PAPER HEALTH REGISTERS PROJECT CASE STUDY:

URUGUAY'S NATIONAL IMMUNIZATION PROGRAM REGISTER

UNIVERSITY OF WASHINGTON GLOBAL HEALTH START PROGRAM
REPORT TO THE BILL AND MELINDA GATES FOUNDATION

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EXECUTIVE SUMMARY

Vaccination is a key component of child health promotion across the globe. Tracking and monitoring vaccination coverage and services delivered is critical to the success of vaccine programs and to the health of children and communities. In the late 1980s, Uruguay released a new National Immunization Plan (PNV), accompanied by a vaccine register. This vaccine register, called the National Immunization Program Register (SNNI) was the first nominal register in Latin America. Since 1987, the SNNI has been a mixed paper and electronic register system. It has produced very high data quality, and is touted as a great success by the Pan American Health Organization (PAHO). The SNNI has been moving toward a fully electronic model (including electronic data entry) since 2005.

Lessons learned from this case include: 1) integrating the register in the vaccinators' workflow supports data quality, 2) well-developed infrastructure facilitates the success of the register system, 3) transitioning away from the highly successful paper forms is a challenge, and 4) support for patient care is limited by the current system.

PURPOSE

The Bill & Melinda Gates Foundation's Vaccine Delivery Team engaged the University of Washington's Global Health Strategic Analysis and Research Training (START) Program in the *Paper Health Registers Project* in September 2013. Case studies were identified to fill gaps in knowledge about best practices for implementation and use of paper health registers. Innovative register systems in Ethiopia, Ghana, South Africa, Uganda, and Uruguay illuminate opportunities for improving paper health register systems and identify approaches to both strengthen support for patient care and optimize reporting mechanisms.

This case study is one of five case studies developed as a part of this effort. Case studies from both Uruguay and Ethiopia were limited by a paucity of peer-reviewed literature and minimal access to other reports and experts. These cases illustrate key themes and innovations in paper health register systems, but are less detailed than case studies on Ghana, South Africa, and Uganda.

BACKGROUND

CHILDHOOD IMMUNIZATIONS

Immunizations are a critical component of global public health and child health promotion. Recent estimates suggest that immunizations avert 2-3 million deaths from diphtheria, tetanus, pertussis, and measles each year (UNICEF 2013). Childhood immunizations are a foundational strategy for moving toward the Millennium Development Goals (MDGs), particularly for the goal to reduce child mortality (MDG4) (Andrus et al. 2008).

Mechanisms for estimating vaccination coverage generally include administrative methods (tally sheets), nominal immunization registries, and surveys (Nwude 2010). Vaccine registers span the divide between individual-level data and population-level tracking. Registers are used by vaccinators to identify defaulters (children who miss doses of vaccines), used administratively for supply chain management, and used to estimate vaccine coverage.

COUNTRY PROFILE: URUGUAY

Population (2013): 3,395,000

GNI (PPP int. $ 2012):
$15,310

Life expectancy at birth (2012):
(M/F) 73/81 years

Top causes of under-5 mortality (2010):
1. Congenital abnormalities
2. Acute lower respiratory infections
3. Prematurity

Immunization coverage (2012):
Measles: 96%
DTP3: 95%

(WHO 2013)

URUGUAY

Uruguay is a South American country that borders Argentina and Brazil. In the late 1980s Uruguay was considered a middle-income country, but it is now considered a high-income country by the World Bank (World Bank 2014). Uruguay performs well in key health areas, including in-facility births and immunization coverage. As of 2012, 99% of births in Uruguay occurred in health facilities (PAHO 2012). Uruguay was the only country in South America to achieve greater than 80% DTP3 coverage in all districts by 2012 (WHO & UNICEF 2013). All vaccinations are free and mandatory under national law, even those administered in the private sector (Ronveaux et al. 2009).

URUGUAY'S NATIONAL IMMUNIZATION PROGRAM REGISTER

This case study describes Uruguay's National Immunization Program Register. Lessons learned from this case study may be applicable to other countries with sufficient infrastructure to support a mixed paper and electronic system.

REGISTER DESIGN

Uruguay's Ministry of Public Health adopted a new National Immunization Plan (PNV) in 1987, and placed it under the charge of the Honorary Committee to Fight Tuberculosis and Other Prevalent Diseases (CHLA-EP) (Arrieta 2014). The CHLA-EP is a separate public entity that is administered alongside the Ministry of Public Health. Charged with a mandate to improve vaccine coverage and tracking, the CHLA-EP internally developed the National Immunization Program Register (SNNI) (Arrieta 2014). Notably, this system was the first nominal immunization register in Latin America (Ronveaux et al. 2009; PAHO 2012). A nominal register captures data on individual patients by name, often with one line per patient in the register book or form, and thus can track trends at the aggregate and individual levels. The SNNI is the standard for vaccination registration in Uruguay, with both public and private health providers using the SNNI to report all vaccinations.

DATA FLOW

The SNNI consists of a standard paper form ("Boleto de Vacunación") with a carbon copy and a national electronic database to house immunization data. The paper form includes data on the child, the mother, the vaccination center, and all vaccines administered during a single encounter. Vaccinators fill out the form immediately upon administering vaccines. The originals are sent to department-level CHLA-EP offices for data entry, and the carbon copies are kept on file at the vaccination centers (Ronveaux et al. 2009; Arrieta 2005). The department-level CHLA-EP offices submit an electronic back-up of the data to the central CHLA-EP office in Montevideo every one or two weeks (Ronveaux et al. 2009). The full database is only maintained at the national level. This case study demonstrates a mixed paper and electronic system, in which the paper forms are really a mechanism for data collection and the register is the national electronic database.

A child is usually first entered into the SNNI upon receiving the BCG vaccine at birth (Arrieta 2005). Even children who do not receive the BCG vaccine (e.g. due to contraindications) are registered in the SNNI database at birth (Ronveaux et al. 2009). The record in the department-level CHLA-EP database is updated with each subsequent vaccination. The SNNI tracks children regardless of the department where they receive their vaccines. For children who receive vaccinations outside the department where they were born, the original paper forms are sent each month to the department of birth for recording in the child's one-line record in the electronic register, and the child's information is updated to reflect any changes in residency (Ronveaux et al. 2009). Vaccination data remains housed in the department where the child was born; only the central CHLA-EP houses the full database.

DATA QUALITY

Data quality in the SNNI database is monitored internally by the Department of Immunizations in the CHLA-EP (Arrieta 2014). The SNNI database produces standardized electronic reports that track defaulters and report various quality indicators, such as number of children vaccinated versus vaccine requests (Ronveaux et al. 2009). These reports are sent electronically to facilities so that vaccinators can track down defaulters, facilitating Uruguay's high vaccine coverage rates. The original software for the national database was very inflexible and only allowed for specific reports to be generated. These reports did not monitor vaccine timeliness, nor vaccine coverage at the department level (Ronveaux et al. 2009). The SNNI began transitioning toward a fully electronic system in 2005, and was moved to a more flexible software to fill some of the reporting gaps in the older database.

In 2006, PAHO independently assessed the data produced by the SSNI using the World Health Organization's Data Quality Self-Assessment (DQS) tool, making Uruguay's SNNI the only national immunization registry in Latin America that has been evaluated by an external organization (PAHO 2012; Ronveaux et al. 2009). Findings from the DQS suggest that the data quality of the SNNI is very high and provides an accurate vaccination coverage estimate for the country (Ronveaux et al. 2009). PAHO recognizes Uruguay's SNNI as the standard for other Latin American countries (Ronveaux et al. 2009).

Results of this evaluation showed that the system performed very well. The archived forms were available at every vaccination center assessed, data timeliness followed a weekly or biweekly update schedule (with the exception of one facility on a 27-day turnaround), and feedback from the SNNI database for defaulter tracing was regular and reliable (Ronveaux et al. 2009). There was a 100% match between the paper vaccination forms stored at facilities and records in the central SNNI database, which was considered high numerator accuracy.

KEY LESSONS

INTEGRATING THE REGISTER INTO THE VACCINATORS' WORKFLOW SUPPORTS DATA QUALITY

Integration into vaccination workflow has made data collection a natural part of the vaccination process and contributes to high data quality. Once the new register was developed in 1987, trainings were held for departmental CHLA-EP staff, and extended to all vaccinators across the country. Filling out the register form was integrated into the workflow of vaccinators and quickly became a part of routine vaccine administration. There is now a very strong culture of recording immunizations on the forms immediately upon vaccination (Danovaro 2014). Key informants suggest that there is also a strong culture of workplace feedback in Uruguay, and that facility-level data quality monitoring occurs informally but is not standardized (Arrieta 2014; Danovaro 2014).

WELL-DEVELOPED INFRASTRUCTURE FACILITATES THE SUCCESS OF THE REGISTER

Many of the successes of the SNNI can be attributed to commitment of resources, developed infrastructure, and health system strengths. Uruguay is a small, high-income country with a strong health infrastructure in place. When the SNNI was developed in the late 1980s, the CHLA-EP was able to leverage the country's commitment to free vaccination to bring all public and private vaccine providers on board with the SNNI. This level of political commitment and ability to leverage both public and private relationships is unique.

The resources required to sustain the SNNI database and register form are fairly significant. The paper forms with carbon copies are very expensive. Each time a child is vaccinated a new paper form is used, and carbon paper is very costly (Danovaro 2014). Updates to vaccine schedules since the 1980s have increased the workload for data clerks, whose work has expanded from capturing data on about 10 immunizations per child to over 40 immunizations per child (Danovaro 2014). This system likely could not be sustained in a country with fewer resources.

TRANSITIONING AWAY FROM THE HIGHLY SUCCESSFUL PAPER FORMS IS A CHALLENGE

The original system has been so successful that the transition to an electronic system is now very challenging. The SNNI has been moving toward a fully electronic model since 2005 (Arrieta 2005). The transition has two phases: 1) move the SNNI database into a flexible software, and 2) "universalize" the new software to all vaccination centers (Arrieta 2014). This new system will provide geo-referenced information about the vaccinated population, identifying where vaccines are administered (PAHO 2012; Arrieta 2014). Importantly, this update will allow the database to include all vaccines given in the country, including non-standard vaccines (PAHO 2012).

The first phase has been achieved and the database is now housed in a much more flexible software, which has improved ease of updates and made reporting much more flexible (Ronveaux et al. 2009). The second phase has not yet been achieved. The paper form is so fully integrated into the vaccinators' workflow that the shift toward online data entry has been a difficult transition for the workforce (Danovaro 2014; Arrieta 2014). There is concern uptake will not be consistent across vaccination centers (Danovaro 2014).

SUPPORT FOR PATIENT CARE IS LIMITED BY THIS SYSTEM

The SNNI has very high data quality, but its utility in supporting patient care is currently limited. Aside from defaulter tracking, data from the SNNI is not easily integrated into patient care. Vaccination centers keep carbon copies of vaccine register forms, but it is unclear whether this information is linked with the patients' full medical record. The updated SNNI database will allow for more flexible reporting, which could further support patient care.

There have also been discussions around integrating the SNNI database with other health records as the SNNI transitions toward a fully electronic model. Conversations around integration have been highly politicized, partly because vaccination programs are vertical programs. There are concerns about maintaining the integrity of the data quality (Danovaro 2014; Arrieta 2014). Considering how these changes may impact or improve patient care should remain a part of discussions around updates to the SNNI moving forward.

OPEN QUESTIONS

The current case study was limited by a relative paucity of peer-reviewed evidence about Uruguay's SNNI, and depended heavily on expert interviews. While this case identifies the major strengths and challenges faced by the SNNI, detail is lacking. Future investigations into this case could further explore the SNNI's early design choices and implementation strategies. The SNNI is now ubiquitous across public and private vaccination centers; more information around how support for the SNNI was garnered across sectors would be beneficial. Finally, the SNNI offers an example of a successful paper register that is now transitioning toward a fully electronic system. Even in the Uruguayan context (high-income, strong health facility infrastructure) this transition is proving to be challenging. Future studies could investigate strategies for supporting the system throughout this transition.

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