



Examining the cost of delivering routine immunization in Honduras



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ABSTRACT

Background: Many countries have introduced new vaccines and expanded their immunization programs to protect additional risk groups, thus raising the cost of routine immunization delivery. Honduras recently adopted two new vaccines, and the country continues to broaden the reach of its program to adolescents and adults. In this article, we estimate and examine the economic cost of the Honduran routine immunization program for the year 2011.

Methods: The data were gathered from a probability sample of 71 health facilities delivering routine immunization, as well as 8 regional and 1 central office of the national immunization program. Data were collected on vaccinations delivered, staff time dedicated to the program, cold chain equipment and upkeep, vehicle use, infrastructure, and other recurrent and capital costs at each health facility and administrative office. Annualized economic costs were estimated from a modified societal perspective and reported in 2011 US dollars.

Results: With the addition of rotavirus and pneumococcal conjugate vaccines, the total cost for routine immunization delivery in Honduras for 2011 was US\$ 32.5 million. Vaccines and related supplies accounted for 23% of the costs. Labor, cold chain, and vehicles represented 54%, 4%, and 1%, respectively. At the facility level, the non-vaccine system costs per dose ranged widely, from US\$ 25.55 in facilities delivering fewer than 500 doses per year to US\$ 2.84 in facilities with volume exceeding 10,000 doses per year. Cost per dose was higher in rural facilities despite somewhat lower wage rates for health workers in these settings; this appears to be driven by lower demand for services per health worker in sparsely populated areas, rather than increased cost of outreach.

Conclusions: These more-precise estimates of the operational costs to deliver routine immunizations provide program managers with important information for mobilizing resources to help sustain the program and for improving annual planning and budgeting as well as longer-term resource allocation decisions.

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1. Introduction

Implementation of the Expanded Program on Immunization (EPI) in Latin America and the Caribbean (LAC) has been broadly successful. Vaccination has been responsible for much of the reduction in childhood mortality since the 1980s, and the LAC nations are on track to achieve Millennium Development Goal 4 [1]. At the beginnings of these EPI programs, the routine delivery

of childhood vaccines, including Bacillus Calmette-Guérin (BCG), diphtheria–tetanus–pertussis (DTP), oral polio (OPV), and measles (M), cost no more than US\$ 20 per fully immunized child. Today, the cost of vaccines alone to complete the recommended schedules in most LAC countries far exceeds this cost [2]. There are newer, more expensive vaccines, including ones to prevent severe pneumonias, meningitis, and diarrheas in children, as well as the human papilloma virus (HPV) that causes cervical cancer in women. These new vaccines have demonstrated a favorable cost-effectiveness profile, but they often require a doubling or tripling of the budget envelope for their adoption into the routine program [3]. Additionally, the health system costs associated with delivering vaccines are likely increasing due to the infrastructure investments required

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to incorporate new vaccines and a broadening of the program to include population groups beyond children [4].

Concern about growing costs has triggered an interest in strengthening capacity to track and analyze immunization costs, cost-effectiveness, budget impact, expenditures, and outcomes in order to promote greater operational efficiency and sustainability. This trend has been especially true for countries that are approaching a transition away from donor support. Honduras is one of six LAC countries that receive new-vaccine subsidy support from Gavi, the Vaccine Alliance, which is a public–private partnership that works to increase access to new vaccines in the poorest nations of the world. In 2011, Gavi support subsidized 42% of the total cost of vaccines used in Honduras' national immunization program [5]. But, like all other LAC countries supported by Gavi (except Haiti), Honduras is “graduating” from Gavi eligibility due to economic growth and will soon face a higher, “graduated” cost for the newly adopted vaccines. For Honduras and its Gavi graduating peers, understanding the cost of routine immunization in the context of Gavi graduation is critical for planning and program sustainability.

In 2012–2013, the Honduran Ministry of Health (MoH) undertook a study to estimate the costs of the routine immunization program for the year 2011. The study was carried out in collaboration with PAHO's ProVac Initiative, which is a capacity-building effort to strengthen evidence-based decision-making concerning immunization policy [6]. This study was part of the Bill and Melinda Gates Foundation's EPI Costing and Financial Flows (EPIc) project, a study of the cost and financing of national immunization programs in six countries. Research teams in the EPIc network developed common methodological guidance and actively worked to harmonize their studies with this guidance [7]. This article reports the total and unit costs of routine immunization delivery in Honduras in 2011 and describes these costs in the context of programmatic performance and efficiency. A companion article in this special supplement to *Vaccine* explores financing for immunization services in Honduras in the same year [8].

1.1. Routine immunization in Honduras

In Honduras, the recommended schedule of childhood vaccines includes the traditional ones of BCG, Hepatitis B (HepB) infant dose, OPV, DTP/HepB/Hib, and measles–mumps–rubella (MMR), plus two recent additions, pneumococcal conjugate vaccine (PCV) and rotavirus vaccine (RV). The national immunization program also includes vaccines for other populations and diseases, including Tetanus–diphtheria (Td), yellow fever, influenza, and booster doses of DTP (Table 1). Additionally, there are assessments underway to evaluate introducing the HPV vaccine as soon as 2015 [9].

Among countries of the Americas in the same income grouping, Honduras' immunization program is considered a success story. With the help of sustained vaccination coverage above 90% in targeted risk groups, mainly children under 5 years old, Honduras has been free of polio since 1981 and measles since 1989 [10]. Recently, Gavi recognized Honduras for its notable achievement of reaching 98% coverage of the target population with the rotavirus vaccine within two years of the vaccine's introduction into the routine schedule [11]. In 2011, Honduras reported that all children under the age of 2 years were fully vaccinated with all the recommended routine vaccines, with the exception of PCV13, which had been newly introduced in the middle of that year. However, population coverage of childhood vaccines in Honduras saw a slight downward trend after adjustments to the official denominator estimates in more recent years [18]. When using municipal-level denominators that do not account for migration, coverage gaps appear to persist in vulnerable populations and difficult-to-access areas. Security problems in the country have compounded the problem of suboptimal

coverage in some districts [12]. Nonetheless, the estimates available indicate coverage has been very high overall for many years [10].

The MoH delivers over 90% of all vaccinations in Honduras. The national immunization program has its central administrative offices in the capital, Tegucigalpa. Regional offices in each of Honduras' 20 sanitary regions oversee service delivery activities as well as organize and operate the supply chain. At the municipal level, one health facility is designated as the “lead” facility for EPI, and has some administrative role in managing immunization in the municipality's health facilities.

The vast majority of immunization service delivery occurs in three types of health facilities: (1) hospitals; (2) CESAMO [*Centro de Salud con Médico y Odontólogo*] health centers, which are typically found in more densely populated areas; and (3) CESAR [*Centro de Salud Rural*] health centers, which are mostly found in rural areas. Immunization in hospitals is limited to newborn application of BGG and hepatitis B doses (70% of all births occur in hospitals). Therefore, the bulk of immunization activity occurs in CESAMO and CESAR health centers.

2. Methods

The methods for this study were guided by the “common approach” methodology for the EPIc multi-country study [7], which aimed to harmonize approaches between the six study sites regarding the sampling protocol, scope and categorization of costs, preferred data sources and assumptions, and study perspective. In Honduras, we retrospectively estimated the economic costs of the government-administered routine immunization program for 2011, from a societal perspective that valued the opportunity cost of all resources consumed in the delivery of immunization except patient time and expenses (e.g., for transportation to clinics).

The routine immunization program is defined as the routine activities to deliver vaccines to the recommended target populations in Honduras. These routine activities include health facility-based vaccination, outreach activities, and the annual periodic intensification of routine immunization (PIRI) through mass social mobilization (which overlaps with Vaccination Week in the Americas). The annual total number of doses applied in the routine program includes those applied in-facility and out-of-facility, but excludes doses applied to achieve a supplemental non-routine program goal, such as vaccination of adult risk groups with the pneumococcal polysaccharide vaccine supply that Honduras received as a donation in 2011. To facilitate comparison to other countries in the EPIc study, we also present the portion of program cost for delivering immunization to children up to 1 year of age (see Supplementary Appendix 1). All costs, other than for vaccines and syringes, were collected in the local currency, lempiras, and converted to 2011 US dollars, with the official exchange rate of 18.8915 lempiras to US\$ 1.00. Vaccines and syringe purchase records were already in US dollars. All capital costs were annualized, with a three percent discount rate [13].

Data were collected on resource use and costs at the central, regional, and municipal program administrative levels as well as at health facilities. Eight of the country's 20 sanitary regions were selected purposefully by the EPI to represent a range of settings in terms of the level of urbanization, socioeconomic status, and geography. Two of the selected regions are geographically small, but very populous metropolitan regions (Tegucigalpa and San Pedro Sula). The six other selected regions are more characteristic of the country as a whole. Within the 8 regions, we gathered data from each regional EPI office. In addition, using a multistage probabilistic design, we collected information from a sample of 31 rural (CESAR)

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