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Cuban experience in immunization, 1962–2016*

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ABSTRACT *Cuba's Immunization Program was created in 1962. It arose from the political, economic and social transformations initiated in 1959 when communicable diseases—including vaccine-preventable diseases—were the main cause of child morbidity and mortality. The program's organization and uninterrupted implementation have led to the eradication of six diseases, two severe clinical forms and two serious complications, as well as incidence and mortality rates of remaining diseases maintained at such low levels they do not constitute a health problem. An average of 4.8 million doses of simple or combined vaccines that protect against 13 diseases are administered annually in Cuba, including a pentavalent vaccine whose five components are produced domestically. The 1962 oral polio vaccine campaign was the first intersectoral experience with community participation in the Americas region, and Cuba was the first country to eradicate the disease. Recent Cuban research results have influenced the Global Polio Eradication Initiative. Universal vaccination against hepatitis B administered 24 hours after birth, using a domestic vaccine, was achieved in Cuba 19 years before the World Health Organization set the goal. Vaccination in Cuba is free, universal and integrated into primary health care. Cuba's comprehensive health system is the vehicle by which political will and the commitment to the population's health are put into practice. Epidemiologic data and surveillance are systematic, reliable and sensitive. Vaccination coverage for all vaccines is above 98%, and the population's level of immunity is high.*

Keywords Immunization; vaccines; health systems; Cuba.

Vaccination has drastically reduced morbidity and mortality from communicable diseases. It is the second most cost-effective preventive health action, surpassed only by access to safe water. Extraordinary progress has been made in improving existing vaccines and producing new formulations, but there is more to be done: in 2004, one-third of countries had not reached 90% coverage for three doses of DPT (1); in 2016, global coverage of three doses of DPT was 86% (2).

Coverage for nearly all vaccines in Cuba's routine vaccination schedule was 99%–100% in 2016 (3). An average of 4.8 million doses of simple or combined vaccines providing protection against

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13 diseases are administered annually, including one pentavalent vaccine produced in Cuba. Since 2004, most of the vaccines are manufactured in Cuba; the MMR, BCG, and polio (oral and parenteral) vaccines are imported. This capability, along with high vaccination coverage, is another striking indication that vaccine-preventable diseases (VPDs) are under control (4).

The history of medicine in Cuba includes a reference to smallpox vaccination several years before any such reference was recorded in Spain and other colonies (1802). In 1795, Dr. Tomás Romay, a pioneer in smallpox vaccination, published a report on the safety and efficacy of the procedure in the Papel Periódico newspaper in Havana. In 1887, the first rabies vaccination service in Latin America was inaugurated in Havana, and in 1901, smallpox vaccination was declared mandatory, along with other prophylactic interventions introduced by Cuban doctors.

Vaccination was systematically organized within public health after 1960, as a direct result of the political, economic and social transformations taking place in the country. At that time, health conditions due communicable diseases were poor, with about 500 deaths attributed to VDPs and tens of thousands of cases reported annually (5).

Since then, reducing morbidity and mortality from VPDs, and improving the population's health indicators have been among the main goals of Cuban public health. To achieve them, human resources training was enhanced; registry, statistics and health planning systems were strengthened; and medical services coverage—including creation of the rural health service—was expanded. Furthermore, access to services free of charge was guaranteed. Multisector support for vaccination campaigns and community participation were key strategies for attaining high coverage and efficacy, which quickly transformed the epidemiologic profile of communicable diseases for which registered vaccines existed (6).

The purpose of this paper is to present the main outcomes of the Expanded Immunization Program (EIP) in Cuba and specific elements of the country's health system that enabled reductions in morbidity and mortality from VPDs, as well as development of fundamental strategies based on basic and epidemiologic research, innovations for domestic vaccine production and sustainable interventions.

Origin and development of the EIP in Cuba

Cuba's National Immunization Program began in 1962 (4) at a time when VPD incidence and mortality rates were high, immunization was not a priority, and vaccination coverage was neither registered nor notified.

In 1961, incidence of poliomyelitis was 4.9 per 100 000 population. As the concept of medicine shifted toward a social and preventive approach, the first national poliomyelitis vaccination campaign was organized, in which all children aged <14 years were vaccinated. Launched in 1962, it was the first experience with community participation in the Americas region, 41 years before WHO's "Reaching Every District" approach (2002) (7). The innovative organization of the Cuban campaign can be viewed as a useful lesson for rapidly reducing VPD incidence. No new cases were reported, and in the course of only four months, Cuba became the first country in the region to eradicate poliomyelitis. Vaccination campaigns continue to be organized in conjunction with the national vaccine schedule.

Vaccination campaigns were also organized for diphtheria-pertussis-tetanus (DPT), diphtheria-tetanus (DT) and tetanus toxoid (TT), which were later incorporated into the vaccine schedule. Over time, the program succeeded in radically reducing morbidity and mortality from these diseases.

An essential structure in attaining high immunization coverage and efficacy was the comprehensive polyclinic, a primary health care (PHC) institution established in 1964, 12 years before the Alma Ata Declaration was adopted in 1978. The comprehensive polyclinic brought health services closer to localities and enabled implementation of community-based, prevention-oriented programs. In 1984, the comprehensive polyclinic evolved into the community polyclinic, providing care for 30 000–60 000 individuals distributed among 20–40 family doctor-and-nurse offices. The community polyclinic, with community participation, was and is a core institution for resolving the population's main health problems (8). It also brings a new actor to its focus on health promotion and disease prevention: the family doctor who heads the primary care vaccination programs and campaigns (9).

After 1959, vaccines were successively incorporated into campaigns or the vaccine schedule, or both, during the next 26 years. New formulations were steadily added, and older vaccines were combined in tetra- or pentavalent presentations (Table 2). As a result of these

TABLE 1. Rates of incidence and mortality from vaccine-preventable diseases, and vaccination coverage prior to the launch of Cuba's Immunization Program and 55 years later, by disease

Disease	1961			2016		
	Incidence (per 10^5 pop)	Mortality (per 10^5 pop)	Coverage (%)	Incidence (per 10^5 pop)	Mortality (per 10^5 pop)	Coverage (%)
Diphtheria	20.8	1.1	No notification	0	0	99.9
Tetanus	9.1	5.7	No notification	0	0	99.9
Whooping cough	2.8	0.1	No notification	0	0	99.9
Polio	4.7	0.1	*	0	0	97.4
Severe forms of tuberculosis	39.9	19.6	No notification	0	0	98.7
Measles	33.2	0.5	*	0	0	100
Rubella	1.7	1.7	*	0	0	100
Hepatitis B	No notification	No notification	*	0.5	0	99.9

* No vaccines administered.
Source: Reference 10.

interventions, diphtheria incidence and mortality rates fell from 20.8 and 1.1 per 100 000 population, respectively, in 1962, to 0.9 and 0.0 by 1970, both reaching zero in 1979. Vaccination coverage continued to rise, reaching 99.0% in 1982 (10), in contrast to other countries where current coverage remains below 90% (2).

Vaccination against whooping cough and tetanus, in independent or combined formulations, was introduced early and reduced the incidence of these diseases from 2.8 and 9.1 per 100 000 population, respectively, in 1962 to zero in 1987 for tetanus and 1997 for whooping cough. Thirteen years earlier, coverage had reached 99.0% (10). Its impact on neonatal tetanus was evident the same year vaccination was initiated, and the disease ceased to be a health problem due to its low incidence and mortality after only 15 years of sustained application (4).

Later, vaccination with the triple viral measles-mumps-rubella (MMR) vaccine began, significantly reducing incidence of these disease over a period of nine to eleven years (mumps: from 341.5 per 100 000 population in 1985 to zero in 1995; rubella: from 102.3 in 1985 to zero in 1995; and measles: from 32.2 per 100 000 in 1985 to zero in 1993) with 99% coverage since 1987. Rubella vaccination first targeted women aged <18 years, was expanded four years later to all women of childbearing age, and finally incorporated into the vaccine schedule two years later as a component of the MMR, with a booster at age 6 years (Table 3).

Starting in 1979, rising incidence and mortality rates of meningococcal meningitis were observed, finally spiking at12.8 and 2.0 per 100 000, respectively, during an epidemic in 1989 (10). As a strategy to control the epidemic, after eliminating serotype A in 1980, a license was obtained and granted for a domestic vaccine against *Neisseria meningitides* serotypes B and C (11). In a mass campaign, the entire population aged 3 months to 24 years was vaccinated, and in 1991 the vaccine was incorporated into the national vaccine schedule. That intervention controlled the epidemic, and in 1993,

TABLE 2. Year of intervention and impact, duration and final impact of vaccination, by disease, in Cuba

Disease	Year of intervention	Year of impact	Time period	Final impact
Poliomyelitis	1962	1962	4 months	Eradicated
Whooping cough	1962	1997	35 years	Eradicated
Neonatal tetanus	1962	1972	10 years	Eradicated
Tetanus	1962	1987	25 years	Eradicated
Diphtheria	1962	1979	17 years	Eradicated
Measles	1971	1993	22 years	Eradicated
Rubella	1982	1995	13 years	Eradicated
Mumps	1986	1995	9 years	Eradicated
Congenital rubella syndrome	1986	1989	3 years	Eradicated
Meningitis following mumps	1986	1989	3 years	Eradicated
Tubercular meningitis	1962	1972	10 years	Eradicated
Meningitis by *H. influenzae* type b	1999	2001	2 years	Rate <0.1 per 10^5 pop
Hepatitis B in persons aged <20 years	1992	2001	9 years	Rate <0.1 per 10^5 pop
Meningococcal meningitis BC	1988	1993	5 years	Mortality <98% Morbidity <93%
Typhoid fever	1962	2000	38 years	Rate <0.1 per 10^5 pop

TABLE 3. Official childhood vaccination schedule, Cuba, 2017

Vaccine	Protects against	Date dose initiated				Doses (No.)	Volume of dose (ml)	Application method	Anatomical region of application	Place of application
		1st	2nd	3rd	Booster					
BCG	Severe forms of tuberculosis	24 hours	–	–	–	1	0.05	ID	Left deltoid	Maternity Hospital
Hepatitis B*	Hepatitis B	24 hours	–	–	–	1	0.5	IM	1/3 M CALM	Maternity Hospital
Heberpenta-L (DPT, HB, Hib)	Diphtheria, whooping cough, tetanus, hepatitis B and Haemophilus influenzae b	2M	4M	6M	–	3	0.5	IM	1/3 M CALM	Polyclinic
DPT	Diphtheria, whooping cough and tetanus	–	–	–	18M	1	0.5	IM	1/3 M CALM	Polyclinic
Quimi-Hib	Haemophilus influenza b diseases	–	–	–	18M	1	0.5	IM	1/3 M CALM	Polyclinic
Va-mengoc-BC	Meningococcal B and C diseases	3M	5M	–	–	2	0.5	IM	1/3 M CALM	Polyclinic
MMR	Measles, mumps and rubella	12M	–	–	6Y	2	0.5	SC	Deltoids	Polyclinic and school
DT	Diphtheria and tetanus	–	–	–	6Y	1	0.5	IM	Deltoids	School
Vax Tyvi:	Typhoid fever	10Y	–	–	13Y and 16Y	3	0.5	IM	Deltoids	School
TT	Tetanus	–	–	–	14Y	1	0.5	IM	Deltoids	School
IPV	Poliomyelitis	4M	–	–	–	1	0.5	IM	1/3 M CALM	Polyclinic
OPVb	Poliomyelitis	Annual campaigns						Oral		Polyclinic

* Children whose mother is positive for hepatitis B surface antigen follow a different vaccination schedule: they will receive four vaccine doses at birth, 1 month, 2 months, and 1 year of age. The remaining vaccines are administered in accordance with the vaccination schedule shown.

ID = intradermal

IM = intramuscular

SC = subcutaneous

1/3 M CALM = middle third of the antelateral thigh

incidence fell to <1.0 per 100 000 population, and in 2008 to 0.1 per 100 000 population (10).

For protection against hepatitis B, WHO set the following targets: 1) by 1997, universal vaccination via national immunization programs; 2) by 2009, vaccination of all newborns in the first 24 hours; 3) by 2020, at least 50% coverage of the vaccine's third dose by 2020; and 4) by 2030, eradication of mother-to-child transmission with 80% vaccination coverage at birth (12). In Cuba, universal vaccination of children aged <1 year was introduced two years earlier than anticipated in the WHO recommendations for countries in the region with low prevalence of infection, using a Cuban vaccine comprised of sub-units obtained with DNA recombinant technology (HEBERBIOVAC HB®) (13). Universal vaccination 24 hours after birth was achieved 19 years before the goal set by WHO.

To control mother-to-child transmission, pregnant women are screened for hepatitis B surface antigen (HBsAg), and children born to positive mothers receive four doses of the vaccine. With this surveillance system, between 2007 and 2012, hidden infections were detected using real-time polymerase chain reaction in 2.1% (6/291) of children whose mothers tested positive for HBsAg, even having received the complete vaccination schedule for these groups (14). For this reason, hepatitis B vaccine escape mutants present a new challenge to the country's immunization programs.

To improve and expand the immunization program, a *Haemophilus influenzae* type b (Hib) vaccine was introduced, and the incidence of cases fell from 1.5 per 100 000 population in 1998 to 0.9 in 2001 (6). In 2003, the Cuban vaccine obtained from chemical synthesis (Quimi-Hib) was registered and marketed (15), the first of its kind in the world. It represents both an advancement in vaccinology with innovative technologies to obtain safer formulations against diseases identified as targets in this century, and also an achievement of Cuban science (16).

When the inactive whole-cell calorfenol vaccine against typhoid fever was replaced with the Cuban-produced *Salmonella Typhi* Vi polysaccharide vaccine (vax-TyVi) (17) and included in the vaccine schedule, reactogenicity was reduced with a chemically defined and highly purified product (18).

One goal of the EIP is to reduce the number of inoculations and doses requiring cold chain storage, making combined vaccines a cornerstone of this strategy (19). A year after the Cuban tetravalent DPT-hepatitis B (Trivac-HB) formulation (20) was included in the vaccine schedule, it was replaced by a pentavalent vaccine (Heberpenta®-L), which added to the former a synthetic antigen of *Haemophilus influenzae* type b (21). This new formulation is complemented with booster doses of individual vaccines. For more than 20 years, Cuba has collaborated with the Global Polio Eradication Initiative. Since 2005, strategies have been sought for administering the inactivated polio vaccine (IPV) in the final stages of eradication and post-eradication. One of the most important results of clinical trials informing the global program is the intradermal administration of two fractionated doses, more immunogenic in infants aged >4 months, because in the first months high levels of maternal antibodies interfere with the neutralizing antibody response (22–23). Intradermal administration of IPV with a needle-free injector was also proven safe (24). Additionally, one dose (complete or reduced) reinforces the immune response in adults previously vaccinated with the oral vaccine (OPV) (25). The IPV produced with Sabin strains is as immunogenic and safe as that produced with wild strains (26). The induction capacity of immunological sensitivity after administration of a single dose of IPV, either fractionated or whole, was demonstrated on a global scale for the first time (23).

Based on these outcomes contributed by Cuba, in May 2013, the 66th World Health Assembly approved the Polio Eradication and Endgame Strategic Plan 2013–2018 (27), updating its systematic polio vaccination policy. The Strategic Advisory Group of Experts on Immunization recommended that all countries introduce at least one dose of IPV to reduce the risks of reintroduction or reemergence of the polio virus as a result of the global withdrawal of the type 2 component of the polio vaccine in May 2016 (28).

In 2016, administration of IPV by schedule was initiated, and the bivalent oral vaccine (OPV) continues to be administered in vaccination campaigns (1 and 3), fulfilling the strategy to reduce the risks associated with withdrawal of the oral trivalent polio vaccine (OPVt). It must be noted that introduction of the IPV required dissemination of information to maintain health workers' and community members' confidence in the oral formulation (29).

Influenza vaccines are administered annually to children aged <2 years, adults aged >65 years, and at-risk groups selected annually. Leptospirosis and yellow fever vaccines are administered to at-risk groups. According to data on coverage and notifiable diseases from maternity hospitals; polyclinics; and municipal, provincial and national hospitals (3), the Cuban program is based on several tenets, including universal access to health services free of charge, full universal vaccination coverage >95%, and active community participation in PHC (451 vaccination centers in health areas and 236 outlying posts) (30). When new domestically manufactured formulations were introduced in Cuba, the national vaccination schedule was structured with first doses and boosters of individual and combined vaccines starting at birth.

The benefits of the organization of Cuba's immunization program, with systematic vaccination maintained over time, has made a positive impact on public health. Six diseases have been eradicated as well as two severe clinical forms and two of the most serious complications, and the other VPDs no longer constitute a health problem given their low morbidity and mortality rates (31).

In 1999, the surveillance system of events supposedly attributable to vaccination or immunization (ESAVI) was launched. From 1999 to 2008, the ESAVI rate was 57.8 per 100 000 doses of vaccines administered, highest in children aged <5 years. In 2002, during a measles eradication campaign, three deaths were classified as program errors (nonsterile diluent), and in 2004, one death due to noncompliance with vaccine administration norms (31). VPD surveillance was adapted to the characteristics of the Cuban health system following WHO guidelines for effective EIP management (32) and currently performs basic data collection and evaluation functions on vaccine quality, efficacy and safety. Furthermore, surveillance is done in PHC (33) (see Table 4).

The main achievements identified in the 2004 international evaluation were,

TABLE 4. Surveillance of vaccine-preventable diseases in Cuba

Type of surveillance	Diseases
Passive: Notifiable disease records (ND)	Tetanus and miliary tuberculosis
Active: Health personnel and epidemiologic survey (ES)	Pertussis-like syndrome (2001). Adverse affects following vaccination (1999)
Passive: ND Active: ES and source of infection control (SC)	Diphtheria, tubercular meningitis, hepatitis B (1992), typhoid fever (1962) and *haemophilus influenzae type B* diseases
Passive: ND Active: ES and SC Specific to Cuba	Meningococcal meningoencephalitis, from 1972 National Infectious Neurological Syndrome survey. Revised in 1998
Passive: ND Active: ES and SC Specific to entire Region of the Americas	Measles, mumps, rubella and poliomyelitis (1988)

Source: Reference 32.

first, that vaccination is guaranteed as a universal right of all Cubans, with equal opportunity, equity and free of charge, within a comprehensive health system. Likewise, PHC and community participation are recognized as decisive factors in the results obtained through vaccination, as well as government responsibility for funding vaccination in coordination with international organizations. Furthermore, the Advisory Committee on Immunization Practices ensures vaccination quality thanks to the stable cold chain, safe injections and competent professionals trained in program components, in addition to a systematic, reliable and sensitive epidemiologic surveillance system with individualized follow-up of adverse events and vaccine protection status. Results of basic and epidemiologic research have helped define policies and strategies, and drive biotechnological development in vaccine manufacturing and clinical trials.

WHO has recognized the importance of manufacturing domestic vaccines in developing countries to meet local needs and considers that this strategy could also contribute to the global vaccine supply (1), since it lowers production and marketing costs. From an economic standpoint, domestic vaccine production costs USD $70.83 per vaccinated child aged <14 years, while the hypothetical reference vaccine schedule, taking into account imported vaccines, costs USD $109.34 per child, a difference of USD $38.51 per child, making local development profitable (34). Each year about USD $33 881 890 is allocated for procurement of biological medicines, the cold chain, transport, modeling (surveillance and statistical surveys), fungible materials, training, and electricity, among other expenses. The Cuban government covers about 98% of the National Immunization Program's expenses, and the remaining 2% is covered by funds from international organizations (PAHO, UNICEF and GAVI).

The National Immunization Program and international cooperation

Even though the Cuban government financed 100% of the cost of the immunization program's vaccine supply and operations from 1962 to 1992, international technical cooperation has complemented the country's efforts.

In 1977, PAHO's Board of Directors passed resolution CD25.R27 creating the Revolving Fund which, based on the principle of equity, facilitates access to high-quality vaccination products. With Revolving Fund assistance and using national funds, Cuba purchased polio vaccines (oral trivalent and bivalent), BCG, MMR, yellow fever, influenza, and human and canine rabies vaccines at reduced prices, even 50% below market rates. PAHO promoted training, technical assistance with norms and strategies, strengthening of national laboratories, support for the epidemiologic surveillance system, effective management of vaccines, procurement of computer equipment, resources for teaching and transport, scientific bibliography and research sponsorship, among other actions.

In the 1990s, Cuba's health sector adopted emergency measures to maintain protection of the population and requested international support. Since 1993, UNICEF has provided BCG, DPT, DT and MMR vaccines, cold chain equipment, training and epidemiologic surveillance, and currently provides 70 000 doses of MMR vaccine. Rotary International, through the National PolioPlus Committee of Mexico, subsidized the polio vaccine for five years. This assistance, provided through PAHO, continued until 1996. From 2006 to 2008, the Global Vaccine Fund, also through PAHO, supported the national vaccination network with equipment and training to enable personnel to solve sectoral problems affecting vaccination coverage and eradication of several diseases (35).

Cooperation with the Vaccine Alliance (GAVI) enabled decentralization of vaccination centers to remote communities through storage, conservation, safe vaccine transport and reproduction of materials. Collaboration also included training health personnel, upgrading the network's laboratories, and providing technical assistance for VPD surveillance. In 2015, GAVI expanded its cooperation, supplying the necessary doses of IPV and preparing for its introduction. That cooperation was also facilitated by PAHO.

One of the most important lessons learned was execution of the first oral polio vaccination campaign in 1962, which set the paradigm for vaccination in the country (Table 5).

Challenges ahead for vaccination coverage

A current trend in developed countries is parents' refusal to vaccinate their children influenced by information circulating on social networks and websites attributing adverse affects from vaccination to the autistic spectrum and autoimmune diseases, among others. To date in Cuba there has been no such trend, possibly due to the population's confidence in the success of the program, reinforced by community work in PHC.

Final considerations

In only a few years, the EIP in Cuba drastically reduced VPD incidence and mortality, and made a significant impact on diseases that have been eliminated or no longer pose a health problem in the country. Factors determining the changes in Cuba's health conditions include PHC leadership of prevention activities

TABLE 5. Lessons learned in the first polio vaccination campaign in 1962, in Cuba

Initial problems	From 1932, when continuous morbidity and mortality notification began, until 1961, 4 134 cases of paralyses, 413 000 infected patients and 530 deaths were notified. The overall case fatality rate was 19.4%. The group aged <6 years was the most affected, with no preference of sex and with uniform distribution throughout the country. Lack of vaccination. Shortages in service coverage and health personnel. High illiteracy rate and low levels of schooling in the population made health education difficult.
National focus	In 1962, Cuba's strategy for controlling incidence and existing barriers involved three key elements: high vaccination coverage in national week-long campaigns (February and April), surveillance of suspected cases and actions to control sources of infection. A national census of children aged <15 was conducted; 50 300 people (vaccinators and volunteers) were trained, and a house-to-house vaccination drive was implemented throughout the country. A communication and public education strategy was deployed, including talks by experts on radio and TV, 30 000 radio spots broadcast—reaching rural areas—, TV dramas, and information in print media highlighting the campaign's progress and importance. The virological research laboratory was set up for poliovirus surveillance, seroprotection and circulation, and the National Infectious Neurological Syndrome Commission was created to evaluate cases. Control measures, such as the epidemiologic survey and collection of feces samples for virological and serological studies, were established.
Local setting	Organization involved zonal committees composed of the health director, an epidemiologist and representatives of civil society and other sectors; doctors practicing in rural social service; schools and health centers equipped as vaccination centers; stationary and mobile vaccination equipment in schools and health centers, and vehicles for transporting vaccines and trained personnel to remote areas. Educational messages were also broadcast (with mobile speakers and posters in frequented sites), and community work was done with civil society organizations to educate and convince parents and relatives to vaccinate children, and influence behavior accordingly. A daily telephone information system was used to transmit data from local to national levels.
Challenges	Limited material resources, resolved with cooperation and creative initiatives. Families' refusal to vaccinate children despite educational work in communities. Children with exact age unknown due to lack of birth records. Appearance of two cases of flaccid paralysis, a complication, in 1963.
Relevant transformations	2 216 022 children aged <15 received two doses (OPVt, Sabin) (85.3% coverage). No new cases nor deaths from poliomyelitis reported. Incidence lowered the same year from 4.7 per 100 000 to 0.7 per 100 000, and to 0 in 1963. Protection >80.0% for virus types 1 and 2 and 76.7% for type 3 in children aged <1 year with two doses evaluated by neutralizing antibody response. 20 cases of vaccine-associated poliomyelitic paralysis were reported.
Lessons learned	Sufficient vaccine for universal coverage of the target population and adequate epidemiologic measures, essential for a successful campaign. Intersectoral, multidisciplinary work, with community participation and involving civil society organizations; coordinated actions with the Ministry of Public Health and government, and involving the population, enabled volunteer training and public education to reduce incidence and mortality of polio—despite limited resources—and make an impact on coverage and eradication of vaccine-preventable diseases. The structure of primary health care institutions and their integrated network facilitates the work if they are used correctly to organize campaigns in local contexts. Poliomyelitis was eradicated with the first vaccination campaign in Cuba 55 years ago. Since then, eradication has been maintained through annual vaccination campaigns.

Source: Reference 36.

and participation of an educated community in the immunization program, organization of vaccination campaigns, scientific and technical advances in vaccine manufacturing, and basic and epidemiologic research. Cuba's vaccination coverage and protection indicators are currently among the best in the world.

Recommendations

The recommendations presented here address some of the program's weaknesses. Rotavirus and papilloma virus vaccines have yet to be introduced, and efforts are being made to accomplish this objective in the next three years. Clinical trials of the candidate pneumococcus vaccine are awaiting conclusion before a domestic formulation can be licensed. This is important because pneumococci pneumonia is one of the ten leading causes of death from infectious diseases in the country.

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RESUMEN

Experiencia cubana en inmunización, 1962–2016

El Programa de Inmunización de Cuba se creó en 1962 como resultado de las transformaciones políticas, económicas y sociales iniciadas en 1959, cuando las enfermedades transmisibles — entre ellas las prevenibles por vacunas— eran la principal causa de morbilidad y mortalidad en la población infantil. Su organización y ejecución ininterrumpida han permitido que seis enfermedades, dos formas clínicas graves y dos complicaciones graves estén eliminadas, y las restantes mantengan tasas de incidencia y mortalidad que no constituyen un problema de salud. Anualmente, en Cuba se administran, en promedio, 4 800 000 dosis de vacunas simples o combinadas que protegen contra 13 enfermedades, incluida una pentavalente cuyos cinco componentes se producen en el país. La vacunación antipoliomielítica oral en la campaña de 1962 fue la primera experiencia en la Región de las Américas con participación comunitaria e intersectorial y Cuba, el primer país en eliminar la enfermedad. Resultados recientes de investigaciones cubanas han incidido en el Programa Mundial de Erradicación. La vacunación universal antihepatitis B a las 24 horas después del nacimiento se cumplió 19 años antes de la meta fijada por la OMS empleando una vacuna nacional. En Cuba, la vacunación es gratuita, de acceso universal, está integrada en la atención primaria de salud, y el compromiso y la voluntad política con la salud de la población se vehiculizan mediante un sistema de salud integral. La información y la vigilancia epidemiológica son sistemáticas, confiables y sensibles. Se alcanzan coberturas de vacunación por encima de 98% en todas las vacunas y la población tiene un nivel inmunitario alto

Palabras clave Inmunización; vacunas; sistemas de salud; Cuba.

RESUMO

Experiência cubana em imunização, 1962–2016

O Programa de Imunização de Cuba foi criado em 1962 como resultado das transformações políticas, econômicas e sociais iniciadas em 1959, quando as doenças transmissíveis —entre eles as que são evitáveis pelas vacinas— foram a principal causa de morbidade e mortalidade em crianças. Sua organização e execução ininterrupta permitiram que seis doenças, duas formas clínicas graves e duas complicações graves sejam eliminadas, e as demais mantêm incidência e taxas de mortalidade que não constituem um problema de saúde. Anualmente, em Cuba, uma média de 4,8 milhões de doses de vacinas simples ou combinadas são administradas que protegem contra 13 doenças, mesmo uma vacina pentavalente cujos cinco componentes são produzidos no país. A vacinação oral contra a poliomielite na campanha de 1962 foi a primeira experiência na Região das Américas com participação comunitária e intersetorial, e Cuba foi o primeiro país a eliminar a doença. Resultados recentes da pesquisa cubana influenciaram o Programa Mundial de Erradicação. A vacinação universal contra a hepatite B às 24 horas após o nascimento foi completada 19 anos antes do objetivo estabelecido pela Organização Mundial da Saúde usando uma vacina nacional. Em Cuba, a vacinação é gratuita e o acesso universal, e a vacinação é integrada na atenção primária de saúde. O compromisso e a vontade política para a saúde da população são transmitidos através de um sistema de saúde abrangente. A informação e a vigilância epidemiológica são sistemáticas, confiáveis e sensíveis. A cobertura de vacinação é superior a 98% em todas as vacinas e a população possui alto nível imune.

Palabras-chave Imunização; vacinas; sistemas de saúde; Cuba.