study show that the parameters currently used to estimate vaccine wastage in Brazil under-represent the reality. The national EPI recommends calculating vaccine needs using a correction of 40% for BCG 10-dose vials, 10% for DTP/Hib 5-dose vials, 0 for rotavirus and 20% for MMR 10-dose vials. The wastage rate observed in the study of BCG is almost twice as high for the estimated wastage rate used by the EPI when estimating vaccine needs. The same is true for MMR and DTP/Hib, whereas for the latter, only AM state had results close to the recommended EPI parameters. Rotavirus vaccines showed a relatively high wastage rate for a single dose vial, suggesting either registry errors by the municipalities, or procedural errors.

Results show that open-vial wasted doses account for a much higher proportion of wastage than physical losses due to breakage, expiration and temperature. For multi-dose vials for vaccine with limited shelf life after opening the vial (BCG and MMR), wastage rates are the highest and the number of doses wasted per dose administered is equal to or greater than two. However, still multi-dose vials tend to be more appropriate for the public network by facilitating the distribution and requiring a smaller cold chain, thus reducing other costs, such as cold chain space and transportation. Having accurate data by vaccination center, however, will help immunization programs

Table 2: Number and percentage of vaccine wastage by vaccine and wastage type, 4 states in Brazil, 2008

Total Wastage		Physical Wastage		Technical Wastage	
BCG	N	N	%	N	%
AM	177,983	11,640	6.5	166,343	93.5
MS	146,534	16,960	11.6	129,574	88.4
RN	36,514	7,120	19.5	29,394	80.5
SC	267,291	20,340	7.6	246,951	92.4
TOTAL	628,322	56,060	8.9	572,262	91.1
DTP+Hib	N	N	%	N	%
AM	23,405	1,770	7.6	21,635	92.4
MS	33,191	2,935	8.8	30,256	91.2
RN	24,561	3,320	13.5	21,241	86.5
SC	101,987	5,555	5.4	96,432	94.6
TOTAL	183,144	13,580	7.4	169,564	92.6
Rotavirus	N	N	%	N	%
AM	1,796	245	13.6	1,551	86.4
MS	2,162	896	41.4	1,266	58.6
RN	1,820	607	33.4	1,213	66.6
SC	4,362	2,419	55.5	1,943	44.5
TOTAL	10,140	4,167	41.1	5,973	58.9
MMR	N	N	%	N	%
AM	159,963	2,520	1.6	157,443	98.4
MS	209,386	7,720	3.7	201,666	96.3
RN	56,209	4,450	7.9	51,759	92.1
SC	643,964	12,630	2.0	631,334	98.0
TOTAL	1,069,522	27,320	2.6	1,042,202	97.4

Source: SI_AIU, MS

Legend: AM – Amazonas; MS – Mato Grosso do Sul; RN – Rio Grande do Norte; SC – Santa Catarina. BCG (bacille Calmette-Guérin); DTP+Hib (diphtheria, tetanus, pertussis -*Haemophilus influenzae* type b); MMR (measles, mumps and rubella vaccine).

Table 3: Proportional distribution of physical vaccine wastage, 4 states in Brazil, 2008

	Broken vials	Power outage	Break in Cold Chain	Expiration	Inadequate management	Transportation problems	Other causes
BCG	%	%	%	%	%	%	%
AM	4.3	2.1	1.5	88.0	0.3	-	3.9
MS	6.5	5.0	7.3	69.0	2.4	0.4	10.6
RN	6.0	10.1	0.1	65.2	1.0	-	17.6
SC	4.2	13.2	2.9	73.2	3.5	0.2	2.9
DTP+Hib							
AM	15.3	12.7	17.5	36.2	8.5	0.8	9.0
MS	6.6	26.4	25.9	18.6	10.2	2.2	10.1
RN	3.5	20.8	4.1	26.7	3.6	0.8	40.7
SC	7.2	50.7	12.6	9.5	10.0	2.2	7.9
Rotavirus							
AM	6.1	25.3	18.4	38.0	4.9	-	7.3
MS	4.9	18.0	20.6	25.4	15.1	5.6	10.4
RN	3.0	47.8	10.8	3.3	9.4	-	25.7
SC	3.3	34.6	16.9	14.8	11.9	4.8	13.7
MMR							
AM	7.9	35.7	9.5	14.3	2.0	5.2	25.4
MS	3.9	15.3	14.2	21.2	4.4	2.3	38.6
RN	4.5	16.6	4.5	32.8	1.1	-	40.4
SC	5.9	41.2	7.8	28.5	4.6	2.6	9.4

Source: SI_AIU, MS

Legend: BCG (bacille Calmette-Guérin); DTP+Hib (diphtheria, tetanus, pertussis -*Haemophilus influenzae* type b); MMR (measles, mumps and rubella vaccine).

determine where using single dose vials may be cost saving.

Limitations of this study included underreporting and inconsistencies in some records that had to be excluded. Also, the results of the study may not be generalizable to the rest of the country, as only vaccination centers from four states were included.

Brazil, as all countries, seeks the most appropriate use of vaccines with the consequent reduction of wastage. This has become a priority in evaluating the EPI to make it more efficient, to reducing costs and expanding its actions. The AIU software represents a breakthrough in monitoring vaccine use in vaccination centers, enabling better management and assessment of vaccine supply and cold chain needs.

Using the AIU has made it possible to determine vaccine wastage in four states, providing important input for better planning for vaccine procurement and production, as well as the distribution of these products. ■

* The exchange rate used is based on 1BRL (\$R) = 0.518617USD (US\$); 1USD (US\$) = 1.92820BRL (\$R).

Contributed by: Samia Samad, National Immunization Program, Ministry of Health, Brazil.

The Revolving Fund's New KPI Dashboard: Key tool for continuous improvement

The working group of the Revolving Fund, a multidisciplinary team that manages this mechanism, has pledged to maintain “continuous improvement” as one of its management principles. This commitment guides the team to continually strive for greater efficiency and effectiveness in the Revolving Fund processes.

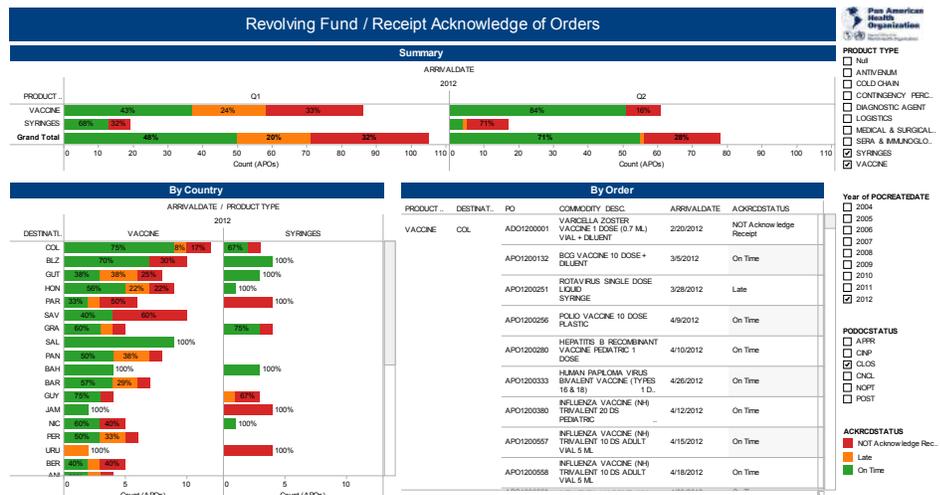
Maximizing the timely arrival of shipments, increasing the reliability of demand forecast, providing estimates and placing purchase orders in the shortest possible time, are some of the goals the team established as a first step. Subsequently, the team developed a technological tool called Key Performance Indicators (KPI) Dashboard to facilitate continuous monitoring of key process performance with respect to the targets.

The technology of the KPI Dashboard consists of two main components: first, a large centralized database, which captures and crosses daily the data from the procurement and financial systems used by the Revolving Fund; second, a series of Web graphic reports that feed from the centralized database intended to monitor the performance of various processes. Now, each order can be monitored along each of its key stages: its creation, shipping, billing and

final payment, allowing the team to identify those purchases that require action to prevent delays or to ensure the appropriate monetary reimbursement to the common capital pool of the Revolving Fund. The system allows analysis of previous results using the drill-down capabilities by vaccine, producer and country, or in combination of these variables in order to take actions for improvement together with suppliers.

The KPI Dashboard was designed as a scalable system used for any purchase mechanism of the Pan American Health Organization.

With the use of this technological tool, it is expected that countries, PAHO's different units and the Revolving Fund itself will improve their processes. It should also facilitate decision-making by all individuals involved in order to increase the on-time arrival of purchases and maximize use of the common working capital. ■



PAHO's Revolving Fund for Vaccine Purchase

The Revolving Fund for Vaccine Purchase of the Pan American Health Organization (PAHO) is a mechanism of technical cooperation for the joint procurement of vaccines, syringes, and related supplies for Member States. Through the Revolving Fund, for over 30 years, participating Member States have ensured a continuous supply of high-quality products, at the lowest possible price for their immunization programs thanks to the economies of scale that the Revolving Fund provides.

The Revolving Fund belongs to the PAHO Member States. PAHO serves as the secretariat managing the negotiation and procurement processes on behalf of the participating Member States. Almost 100% of the resources that countries use to purchase vaccines and immunization supplies through the Revolving Fund come from their national budgets. For this reason, by securing the lowest prices, the Revolving Fund fosters the financial sustainability of national immunization programs.

All participating Member States contribute 3.5% of the net purchase price to a common

fund. Three percent of it is used entirely as working capital to offer a line of credit to Member States that may require it and 0.5% is used to cover the administration costs of procurement activities. The line of credit enables a Member State to pay the Revolving Fund within 60 days of receipt of the products.

The Revolving Fund has been a critical factor in making the Region of the Americas a global role model for the success of immunization programs and for its successful introduction of new vaccines. ■

Alternative algorithm for poliovirus isolation and characterization

As the countries of the world advance towards the eradication of wild poliovirus, it is necessary to maintain good quality laboratory results and improve the timeliness of polio confirmation.

To achieve this, the Global Polio Laboratory Network (GPLN) of the World Health Organization (WHO) recommended the implemen-

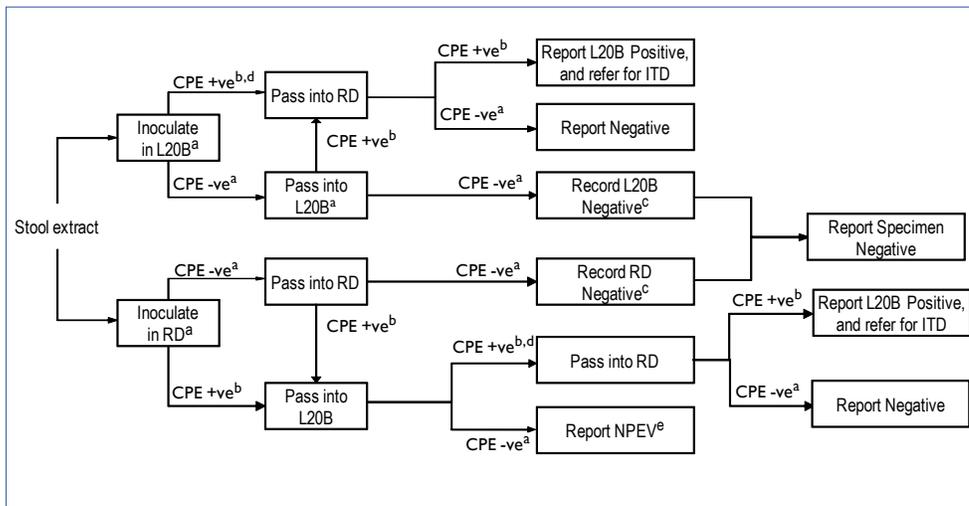
tation of a new algorithm for viral isolation, using the cells RD and L20B simultaneously, permitting the report of results within 14 days of receipt of the stool specimen in the laboratory (previously, 28 days were considered appropriate).

PAHO continues to be committed to the global eradication of polio; therefore it will monitor

the implementation of this algorithm, and update its Weekly Polio Bulletin in order to show compliance with laboratory indicators.

For more information, please refer to the "Supplement to the WHO Polio Laboratory Manual" available below: http://www.who.int/immunization_monitoring/laboratory_polio_resources/en/index.html ■

Figure 1. Poliovirus Isolation New Algorithm



- a Observed microscopically for a minimum of 5 days
 - b Observe until $\geq 3+$ CPE obtained (usually 1-2 days, 5 days maximum; re-inoculate when toxicity or contamination observed)
 - c Total minimum observation time of 10 days (2x5 days)
 - d Pool L20B positive tubes (if both tubes show $\geq 3+$ CPE on the same day, same sample and same cell line) before final RD passage
 - e Isolates can be serotyped by laboratories with an interest in NPEV diagnosis or to confirm proficiency
- Glossary**
 RD = Cell line derived from human rhabdomyosarcoma
 L20B = Mouse cell line expressing the gene for the human cellular receptor for poliovirus
 CPE = Cytopathogenic effects (observed by viral replication on culture cells, generally is recorded as 1+ to 4+ to indicate the percentage of cells affected)
 NPEV = Non Polio Enterovirus
 ITD = Intratypic differentiation (it's necessary to determine whether poliovirus isolated are wild or vaccine-derived)

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5 operating rooms, 2 with hemodynamics, 2 delivery rooms, 4 intensive care units and 200 conventional beds.

The aim of this study was to assess the vaccination coverage among the staff of American Hospital in 2011 and to evaluate the adherence to recommended vaccines such as hepatitis A, hepatitis B, influenza, Td and varicella (chickenpox). To date in Uruguay, there are no publications that investigate vaccination coverage for mandatory and recommended vaccines for health care workers.

Methods

A descriptive cross-sectional study was performed in a population of 1,312 staff members. Data was collected from 1 June to 15 August, 2011. Staff personnel were requested to present relevant immunization certificates. The data was collected by the administrative staff of the Infection Control and Prevention Committee and processed using the computer software EpiInfo version 3.5.

The vaccines investigated were: influenza, hepatitis B, hepatitis A, Td and varicella.

A vaccination awareness campaign was conducted to highlight the risks and benefits for health care workers in the institution prior to the completion of this study.

At the time of data collection, if the health worker did not have the mandatory immunization required by the country, they were requested to get it. They were advised to receive influenza, hepatitis A or varicella vaccines if they did not have them.

Results

Of the 1,312 staff members, only 431 (33%) provided documentation of vaccination, which were ultimately the population studied (graph 1); 86% of the population studied were female and the average age was 40 years.

For hepatitis B, 69% of the population studied presented a vaccination certificate; the 31% that did not, were instructed to receive it. As of 1 September 2011, 17% of those who were not vaccinated returned with the certificate of the first dose of the hepatitis B vaccine while the remaining 83% showed no interest in receiving it. For the Td vaccine, 90% of the population presented a valid certificate (duration of 10 years). Those who did not had a certificate

that had recently expired. In the case of seasonal influenza vaccine, 39% of workers had valid certificates (vaccination in 2011 with the Southern Hemisphere vaccine). Within this group, 70% had been vaccinated at the American Hospital.

Only two employees were vaccinated against hepatitis A. As of 1 September 2011, none of the staff had followed the hepatitis A vaccine recommendation. None of the staff members had received the varicella vaccine, and only 17% of the population studied had a history of clinical disease.

Discussion

There is poor adherence by health personnel in the American Hospital to vaccination mandated or recommended by current legislation, with the exception of the tetanus-diphtheria vaccine. The latter may be due to Uruguay's strong push for the use of tetanus vaccine boosters and as a result, the population coverage is very high. The Td booster is required to obtain the Health Card and in case of surgery.

Immunization coverage against hepatitis B in the American Hospital is clearly insufficient,

despite it being mandatory and those not yet vaccinated showed little interest. Infection with hepatitis B virus (HBV) poses the greatest risk of infection by blood borne pathogens to health personnel, which is clearly related to the handling of blood and contaminated objects. People with chronic HBV infection are at risk for chronic liver diseases and are potentially infectious throughout the course of their life. The seasonal influenza vaccine is not compulsory in Uruguay, but is recommended for health personnel due to their risk of exposure to patients with influenza and their ability to transmit it to patients who may be at higher risk of complications and death. It has also been shown that the seasonal vaccination reduces work absenteeism [5]. The adherence for influenza vaccination in the American Hospital did not reach 40%. Finally, even though the prevalence of hepatitis A varies with age and socioeconomic status, health personnel are more exposed than the general population; this is similar for varicella. It is noteworthy that no health worker followed the recommendation to get vaccinated against these diseases. In general, few adults are still susceptible to these diseases but complications are more frequent among adults than among children.

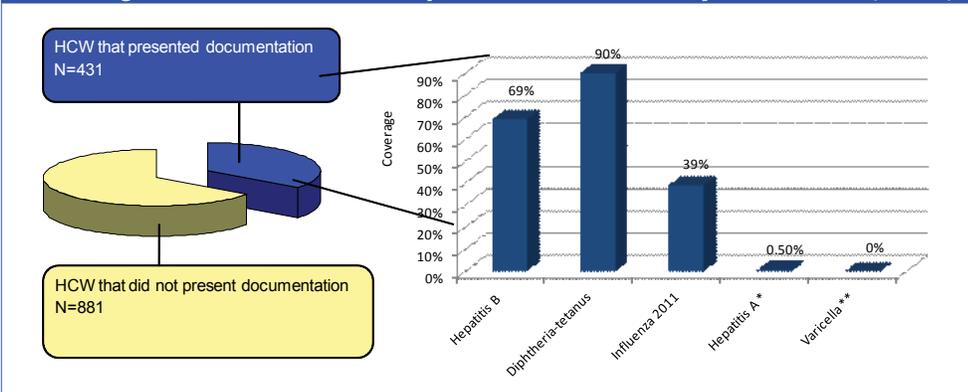
Following this study, the authors recommend the institution make it a requirement for new staff to provide their vaccination certificate and for current employees to present their certificate for payment. These measures were consulted and agreed upon in advance with the employees of the hospital.

Editorial Note

The World Health Organization (WHO) recommends the vaccination of health personnel against hepatitis B and influenza [6-8] and recommends considering the vaccination against varicella, diphtheria, tetanus, pertussis and rabies for health workers. The Pan American Health Organization (PAHO) also recommends the vaccination of health workers against hepatitis B [9, 10] and influenza [11] and has recommended ensuring that these personnel have been vaccinated against measles and rubella [12]. Despite recommendations to vaccinate health workers as an important element of occupational health, a significant number of members of the health team remains inadequately immunized.

In the Americas, at least 35 countries and territories recommend annual vaccination against influenza for health workers. The data for hepatitis B is not available. In the United States, a country with available data, the overall seasonal flu vaccination does not even reach 65%

Figure 1. Distribution of health care workers (HCW) of the American Hospital according to immunization status by vaccine, 1 June to 1 September 2011 (n=431)



among health workers; though hospital workers are the subgroup with the highest coverage [13]. In 2012, WHO's Strategic Advisory Group of Experts [on immunization] recommended influenza immunization of health-care workers and suggested it should be considered as part of a broader infection control package for health-care facilities [14].

Some authors have advocated using the welfare of patients as an ethical argument for making vaccination for health care workers compulsory. In addition to compulsory vaccination, the following strategies have proven effective in increasing vaccination coverage among health care workers [9]:

- Demonstrate management commitment to employee health
- Provide and promote accessible and free vaccination in the workplace
- Establish the participation in vaccination programs through consent forms
- Educate health care workers on the occupational risks associated with vaccine-preventable pathogens and the effectiveness of vaccination and other preventative measures
- Repeat reminders to ensure vaccination with all required doses (3 doses for hepatitis B)
- Integrate immunization in the employment orientation of health care workers and students
- Monitor vaccination coverage regularly
- Studies like the one presented here in a private hospital in Uruguay help raise awareness of the wide gap that still exists to meet the recommendations for vaccinating health workers, a vulnerable group with a great responsibility for the welfare of our community. ■

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Contributed by: Vacarezza M, Vignolo J, Varela C, Alegretti M, Giribone R. American Hospital FEMI. Montevideo, Uruguay.

PAHO Revolving Fund: Vaccine and Syringe Prices, 2012

Table 1. Prices for Vaccines Purchased through the PAHO Revolving Fund, 2012 (prices in US\$)

Vaccine		Doses per vial	Average price per dose	Vaccine		Doses per vial	Average price per dose
BCG	Japanese origin	10	\$0.2140	Measles/Mumps (Zagreb Strain)/Rubella	1	\$1.8500	
	Indian origin	10	\$0.1150		5	\$0.8500	
DT Pediatric		10	\$0.0850		10	\$0.9200	
DTP		10	\$0.1600	Measles/Mumps (Urabe Strain)/Rubella	1	\$3.5000	
DTP-Hepatitis B-Hib (pentavalent)	Lyophilized	1	\$2.8800	Pneumococcal Conjugate Pediatric (10-valent)	1	\$14.2400	
	Liquid	1	\$2.9874	Pneumococcal Conjugate Pediatric (13-valent)	1	\$16.3400	
DTP-Hib	Lyophilized	1	\$2.6500	Pneumococcal Polysaccharide Adult (23-valent)	1	\$6.6000	
	Liquid	10	\$3.3500	5	\$6.4500		
Hepatitis A	Adult	1	\$11.0000	Polio, Oral (Glass)	10	\$0.1650	
	Pediatric	1	\$7.1000	20	\$0.1354		
Hepatitis B (Recombinant)	Adult	1	\$0.3650	Polio, Oral (Plastic)	10	\$0.2500	
		10	\$0.1950	Polio, Inactivated	1	\$5.9848	
	Pediatric	1	\$0.2400	Rabies Human Use (Vero Cells), French Origin	1	\$10.6000	
Human Papillomavirus	Bivalent	1	\$13.4800	Rabies Human Use (Purified Chick Embryo Cell Culture), Indian Origin	1	\$10.5000	
	Quadrivalent	1	\$14.2500	Rotavirus, Liquid	2-dose Immunization Schedule	1	\$6.8800
Influenza Seasonal Northern Hemisphere	Adult-Canadian Origin	10	\$3.3000	3-dose Immunization Schedule	1	\$5.2500	
	Adult-French Origin	1	\$5.3000	Td Adult	10	\$0.0850	
	Adult-Korean Origin	1	\$2.5000	Tdap Triple Acellular Adolescent/Adult	1	\$8.5000	
	Adult-British Origin	10	\$3.0000	DTaP Triple Acellular Pediatric	1	\$10.5000	
	Adult-French/American Origin	10	\$3.7000	Typhoid (Polysaccharide)	20	\$7.8000	
	Pediatric-French/American Origin	20	\$1.8500	Varicella	1	\$8.3000	
Meningococcal A+C Polysaccharide		10	\$1.5000	Yellow Fever	Brazilian Origin	10	\$0.7800
Meningococcal C Conjugate		1	\$19.5000	French Origin	10	\$1.4000	
Measles/Rubella		1	\$1.6500				
		10	\$0.5100				

Table 2. Prices for Syringes Purchased through the PAHO Revolving Fund, 2012 (prices in US\$)

Disposable Syringes, Plastic with Attached Needle			Auto-disable Syringes, Plastic with Attached Needle		
Size	Packed per case	Price per unit *	Size	Packed per case	Price per unit *
1cc 22G x 1 1/2"	2000	0.0342	0.5cc 22G x 1 1/2"	3000	0.0585
	3600	0.0425		0.5cc 23G x 1"	1300
1cc 23G x 1"	2000	0.0342	3000		0.0510
	1400	0.0360	0.5cc 25G x 5/8"	1300	0.0439
1cc 25G x 5/8"	2000	0.0342	0.5cc 26G x 3/8"	3000	0.0710
	1400	0.0360	0.1cc 27G x 3/8"	1300	0.0529
	3600	0.0425			
1cc 26G x 3/8"	2000	0.0342			
	3600	0.0450			
1cc 27G x 3/8"	3600	0.0450			
5cc 22G x 1 1/2"	1000	0.0330			
	1200	0.0356			

*Prices FCA (Free Carrier) for each syringe.

Fourth ProVac Network of Centers of Excellence Meeting Cartagena, Colombia

The Pan American Health Organization's (PAHO) ProVac Initiative created a network of Centers of Excellence to foster South-South collaboration among academic institutions specializing in health economics and decision science. The network supports ongoing efforts to build national capacity around evidence-based decision making for new vaccine introduction in Latin America and the Caribbean. The network is currently comprised of research teams from the State University of Rio de Janeiro (UERJ), São Paulo University, University of Cartagena, National University of Colombia, and the Institute for Clinical Effectiveness and Health Policy (IECS) in Buenos Aires, Argentina.

In its first year, the five participating academic institutions have been developing economic evaluation tools and guidelines aimed at helping countries collect or generate the necessary

evidence to make informed decisions about the introduction of new and underutilized vaccines, including human papilloma virus (HPV), pneumococcal conjugate, rotavirus, and seasonal influenza vaccines.

The fourth ProVac Network of Centers of Excellence meeting was held in Cartagena, Colombia on 12-13 December 2011. The meeting joined principle and junior researchers from each center to discuss the final outcomes of their year-long work plans towards developing online economic evaluation courses, a vaccine program costing tool, guidelines for estimating disease burden, cost-of-illness and productivity losses, health service utilization, and vaccine program costs.

These guidelines and tools are expected to be published and available for country-level use in June 2012. The outcomes of the Cent-

ers' projects will help countries tackle a host of challenges related to insufficient and poor quality data when conducting economic evaluations. Projects for the 2012-2013 period will focus on decision support needs for countries considering the introduction of HPV vaccines. The outcomes of the 2012 projects will help the ProVac Initiative continue to provide timely support to countries considering the implementation of an adolescent HPV vaccination program. ■

The *Immunization Newsletter* is published every two months, in English, Spanish, and French by the Comprehensive Family Immunization Project of the Pan American Health Organization (PAHO), Regional Office for the Americas of the World Health Organization (WHO). The purpose of the *Immunization Newsletter* is to facilitate the exchange of ideas and information concerning immunization programs in the Region, in order to promote greater knowledge of the problems faced and possible solutions to those problems.

An electronic compilation of the *Newsletter*, "Thirty years of *Immunization Newsletter*: the History of the EPI in the Americas", is now available at: www.paho.org/inb.

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**Pan American
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Comprehensive Family Immunization Project

525 Twenty-third Street, N.W.
Washington, D.C. 20037 U.S.A.
<http://www.paho.org/immunization>

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Editor: Carolina Danovaro

Associate Editors: Nabely Castillo and

Cuahtémoc Ruiz Matus

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