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Progress Toward Implementation of Human Papillomavirus Vaccination – the Americas, 2006-2010*

Cervical cancer is a major cause of morbidity and mortality in the Americas, where an estimated 80,574 new cases and 36,058 deaths were reported in 2008, with 85% of this burden occurring in Latin America and the Caribbean [1]. Two oncogenic *Human Papillomavirus* (HPV) types (16 and 18) cause approximately 70% of cervical cancers and a substantial proportion of other HPV-related cancers [2]. HPV vaccination provides an opportunity to greatly reduce cervical cancer burden through primary prevention of HPV infection. This report summarizes the progress toward HPV vaccine introduction in the Americas, focusing on countries that have introduced the vaccine in national or regional immunization programs. As of January 2011, four countries in the Americas had introduced HPV vaccine. Overcoming issues related to financing and delivery of HPV vaccine remains a key public health challenge to more widespread implementation of HPV vaccination in the Americas.

Two brands of HPV vaccine are available. Both are effective against oncogenic types HPV 16 and 18: a quadrivalent vaccine (Gardasil®, Merck & Co., Inc.) and a bivalent vaccine (Cervarix®, GlaxoSmithKline). Quadrivalent HPV vaccine is also effective against nononcogenic types HPV 6 and 11, which cause most genital warts. Pre- and post-licensure studies have shown that both vaccines are safe and well tolerated [3,4]. Because HPV infections are acquired soon after initiation of sexual activity, HPV vaccine is most effective if administered before onset of sexual activity. The World Health Organization (WHO) recommends a 3-dose vaccine schedule, completed over the course of 6 months, for a likely primary target population of girls within the age range of 9 or 10 years through 13 years [3].

In April 2009, WHO issued a position statement recommending that routine HPV vaccination of females be included in national immunization programs, provided that 1) cervical cancer and/or HPV-related diseases constitute a public health priority; 2) vaccine introduction is programmatically feasible; 3) sustainable financing can be secured; and 4) cost-effectiveness of vaccination strategies in the country or region is considered. Preferably, HPV vaccines should be introduced as part of a coordinated strategy to prevent cervical cancer and should not undermine or divert funding from effective cervical cancer screening programs [3].

Information on HPV vaccine introduction in the United States and Canada was reviewed. Information about Latin America and the Caribbean was obtained through the Pan American Health Organization

TABLE: Implementation of human papillomavirus (HPV) vaccination in national immunization programs, by country and selected characteristics – the Americas, 2006–2010

Country	Year of implementation	Target population and age group	Catch-up age group	Geographic scope
United States*	2006	Females, 11–12 yrs	13–26 yrs	National
Canada†	2007	Females, 9–15 yrs	Varies	National
Panama	2008	Females, 10 yrs	None	National
Mexico‡	2008	Females, 9–12 yrs	Varies	Partial (5%)

* In the United States, quadrivalent HPV vaccine is approved by the Food and Drug Administration for use in females and males; the Advisory Committee on Immunization Practices (ACIP) states that quadrivalent HPV vaccine may be given to males aged 9–26 years, but currently it is not part of the routine immunization schedule for males.

† In Canada, quadrivalent HPV vaccine is approved for use in both females and males aged 9–26 years and females up to age 45 years by Health Canada; no recommendations from the National Advisory Committee on Immunization currently exist for women aged >26 years or for males of any age. Target ages vary across provinces and territories; the upper catch-up age in some jurisdictions ranges from 15 to 26 years.

‡ In Mexico, target age and catch-up age ranges varied by year, with an upper catch-up age as high as 16 years.

The Development of Dengue Vaccines and their Potential Use in the Americas

Dengue is a disease caused by an infection of four serologically and genetically related but distinct flaviviruses, denominated dengue viruses 1 to 4. *Aedes* mosquitoes, principally of the species *Aedes aegypti*, that bite infected persons infect themselves and then serve as the vector of the infection between people. In humans, 50–90% of primary infections remain asymptomatic.

When it clinically manifests, dengue has a spectrum of clinical presentations ranging from a debilitating fever to potentially lethal severe complications (severe plasma leakage, severe bleeding, or severe organ involvement). A key risk factor for severe dengue is a previous infection with a dengue virus of a different serotype.

Starting in the 1960s, dengue has gradually become a leading cause of hospitalization and death among children and adults in many countries of South-east Asia, the Western Pacific, and Latin America and the Caribbean. Because *Aedes aegypti* is the main vector, dengue flourishes in tropical and subtropical countries mainly among residents of urban and peri-urban poor areas but does not spare more affluent neighborhoods.

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(PAHO), which, as part of ongoing cooperation with its member states, monitors HPV vaccine introduction in the region.* Country-specific information was verified by representatives of PAHO member states. As of January 2011, four countries in the Americas had included HPV vaccine in their immunization programs: the United States, Canada, Panama, and Mexico (Table). HPV vaccination coverage varied widely. For the 3-dose vaccination series, coverage among girls aged 13–17 years in the United States was 32% in 2010; in parts of Canada, ≥80% coverage has been reported among girls in the target age ranges.

In the United States, HPV vaccine has been available since 2006. HPV vaccine administration occurs mainly through pediatric and family medicine primary-care providers; a publicly funded program, Vaccines for Children, provides vaccine at no charge to children aged ≤18 years who are uninsured or meet eligibility criteria. Coverage rates have increased each year since introduction in 2006. In 2010, overall coverage among girls aged 13–17 years was 48.7% for ≥1 dose of HPV vaccine and 32.0% for 3 doses [5].

In Canada, HPV vaccine has been available since 2006. School-based HPV vaccination programs delivered by public health agencies began in

2007, and all provinces and territories had publicly funded programs in place by 2009 [6]. Year of introduction, target age groups, and dosing schedules varied across provinces and territories; however, all offered HPV vaccine, free of charge, to girls in at least one of grades 4 to 9 (ages 9–15 years) [6]. Ten of the 13 jurisdictions offered the vaccine to more than one grade as part of a time-limited catch-up program [7]. Although most provinces and territories followed a 0-, 2-, 6-month dosing schedule, Quebec implemented a different approach; the first 2 vaccine doses were administered in grade 4 (ages 9–10 years), and the third dose in grade 9 (ages 14–15 years) [7]. In September 2010, British Columbia also began using an extended dosing schedule. Series coverage varied nationally among jurisdictions that reported, with a range of 80% to 85% in the Atlantic (eastern) provinces to 51% in Ontario, after the first year of the program.

In Panama, the Ministry of Health added bivalent HPV vaccine to the national immunization program in 2008 for a target population of girls aged 10 years [8]. Vaccine has been delivered through adolescent health services in both clinics and schools. Coverage rates have improved since vaccine introduction in 2008. In 2009, 1-dose coverage among girls aged 10

years was 89%, and 3-dose coverage was 46% [8]. In 2010, 3-dose coverage was 67%.

In Mexico, HPV vaccine was introduced in 2008 to 125 targeted municipalities (comprising approximately 5% of Mexico's population) with the lowest human development index, which were estimated to have the highest incidence of cervical cancer [8]. Quadrivalent HPV vaccine was delivered via mobile health clinics to girls aged 12–16 years in these municipalities using a 0-, 2-, 6-month dosing schedule [8]. In 2008, 1-dose coverage among girls in the target age range within these municipalities was 98%, and 3-dose coverage was 81%. In 2009, Mexico expanded its HPV vaccination program to include 182 municipalities with the lowest human development index and changed to an extended dosing schedule that targets girls aged 9–12 years for the first 2 doses, delivered 6 months apart, followed by the third dose 60 months later. Using the extended dosing schedule, 1-dose coverage was 85%, and 2-dose coverage was 67%; 3-dose coverage at 60 months is yet to be measured. In 2011, Mexico's National Immunization Council approved a nationwide expansion of its HPV vaccination program to include school-based vaccination of all girls aged 9 years.

What is already known on this topic?

Cervical cancer is a major cause of morbidity and mortality in the Americas, where an estimated 80,574 new cases and 36,058 deaths were reported in 2008. *Human papillomavirus* (HPV) vaccines are safe and effective, and HPV vaccination offers an opportunity to reduce the substantial burden of cervical cancer.

What is added by this report?

This report summarizes the progress toward HPV vaccine introduction in the Americas. As of January 2011, four (11%) of the 35 countries in the Americas had included HPV vaccine in national or regional immunization programs: the United States, Canada, Panama, and Mexico. HPV vaccination coverage varied widely. For the 3-dose vaccination series, coverage among girls aged 13–17 years in the United States was 32% in 2010; in parts of Canada, ≥80% coverage has been reported among girls in the target age ranges.

What are the implications for public health practice?

Overcoming issues related to financing and delivery of HPV vaccine remain key public health challenges to more widespread implementation of HPV vaccination, especially in regions with a disproportionate burden of cervical cancers.

Editorial Note

HPV vaccines are safe and effective, and HPV vaccination offers an opportunity to reduce the substantial burden of cervical cancer for women in the Americas. Although progress has been made in HPV vaccine introduction in the Americas, only four of 35 (11%) PAHO countries included the vaccine in their immunization programs as of January 2011. Several important challenges to implementation of HPV vaccination in the Americas exist, including cost, competing demands for the introduction of other new vaccines, and limited health-care delivery systems that reach adolescents.

HPV vaccines are among the most expensive vaccines available, and current prices in high-income countries[†] are not affordable for low- and middle-income countries. As with other new vaccines, international cooperation aims to increase HPV vaccine affordability by reducing the cost per dose. For instance, PAHO's Revolving Fund for vaccine procurement is a mechanism that aggregates vaccine purchases by countries in Latin America and the Caribbean and thus achieves economies of scale. Under this fund, HPV vaccine was first offered in 2010; the price per dose for participating countries in mid-2011 was \$14 (U.S. dollars). The GAVI Alliance (formerly

the Global Alliance for Vaccines and Immunization) is a public-private partnership that provides financing and programmatic support for vaccine introduction in low-income countries. As of October 2011, GAVI had not committed funds for HPV vaccination, and only three Latin American and Caribbean countries (Guyana, Haiti, and Nicaragua) were GAVI-eligible, limiting the potential impact of this program in the Americas. Access to HPV vaccine at more affordable prices is critical for widespread introduction and long-term sustainability of this vaccine in Latin America and the Caribbean, where most countries are considered middle-income. See [HPV](#) on page 3

* PAHO countries include: Antigua and Barbuda, Argentina, Bahamas, Barbados, Belize, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago, the United States, Uruguay, and Venezuela.

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Another important challenge for implementation of HPV vaccination is limited experience in health-care delivery to adolescents. Historically, most immunization programs have focused on infant vaccination and therefore are less experienced with accessing and vaccinating adolescents. Some countries in the region have participated in demonstration projects to explore options for vaccine delivery. HPV vaccination projects, including school-based implementation projects, have been piloted in Bermuda, Bolivia, Cayman Islands, Haiti, and Peru. In addition to Mexico, the governments of Argentina, Guyana,

Peru, and Suriname have been planning to implement national HPV vaccination programs in 2011. Efforts to identify the most effective and affordable strategies for vaccine delivery continue to be investigated [9]. Although some countries are using an extended 3-dose schedule, PAHO/WHO and CDC recommend a 3-dose schedule administered over 6 months.

The pace of global introduction of vaccines can be slow. For example, worldwide introduction of hepatitis B vaccine took approximately 20 years. During the past 4 years, several countries

in Latin America have introduced rotavirus and/or pneumococcal conjugate vaccines, marking the first time that new vaccines were introduced in middle- and low-income countries at the same time as in high-income countries [10]. Additional strategies are needed to overcome challenges to increasing HPV vaccine introduction, especially in regions with a disproportionate burden of cervical cancers. New opportunities to focus on health issues for women could support prioritization of this vaccine for Latin America and the Caribbean. ■

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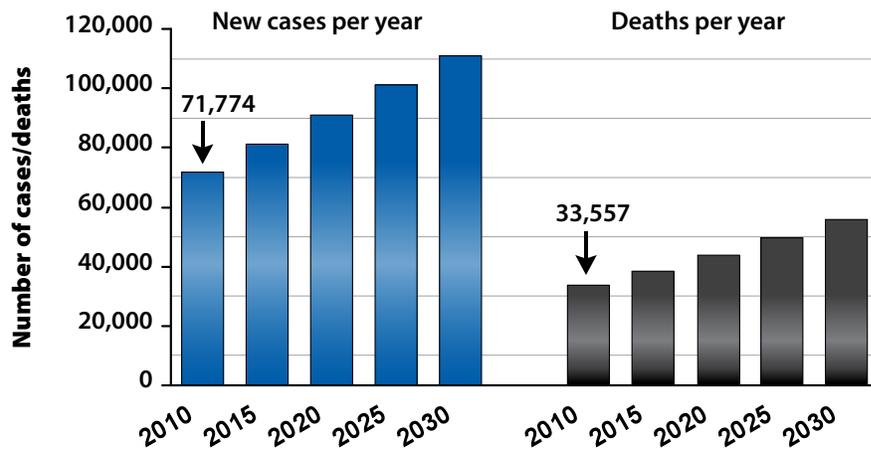
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ProVac Model for Evaluating the Cost-effectiveness of Cervical Cancer Control Strategies

Over 275,000* women die annually from cervical cancer worldwide. In the Americas, the Caribbean sub-region has the fourth highest cervical cancer incidence in the world. Achieving high coverage of secondary preventative strategies, such as cytology, to detect precancerous lesions in women has proved challenging in Latin American and Caribbean (LAC). In recent years, a safe and efficacious vaccine to prevent the sexually transmitted infection *human papillomavirus* (HPV), a leading cause of cervical cancer in women, was developed and tested for use in young girls.

With the availability of primary and secondary preventative strategies to control cervical cancer, countries in the Americas are looking to evaluate how best to combine these strategies to attain optimal impact. To that end, PAHO's ProVac Initiative has been developing a cost-effectiveness model to evaluate the relative costs and benefits of introducing HPV vaccination and optimizing screening strategies. This model will allow country study teams to evaluate the incremental cost-effectiveness of introducing the HPV vaccine among adolescent girls in combi-

Projected Cervical Cancer Burden in Latin America and the Caribbean, 2010–2030



Source: WHO/IARC, GLOBOCAN 2008.

nation with adopting new screening technology or addressing inefficiencies of current screening practices among adult women.

PAHO's ProVac Initiative has trained over 200 immunization professionals in the Region on basic health economic concepts, evidence-based decision making, and the use of economic models to inform national immunization policy. The new cost-effectiveness model under development will bring more actors to the immuniza-

tion policy discussion, including cervical cancer program managers, reproductive health professionals, among others. In order to socialize the model and provide a basic foundation for the use of health economics in the context of evidence-based decision making, PAHO's ProVac Initiative will hold a 3-day workshop in Bogota, Colombia at the beginning of November with the expected participation of the majority of the countries in the Region. ■

* Source: IARC, 2008.

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Dengue burden globally and in the Americas

One third (2.5 billion people) of the world population live at risk of a dengue infection. Worldwide, dengue is now reported in over 110 countries; it is estimated that up to 50 million infections, 500,000 cases of severe dengue and 20,000 deaths occur each year.

In Latin America and the Caribbean, dengue virus transmission now occurs in all countries and territories except for Uruguay and continental Chile. In 2010, 1,663,276 dengue cases were reported throughout the Americas – the highest number ever recorded (Graph). This number of cases corresponds to an annual rate of 3.2 cases per 1,000 people. Of the total dengue cases, 48,954 cases were classified as severe dengue and 1,194 case-patients deaths.

Although the incidence remains historically high, dengue incidence appears lower in 2011. As of November 18, 2011 (epidemiological week 46), 997,974 cases had been reported, of which 17,055 were severe dengue and 708 case-patients deaths.

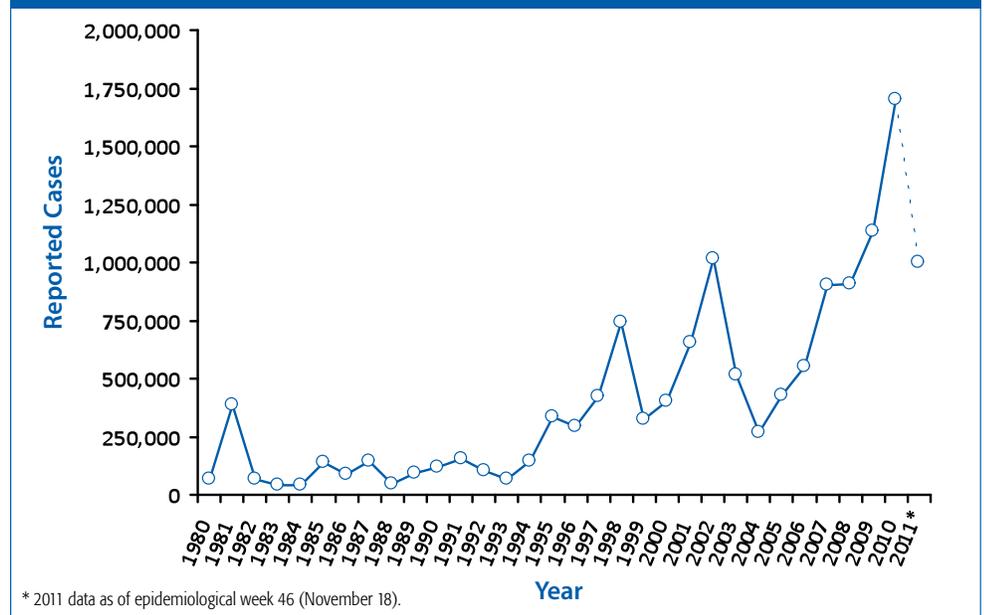
At country level, severe dengue manifests itself in either children or adolescent and adults. The distinct age group pattern depends on the previous waves of dengue epidemics and on the dengue virus serotype types that circulated previously. El Salvador and Venezuela are examples of countries where dengue occurs in children; in contrast, Mexico, Colombia, and Paraguay are examples of countries where all age groups, in particular adolescents and young adults, are affected. Incidence does not vary between genders.

The integrated management strategy for dengue prevention and control

Countries have made important efforts to contain and curb dengue burden. Since 2003, PAHO has supported Member States with the implementation of an integrated strategy for dengue prevention and control. Its core element is a management model designed to strengthen national programs interprogramatically through stronger partnerships among public entities at all levels, communities, and the private sector. Activities are organized into five components: patient care; social communication; epidemiological surveillance; vector control; and laboratory capacity. Until October 2011, the strategy had been adopted by 21 countries and systematically evaluated in 16.

In recent years, recognizing the key role of communities' involvement in dengue prevention and control, PAHO reinforced the commu-

Figure: Dengue cases reported in Latin America and the Caribbean, 1980–2011*



nication component of the integrated strategy with a methodology called COMBI (Communication for Behavioral Impact). Through the integration of health information-education-communication, social mobilization and marketing, and training and situation analysis research, this methodology aims to motivate and encourage communities to adopt and maintain key preventive actions for dengue.

Clearly, dengue prevention and control has a history in the Americas stretching back several decades. At least since 2003, dengue prevention and control is anchored on a well-defined strategy based in the integrated management of different components. In a few years, vaccination and transgenic *Aedes aegypti* mosquitoes incompetent for dengue transmission (being developed and tested in Asia and the Americas) might become an additional component and tool of this strategy, and thus complement and strengthen ongoing actions.

Dengue vaccine development

Dengue vaccine development has faced unique challenges due to the peculiar nature of dengue virus infection. Although significant advances have been made since the mid-1960s, the pathogenesis of severe dengue is still not completely explained, in part because of the absence of an animal model for the clinical disease. In simplified terms, the leading hypothesis has postulated that the transient protection conferred by one dengue virus serotype against infection by the three heterologous serotypes actually creates the conditions for an enhanced immune response

and thus for severe dengue, should a subsequent secondary infection by a heterologous serotype occur. This phenomenon, commonly denominated antibody-dependent enhancement (ADE), implies that any dengue vaccine must provide a simultaneous and long-term protection against all four dengue virus serotypes, i.e. it needs to be tetravalent. Although neutralizing antibodies are thought to be the immunological correlated for protection, the required antibody quantity is still uncharacterized—a lack in knowledge that has also contributed to the delays in vaccine development.

In spite of these challenges, the dengue vaccine pipeline is considerable and includes candidate vaccines at both the pre-clinical and clinical development stage. The Table summarizes five candidate vaccines in active clinical development. Three of these vaccines are live-attenuated and tetravalent, but vary in the employed virus and the actual dengue virus antigen; the two additional candidate vaccines are non-replicating.

The candidate vaccine that is more advanced in its clinical development is a live-attenuated tetravalent vaccine called ChimeriVax-DEN. This vaccine was obtained by replacing in the yellow fever vaccine 17D strain the genes coding for the membrane and envelope proteins for the corresponding genes of each of the four dengue viruses. The vaccine was deemed safe and efficacious in phase I–II clinical trials. Consequently, phase III clinical trials started in October 2010 in Australia (age groups included: 18–60 years) and in

Table: Dengue candidate vaccines in active clinical development, October 2011*

Clinical trial phase	Developer	Approach (details)	DENV antigens	Valencies
Phase 3	Sanofi Pasteur	Live attenuated (YF17D/DENV chimeras)	prM/E	Tetravalent
Phase 1	Inviragen	Live attenuated (DENV2-PDK53 DENV chimeras)	Whole virus	Tetravalent
Phase 1	US National Institute of Health; licensees: Biological E, Butantan, Panacea, Vabiotech	Live attenuated (targeted mutagenesis DENV chimeras)	Whole virus	Tetravalent
Phase 1	Merck	Recombinant subunit	80% of E	Monovalent
Phase 1	NMRC/WRAIR	DNA	prM/E	Monovalent

Adapted from Julia Schmitz and Joachim Hombach, World Health Organization / Initiative for Vaccine Research (WHO/IVR).

June 2011 in South-east Asia (2–14 years). A phase III trial is also planned at sites in five Latin American countries, namely Brazil, Colombia, Honduras, Mexico and Puerto Rico. Over 20,000 children and adolescents aged 9–16 years are being enrolled in this trial, expected to last until August 2016. In all these phase III trials, the vaccine is administered subcutaneously in a 3-dose schedule at 0, 6 and 12 months. First efficacy and safety results from these phase III trials may be available in 2013; if results were satisfactory, the vaccine developer plans to seek licensure as early as 2014–2015. During the first five years following licensure, the annual production is projected

at 100 million doses. Whilst substantial, at least initially vaccine availability would clearly be much smaller than the potential worldwide demand. No information has been released on the possible price of this vaccine.

In addition to clinical stage candidate vaccines, a large variety of candidates are in preclinical development. Some of these candidate vaccines potentially show superior product profiles and might thus become a second generation of dengue vaccines. Overall, the considerable dengue vaccine pipeline promises that several and diverse dengue vaccines might become available within a decade or so after a first vaccine is licensed.

Conclusions

As in other continents, dengue burden has notably increased in Latin America and the Caribbean over the past decades. Although an integrated management strategy for dengue prevention and control was implemented in several countries throughout the Region, anticipation exists for vaccination to complement current actions. For the first time in the history of the Americas' expanded immunization programs (EPI), discussion on the potential use of a vaccine has started even before the vaccine has been licensed.

In the next few years, clinical trials are being continued and partially concluded, thus generating needed additional safety and efficacy data. Given the peculiar nature of dengue, experts are actively discussing long-term evaluations of the interaction of mass vaccination and natural infection occurrence. Whilst some level of uncertainty persists, a window of opportunity is nonetheless present for national dengue and immunization programs to – similarly to what has been done for other new vaccines – collaborate towards supporting national level decision-making on a possible dengue vaccine introduction through the use of economic evaluations grounded in local data and towards ensuring surveillance systems able to inform vaccination policies and monitor vaccination effectiveness and impact. ■

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Progress Report: “Immunization: Challenges and Outlook”

Background

At the 50th Directing Council of the Pan American Health Organization (PAHO), the concept paper Strengthening Immunization Programs (Document CD50/14 (2010)) was submitted and adopted through Resolution CD50.R5. This resolution recognizes the great strides made in this area in the Region and urges the Member States to endorse national vaccination programs as a public good, while reiterating its support for the Regional Strategy for Immunization and its vision to sustain the achievements, complete the unfinished agenda, and tackle new challenges. It also calls for continued support for PAHO's Revolving Fund for Vaccine Procurement.

Progress

Vaccination coverage in the Region is among the highest in the world. The World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) estimated coverage for the Region of the Americas in 2009 at 94% for BCG, 91% for OPV3, and 92% for DTP3 in children under one year of age, and 93% for the MMR vaccine in children aged one. However, 10 countries reported national coverage of <90% for DTP3, while 43% of municipalities in Latin America and the Caribbean reported coverage of <95%.

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Sustain the Achievements

- Since 1991, our Region has been free of polio cases caused by wild poliovirus. There have been no indigenous cases of measles since 2002 or indigenous rubella or congenital rubella syndrome since 2009. In 2010, 63 cases of measles imported from other regions of the world were reported, along with 190 cases connected with imports. Measles outbreaks in Argentina and Brazil in 2010 involved people who had attended the Soccer/Football World Cup in South Africa.
- Given the reintroduction of polio in disease-free countries in other regions of the world and the imported cases of measles, in 2010 all the Member States analyzed the risk of the reintroduction of these diseases, the capacity for timely detection of cases or of the reintroduction of the viruses, and the capacity for timely and definitive prevention of secondary cases.
- *Haemophilus influenzae* type b (Hib) vaccination has resulted in a dramatic reduction in the number of cases and hospitalizations from this cause, and measures to assess the impact of the vaccine are being strengthened. It is possible that many countries have already eliminated the invasive diseases caused by Hib.

Complete the Unfinished Agenda

- Use of the vaccine against seasonal flu in the vaccination programs of the Member States has been on the rise; 36 countries and territories now include the vaccine in their immunization scheme. Based on the lessons learned from the vaccination efforts to combat pandemic influenza H1N1 2009, the vaccination approach targeting at-risk groups, especially pregnant women, has proven to be very important.
- Yellow fever vaccination has remained a priority in Member States where the disease is enzootic. In 2010, vaccination efforts were compromised by a drop in the supply of vaccines from producers. The situation has begun to correct itself in 2011, and it is anticipated that Member States will catch up on the vaccination of their at-risk populations.
- Each Member State has prepared a plan of action to achieve or maintain municipal vaccination coverage of 95% or higher and to strengthen epidemiological surveillance. In this effort, the technical and financial support of the Canadian International Development Agency (CIDA) and the U.S. Centers for Disease Control and Prevention (CDC) has been key.
- Vaccination Week in the Americas (VWA) represents an opportunity to keep vaccination on the countries' political and social agenda and to connect with vulnerable or hard-to-reach populations. In 2011, the theme of the ninth VWA is "Vaccinate your family. Protect your community." Four other regions of WHO are holding their own Vaccination Week in 2011: the European Region is holding its sixth, the Eastern Mediterranean Region, its second; and, the African and Western Pacific Regions are holding their very first. PAHO has provided technical support to the other regions through workshops, teleconferences, and field visits to share materials and information on experiences and lessons learned. The South-East Asia Region has committed to launching its own initiative in 2012, bringing us close to the goal of declaring a World Vaccination Week.
- Haiti is at risk for the reintroduction or reemergence of vaccine-preventable diseases, especially given the fragility of its health situation following the earthquake and cholera outbreak of 2010 and the number of susceptibles that have accumulated. In light of this, PAHO, under the coordination of Haiti's Ministry of Public Health and Population, has called on other institutions and partners to work together to strengthen the country's vaccination program.

Tackle New Challenges

- Extraordinary progress has been made in the introduction of new vaccines, which will save lives and avert expenditures. By 2010, 15 countries and territories had added the rotavirus vaccine to their regular series, 18 had the pneumococcal vaccine and 5, the human papillomavirus vaccine. Sixteen countries have sentinel surveillance centers that will enable them to assess the impact of vaccination and detect changes in the epidemiological patterns of diseases in a timely manner.
- Through the ProVac Initiative, PAHO has continued its technical assistance to the Member States in all the aspects of decision-making in connection with new vaccines and support for the aspects related to economic studies.
- Studies have been conducted with the Member States and technical partners to consolidate the lessons learned from the introduction of new vaccines in terms of cost-effectiveness, epidemiological impact, and the cost and surveillance of adverse events. These studies have served as a global reference.
- Ensuring timely and adequate information on the vaccinated population, coverage, and vaccine and supply needs for the development of strategies and planning operations is one of the major challenges for vaccination programs. With support from PAHO, the Member States have promoted the creation of digital vaccination records. Some countries have had records of this type for years, and others are well into the development and execution stage. The Member States have made a commitment to sharing experiences and working together, which means that the use of digital vaccination records is likely to spread in the Region in the short term.

PAHO Revolving Fund for Vaccine Procurement

- At the close of 2010, 40 Member States had purchased vaccines, syringes, and supplies through the Revolving Fund for Vaccine Procurement (RF). In 2010, the RF offered 45 different biologicals, with purchases totaling US\$ 510 million.

Next Steps

- Sustain vaccination as a public good.
- Strengthen epidemiological surveillance measures and vaccination at all levels in response to the risk that vaccine-preventable diseases already or eliminated in our Region could be reintroduced.
- Strengthen communication, information, and education for the population about the benefits of vaccines and immunization.
- Continue providing technical support to the Member States through the Pan American Sanitary Bureau. ■

Reported Cases of Selected Diseases, 2009-2010

Number of reported cases of pertussis, diphtheria, tetanus, neonatal tetanus (NNT), and mumps

Country	Pertussis		Diphtheria		Neonatal Tetanus		Tetanus (Non-NNT)		Mumps	
	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010
Anguilla	0	0	0	0	0	0	0	0	0	0
Antigua and Barbuda	0	0	0	0	0	0	0	0	0	0
Argentina	1,743	804	0	0	0	0	15	5	5,913	5,083
Aruba	0	1	0	0	0	0	0	0	0	0
Bahamas, The	0	0	0	0	0	0	0	0	3	0
Barbados	0	0	0	0	0	0	2	0	0	0
Belize	0	0	0	0	0	0	0	0	0	36
Bermuda	0	0	0	0	0	0	0	0	2	0
Bolivia	0	0	0	5	1	0	8	0	3,696	1,781
Brazil	1,037	477	4	32	3	6	275	302	...	...
Canada	1,667	759	2	0	0	0	2	3	214	799
Cayman Islands	0	0	0	0	0	0	0	0	0	0
Chile	692	794	0	0	0	0	10	9	825	891
Colombia	407	344	0	0	4	2	36	69	9,457	10,376
Costa Rica	664	71	0	0	0	0	1	0	25	17
Cuba	0	0	0	0	0	0	3	1	4	1
Dominica	0	0	0	0	0	0	1	1	0	0
Dominican Republic	18	37	5	4	1	0	58	50	...	4,897
Ecuador	41	0	0	0	5	2	4	0	837	1,331
El Salvador	2	2	0	0	0	2	10	0	126	369
French Guiana	...	...	...	...	...	...	...	...	...	...
Grenada	0	0	0	0	0	0	0	0	0	0
Guadeloupe	...	...	...	...	...	...	...	...	...	...
Guatemala	0	0	0	0	1	0	3	2	1	9
Guyana	0	0	0	0	0	0	0	0	0	0
Haiti	4	13	37	46	...	0	3	2	0	2,191
Honduras	127	135	0	0	1	1	20	15	187	172
Jamaica	0	0	0	0	0	0	6	3	0	1
Martinique	...	...	...	...	...	...	...	...	...	...
Mexico	559	371	0	0	0	3	39	43	...	5,780
Montserrat	0	0	0	0	0	0	0	0	0	0
Netherland Antilles	0	0	0	0	0	0	0	0	0	0
Nicaragua	11	24	0	0	0	0	0	1	103	52
Panama	101	22	0	0	1	0	1	1	154	81
Paraguay	1	1	0	0	1	2	11	6	83	132
Peru	254	64	0	0	1	5	18	42	...	...
Puerto Rico	...	...	...	...	...	...	...	...	...	...
Saint Kitts & Nevis	0	0	0	0	0	0	0	0	0	0
Saint Lucia	0	0	0	0	0	0	0	0	0	0
Saint Vincent and the Grenadines	0	0	0	0	0	0	0	0	0	0
Suriname	1	0	0	0	0	0	1	1	0	0
Trinidad and Tobago	0	0	0	0	0	0	0	0	0	0
Turks and Caicos Islands	0	0	0	0	0	0	0	0	0	0
United States of America*	16,858	23,983	0	0	...	...	18	26	1,991	2,547
Uruguay	9	36	0	0	0	0	1	3	256	169
Venezuela	...	0	0	0	1	2	16	11	7,509	3,353
Virgin Islands (UK)	0	0	0	0	0	0	0	0	0	0
Virgin Islands (US)	...	...	...	...	...	...	...	...	...	...
TOTAL	24,196	27,938	48	87	20	25	562	596	31,386	40,068

Source: 2010/11 PAHO-WHO/UNICEF Joint Reporting Forms (JRF) and Country reports to FCH-IM/PAHO: Morbidity and Mortality Weekly Report (MMWR), Vol. 60/No. 50.
 ... Not available

Data up to: 31 October 2011.

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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Guatemala's Vaccination Information System: An identification of unvaccinated and improved logistics for vaccine and supply distribution tool

Contributed by: Anabella Batres, Lisette Barrera, and Ana Elena Chevez

As part of the efforts to maintain and increase the vaccination coverage, the Ministry of Public Health and Social Welfare (MSPAS) of Guatemala is implementing a vaccination information system thanks to technical and financial support of the Optimize Project (PAHO, PATH, WHO). This system is part of the MSPAS's Management Information System in Health (SIGSA), and will be comprised of 3 key components: 1) a nominal registry component; 2) a vaccine, syringe, and supplies logistics component, and 3) a mobile technology application component.

The nominal registry component will allow for information on all children aged <5 years in the country to be captured. The information contained in the register includes the child's entire personal data (name, date of birth, age, gender, address), including the names and contact details of the parents (address, telephone number).

The logistics component is to provide support for the work performed by nurses at the opera-

tional levels, facilitating the process of monthly planning for vaccines, syringes, and other supplies. For this, the system will consider: the balances of vaccines, the number of children to vaccinate that month, the vaccine wastage factor, and the cold chain capacity.

The mobile technology component will contribute to the information/education/communication activities, by sending "SMS" to the children's parents regularly. These would serve to remind parents of the next vaccination date, as well as other primary health care aspects such as: Vitamin A, micronutrients, nutrition, among others, for their child(ren). Furthermore, an sms will be sent to the health workers reminding them about logistical aspects of the vaccination. Some examples of the messages that will hopefully be sent include: "Ms. Laura Figueroa: according to SIGSA you have reached recommended minimum stock of MMR vaccines. We recommend that you consider submitting an additional order" or "Mrs. Albina Guerra: according to SIGSA there are 10 vials of a lot of

Datos del Niño(a)	
RUP:	2010117020010029
Nombre del Niño (a):	COLLI EDISON
Nombre de la Madre:	
Nombre del Padre:	
Nombre del Encargado:	
CI:	
Municipio:	N/A
Comunidad:	N/A
Dirección Exacta:	CAR. JOMI
Sexo:	<input type="checkbox"/> Masculino <input type="checkbox"/> Femenino
Fecha de Nacimiento:	15 de Febrero del 2010
Edad:	<input type="text"/> Años <input type="text"/> Meses <input type="text"/> Días
Vive:	<input type="checkbox"/> Siempre <input type="checkbox"/> A veces

Rotavirus vaccine that expire the next month remaining. We recommend that you adopt the necessary administrative actions."

Over the following 6 months, the implementation process for this new tool will be completed helping to identify in detail the number and identity of unvaccinated children. This will provide the opportunity to learn the epidemiology of unvaccinated children in Guatemala. Furthermore, it will facilitate guaranteeing that the number of vaccines, syringes, and supplies required at each local establishment be available when that the establishments require them. ■