SUPPLEMENT ARTICLE

Putting Safety First: Ensuring Safe Vaccination Practices During the 2006 Rubella Campaign in Bolivia

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Over 3 weeks in 2006, 3,826,083 persons were vaccinated against rubella during a national immunization campaign in Bolivia. This campaign was the largest mass immunization campaign ever conducted in the country. Therefore, in addition to strategic and micro-planning and financial and social mobilization, issues of safety (eg, safe injection practices and waste management) were at the forefront of campaign preparations. Waste management practices were promoted through guidelines, training, and implementation of locally appropriate solutions. These experiences show that, with detailed planning and preparation, in addition to collaboration among key partners, effective management of waste during campaigns in low-income countries is both feasible and beneficial. However, challenges remain in implementing environmentally appropriate solutions. This campaign served as the launching pad for a focus on ensuring that proper waste management practices are used both in the routine immunization program and in subsequent campaigns across Bolivia.

Immunization campaigns represent both a key component in disease elimination strategies and a logistical challenge to implement. In September 2003, at the 44th Directing Council of the Pan American Health Organization (PAHO), all countries in the Americas, including Bolivia, adopted the goal of eliminating rubella and congenital rubella syndrome (CRS) by 2010 [1]. In Bolivia, as in other countries in the region, campaigns formed a pillar of the strategy planned to achieve that goal.

Bolivia launched its campaign in May 2006 using a measles-rubella (MR) vaccine, with the goal of vaccinating all men and women aged 15–39 years across the country (>3.8 million total) during a 3-week period. This was the largest number of individuals ever to be vaccinated during a single campaign in Bolivia. Therefore, in addition to strategic and micro-planning and financial and social mobilization components, issues of safety (eg, safe injection practices and waste management) were at the forefront of campaign preparations. Often an afterthought in campaign planning, the experiences in Bolivia serve to demonstrate the impact and benefits from prioritizing the safety issues during mass campaigns.

CAMPAIGN PREPARATION: MATERIALS AND PLANNING

The planning for the safety component of the campaign centered around a safe vaccination practice [2] composed of 3 key pillars: (1) ensuring safe vaccination practices; (2) developing a solid waste disposal plan, including recycling; and (3) monitoring the plan for adverse events following immunization (AEFIs). Although a description of all 3 pillars will be provided, this article will focus its analysis and discussion on the second pillar, waste management.

Safe Vaccination Practices

Safe injection practices were of paramount importance during the campaign, to ensure that all persons vaccinated received high-quality vaccines safely. The first
step in ensuring the safety of all vaccines delivered during this campaign was ensuring the procurement of the appropriate products.

**Vaccine.** The 10-dose MR vaccine used during the campaign was procured through the PAHO Revolving Fund, which only purchases prequalified and approved vaccines, guaranteeing the quality of the manufacturer and the finished product.

Syringes: Two types of syringes were used during this campaign, both of which were prequalified and approved for use in immunization campaigns. The first was a reconstitution syringe with metal needle; the second was an auto-disable syringe (0.5 cc AD[3], with 25G x 5/8) for administering the vaccine.

Safety boxes: Prequalified 5-L POLISAFE cardboard boxes [4] were used for sharps disposal. Health care workers were instructed to deposit used syringes in the safety boxes without recapping the needle, to avoid the potential for needle stick injuries.

Although having the right vaccines and equipment is a key first step, the appropriate guidelines and training to enable their proper use and implementation are essential. The Ministry of Health and Sports published a manual entitled “Environmental and Biosecurity Guidelines for the Management of Solid Waste Generated during Vaccination Campaigns.” The manual was prepared by the biosafety subcommittee to inform health care workers about the proper management of safe injection practices and solid waste management [5]. These guidelines were distributed and included in the health care worker training for the campaign.

**Solid Waste Disposal**

Because of the large number of persons to be vaccinated in such a short period, appropriate and feasible practices for solid waste disposal were a key concern. In the development of an appropriate plan, it was recognized that different options would need to be considered for urban and rural areas of the country.

Although ideally all health care centers would have access to a sanitary landfill or an incinerator and recycling for selected components, in reality, logistical and financial challenges mean that many health centers only have the option to dispose of waste using either pit burial or open pit burning. Therefore, guidance was provided on all of the aforementioned practices.

- **Incineration:** This method allows needles and syringes to be completely destroyed. They are burned at temperatures >800°C, thus eliminating microorganisms and minimizing the volume of waste. This was the first choice for waste disposal in areas where a working incinerator was available.

- **Sanitary landfill:** Sanitary landfills are designated landfills where pathogenic waste or health service–generated waste can be deposited free of risk. These are a good option for safely disposing of campaign waste. However, there are a limited number of cities in Bolivia that have these landfills, and thus, they are only an option in those areas.

- **Burial pit:** Burial pits are holes dug to deposit biohazardous and special waste, preferably after disinfectant treatment or chemical neutralization. This was the most widespread practice in both urban and rural areas, because it can be done at any location and does not require a large financial investment or any specialized equipment.

- **Open-air burning:** Burning vaccination waste has not been widely recommended because of environmental pollution and consequences to both health care workers and the general population. However, because this practice is often the only option in remote rural areas or because of financial and logistical limitations, guidelines were established to minimize the potential risks associated with open-air burning. The guidelines specify that if open-air burning is to occur, there should be no neighboring populations in the vicinity. Accordingly, this practice is currently restricted to remote rural areas.

- **Recycling:** For the first time in Bolivia, the practice of recycling campaign-generated waste was implemented. In some departmental capitals, plastic needle covers, glass vials (vaccine and diluent), and cardboard boxes were collected in different plastic bags, to be stored for recycling. Nonrecyclable materials (syringe wrappers and cotton) were disposed of in a third plastic bag.

**Surveillance of AEFIs**

Never before in Bolivia’s immunization history have so many doses of vaccine been administered in such a short period. Under these circumstances, cases of adverse events supposedly attributable to vaccination were expected. A standardized definition of potential events associated with the vaccine was developed and included in the manual for training the health care workers.

In addition, AEFI committees were organized in each of the 9 departments of the country to review severe events and provide a classification into 1 of the following 4 categories: (1) coincidental event, (2) programmatic error, (3) true vaccine-related adverse event, and (4) unknown. A national crisis committee was established to review any AEFI reports from the departmental committees. The national committee oversaw the investigations of each case as needed, and provided regular updates and communication links with the media.

**CAMPAIGN ACTIVITIES AND RESULTS**

A cluster-survey in July 2006 showed a coverage rate of 94% at the national level [6]. In total, 3,826,083 men and women aged 15–39 years were vaccinated across Bolivia’s 9 departments and 324 districts. At the end of the campaign, 28,060 kg of waste from the campaign, including vaccine vials, syringes, and safety boxes, had to be discarded safely (Table 1).
Waste Collection
Solid waste was divided into 2 color-coded garbage bags: black plastic bags to transport glass, plastic, papers, and other non-biohazardous waste, and red plastic bags, to manage biohazardous waste, such as the cotton. Of note, red bags were only used in those establishments that have a specific collection program for biohazardous waste.

Approximately 50,000 safety boxes were used during the campaign. These containers came with instructions printed on their side for assembly and use. One challenge that was encountered in this regard was that the illustrations on the box indicate that the contents should be burned, which contradicts the guidelines issued by the Ministry of Health instructing that only in certain instances should filled boxes be burned in the open.

On-Site Waste Management
Each establishment had identified an intermediary (temporary) storage site for boxes and biohazardous waste (red garbage bags) after they were full. The site had to be an enclosed space that prohibited access of unauthorized personnel, the general population, and animals.

Mobile teams and immunization posts transported the safety boxes by hand or in a vehicle to the temporary storage site at the health facility daily.

Waste Transportation
Separate transportation plans were made to handle the collection of solid waste from the immunization campaign, coordinated through the Departmental Health Services and the municipal public utility for waste management. In some instances, a private company was contracted to deliver these services. In these instances, volumes, time tables, and routes of collection from the health facilities were established before the campaign by the contractor and the Departmental Health Services. Because of the risk of pollution from transporting the waste from health institutions to the sanitary landfill, the plan specified the use of closed vehicles.

Outside the urban areas, where biohazardous waste collection systems were not available, ordinary trash trucks were used for collection. Compacting trucks were not used, to avoid breaking open safety boxes filled with waste and increasing the risk to workers at the moment of dumping the waste in the landfill. For health facilities with no access to collection services, it was recommended that trained health care workers collect the filled safety boxes daily or as needed and transfer them to the nearest health center that had access to municipal collection service or in situ destruction and final disposal.

On-Site Disposal
At the majority of rural health centers, open pit burning remained the most common method for waste disposal. However, an increase was observed in the use of pit burial, a preferred option, during this campaign.

Not all hospitals had incinerators on site. Other hospitals used incinerators at other institutions (eg, the local cement factories).

DISCUSSION
Because this campaign was the most ambitious immunization activity in Bolivia’s history, including a focus on the safety component was important for campaign activities and to maintain confidence in immunization practices.

Preparing and planning the technical aspects around safety in advance was a key element. In Bolivia, guidelines on waste management during campaigns had not previously been available, and thus, this campaign provided the impetus to both finalize their development and implement them in the field. These guidelines were crucial to the success of the campaign; they have subsequently been used both in other campaigns, such as

Table 1. Waste Materials Produced During the 2006 Campaign to Eliminate Rubella and Congenital Rubella Syndrome in Bolivia

<table>
<thead>
<tr>
<th>Type of waste</th>
<th>Quantity</th>
<th>Weight, kg</th>
<th>Characteristic(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 mL vials of vaccine</td>
<td>380,000</td>
<td></td>
<td>White glass (10-dose vials)</td>
</tr>
<tr>
<td>Vials of diluent</td>
<td>380,000</td>
<td></td>
<td>5-mL white glass</td>
</tr>
<tr>
<td>AD syringes</td>
<td>3.8 million</td>
<td>1700</td>
<td>0.5-mL metal needles</td>
</tr>
<tr>
<td>Reconstitution syringes</td>
<td>380,000</td>
<td>3400</td>
<td>5-mL metal needles</td>
</tr>
<tr>
<td>Syringe wrappers</td>
<td>4.18 million</td>
<td></td>
<td>Plastic and paper</td>
</tr>
<tr>
<td>Needle caps</td>
<td>4.180 million</td>
<td></td>
<td>Plastic</td>
</tr>
<tr>
<td>Cotton</td>
<td>8360</td>
<td>8360</td>
<td>Kilo's</td>
</tr>
<tr>
<td>Packaging for cotton</td>
<td>8360</td>
<td></td>
<td>Carton</td>
</tr>
<tr>
<td>Safety boxes for waste</td>
<td>50,000</td>
<td>14,600</td>
<td>Cardboard</td>
</tr>
<tr>
<td>Vaccine boxes</td>
<td>7600</td>
<td></td>
<td>Cardboard</td>
</tr>
<tr>
<td>Diluent boxes and protection</td>
<td>7600</td>
<td></td>
<td>Cardboard and plastic</td>
</tr>
<tr>
<td>Total</td>
<td>28,060</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Ministry of Health and Sports of Bolivia.
as the H1N1 influenza pandemic response, and to strengthen the routine immunization program.

Although progress was made in managing vaccination-produced waste during this campaign, there is clearly more work to be done. Advances have been made in implementing standards and obtaining adequate supplies of safety boxes and disposal bags, but the guidelines remain a work in progress that must be continuously reevaluated and revised to correspond with national environmental and legal realities.

A large part of the success of this campaign can be attributed to the coordination between the Ministry of Health and key stakeholders, such as the PAHO, United Nations Children’s Fund, and nongovernmental organization, such as Swisscontact. In addition to collaborating on the development of the guidelines, these organizations committed jointly to standards that should be upheld during campaign activities across all districts and worked together to enforce them.

Waste management is a challenge in resource-constrained countries, such as Bolivia. Another key lesson from this experience was that the national immunization program lacks the resources and expertise to manage such large amounts of health system–generated waste on its own. Therefore, the need for joint standards and collaborative implementation by all actors is essential. This campaign showed that proper planning and engagement by all partners has the ability to raise the profile of this important issue and to address the safety issues in locally feasible ways.

This campaign was the launching pad for highlighting the importance of this issue in Bolivia. Ministry of Health officials and health care workers have seen firsthand the benefit of planning for these issues: the availability of clear guidelines, adequate numbers of safety disposal boxes and auto-disable syringes, and environmentally friendly solid waste disposal options that reduce pollution for them and their communities. Although there is still work to be done, this campaign and its focus on putting safety first has set Bolivia firmly on the right track to addressing the issue of waste management in a responsible, progressive manner and should serve to inspire the rest of the region.

References