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Funding gap for immunization across 94 low- and middle-income countries

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ABSTRACT

Novel vaccine development and production has given rise to a growing number of vaccines that can prevent disease and save lives. In order to realize these health benefits, it is essential to ensure adequate immunization financing to enable equitable access to vaccines for people in all communities. This analysis estimates the full immunization program costs, projected available financing, and resulting funding gap for 94 low- and middle-income countries over five years (2016–2020). Vaccine program financing by country governments, Gavi, and other development partners was forecasted for vaccine, supply chain, and service delivery, based on an analysis of comprehensive multi-year plans together with a series of scenario and sensitivity analyses.

Findings indicate that delivery of full vaccination programs across 94 countries would result in a total funding gap of $7.6 billion (95% uncertainty range: $4.6–$11.8 billion) over 2016–2020, with the bulk (98%) of the resources required for routine immunization programs. More than half (65%) of the resources to meet this funding gap are required for service delivery at $5.0 billion ($2.7–$8.4 billion) with an additional $1.1 billion ($0.9–$2.7 billion) needed for vaccines and $1.5 billion ($1.1–$2.0 billion) for supply chain. When viewed as a percentage of total projected costs, the funding gap represents 66% of projected supply chain costs, 30% of service delivery costs, and 9% of vaccine costs. On average, this funding gap corresponds to 0.2% of general government expenditures and 2.3% of government health expenditures.

These results suggest greater need for country and donor resource mobilization and funding allocation for immunizations. Both service delivery and supply chain are important areas for further resource mobilization. Further research on the impact of advances in service delivery technology and reductions in vaccine prices beyond this decade would be important for efficient investment decisions for immunization.

1. Introduction

The cost of national immunization programs (NIPs) is increasing with the introduction of new vaccines and efforts to improve coverage of existing vaccine schedules. A greater need to vaccinate children in more remote and hard-to-reach areas also contributes to the rising costs of immunization. The Global Vaccine Action Plan (GVAP) 2011–2020 – endorsed by the 194 member states of the World Health Assembly in May 2012 – was created to facilitate commitments to support immunization by presenting a roadmap for strengthening NIPs through increased vaccination coverage and introduction of new and underutilized vaccines. It outlines a mission to improve health by extending, to 2020 and beyond, the full benefits of immunization to all people. In order to achieve GVAP goals, understanding the resources required for vaccination programs and the projected gaps in financing is important to ensure adequate and sustainable health investments in the world's poorest countries.

While governments share in the financing of vaccination programs [1], achieving ambitious GVAP targets will require

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additional financial commitment. One of the primary challenges in garnering these commitments lies in the difficulty of estimating the resources required for NIPs. Estimating the level of financing necessary to continue to reduce vaccine-preventable disease burden worldwide is important to sustain and improve upon advances made in immunization. Economic evidence is therefore essential to enable governments and development partners to project funding needs and commit resources toward vaccination.

This analysis augments the Decade of Vaccine Economics (DOVE) project [2–4], extending prior efforts to examine financing for immunization. Specifically, we explore six scenarios on the impact of future cost and financing projections, link the latest cost and financing requirements at a global scale, examine financing requirements by cost components (vaccine, supply chain, service delivery), and provide uncertainty ranges through sensitivity analyses. By linking detailed vaccine program costs [2] with a range of financing projections, this work provides an in-depth view of immunization program resource requirements that reflect dynamic realities such as economic growth and pricing policy changes over time.

2. Materials and methods

2.1. Analysis scope and approach

This analysis estimates the projected available financing and resulting funding gap based on immunization program costs across 94 low- and middle-income countries (LMICs) over 5 years, 2016–2020. This includes 73 countries supported by Gavi, the Vaccine Alliance, and 21 countries not eligible for Gavi support. Gavi countries include 36 low-income countries, 17 countries above the World Bank's low-income threshold that received Gavi support, and 20 countries that will graduate from receiving Gavi support during 2016–2020 (see Appendix A for the full list of countries).

The model incorporates the following 18 vaccines currently in national immunization programs in some LMICs: Bacillus Calmette-Guérin (BCG), cholera, diphtheria-tetanus-pertussis (DTP), DTP-hepatititis B-hib (pentavalent),[2] hepatitis B birth dose, human papillomavirus (HPV), inactivated polio (IPV), Japanese encephalitis (JE), malaria, measles, measles-rubella (MR), measles-mumps-rubella (MMR), meningococcal conjugate A (MenA), oral polio (OPV), pneumococccal conjugate (PCV), rotavirus, typhoid, and yellow fever (YF). These include 12 vaccines where Gavi supports partial or full financing to facilitate new vaccine introductions, five other traditional vaccines, and a cholera stockpile. These vaccines are delivered through a combination of channels, where 17 vaccines are provided through routine immunization programs and 8 vaccines through supplementary immunization activities (SIAs).[3] The cholera vaccine is not routinely delivered but rather set aside as stockpiles for cholera control and outbreak response.

We estimate vaccine program costs for three mutually-exclusive components of routine immunization (vaccines, supply chain, and service delivery) and two components of SIAs (vaccines and operational support). *Vaccine costs* were defined as the costs of procuring vaccines and related injection equipment and safety boxes needed to safely administer vaccines. *Supply chain costs* included the costs for immunization-specific and shared[4] transportation, storage, and cold-chain specific labor. *Service delivery costs* encompassed the costs of immunization-specific and shared[5] personnel and non-personnel components including program management, training, social mobilization, surveillance, and other recurrent costs related to vaccination. *Operational support* for SIAs included vaccine delivery and management of vaccination campaign efforts. The categorization reflects classifications and definitions used in previous vaccine program analyses [5–7]. Projected available financing was estimated for each of these components.

Our method of analysis was developed with consideration of the approaches and lessons learned from previous immunization program costing exercises [5–8], and the availability and use of country-level data. For example, data from national comprehensive multi-year plans (cMYPs) provided the basis for estimates of immunization costs and financing for the majority of Gavi countries. The cost and financing estimates in the cMYP are provided by country teams using standardized guidelines developed by the World Health Organization (WHO) [9]. Transparency of the model design was also valued for continuous use and ability to update future inputs. Table 1 presents the full scope of costing and financing analysis. All cost and financing projections are presented in constant 2010 US dollars (US$2010).

2.2. Costing of national immunization programs

The costing, financing, and funding gap analyses were conducted concurrently across 18 vaccines over the decade, 2011–2020. The costing analysis is presented in a companion piece [2]. Specifically, vaccine costs were primarily derived from Gavi, the Pan American Health Organization (PAHO), and UNICEF price projections [10–15] in combination with doses from Gavi's Adjusted Demand Forecast version 9 (ADFv9, released spring 2014) [16]. Supply chain costs were modeled based on simulations of country-specific models developed by the HERMES (Highly Extensible Resource for Modeling Event-Driven Supply Chains) Logistics Modeling Team [17–27]. Average and marginal service delivery costs per dose and operational support for SIAs were obtained from an analysis of cMYPs [28]. See Portnoy et al. for further details on costing methods and results [2].

2.3. Financing of national immunization programs

The financing analysis focuses on three funding sources: funds from country governments, funds from Gavi and funds from "other development partners" (ODP). Sources from ODP include multilateral and bilateral donors, non-governmental organizations, foundations, and private philanthropy organizations. Financing approaches are summarized in Table 2.

2.3.1. Government financing

In Gavi-supported countries, we estimated governments' vaccine co-financing obligations articulated in the Gavi co-financing policy based on the 2014 demand forecast (ADFv9) [16,29]. We assumed that governments will meet these co-financing obligations for Gavi-supported vaccines [29]. For non-Gavi supported vaccines, the baseline percentage of government financing for vaccines was obtained from cMYPs and applied to the total estimated annual costs for those vaccines to estimate a plausible proportion of vaccine financing by government. If a cMYP was not available for a country, the percentage of government financing of routine vaccines was taken from the WHO/UNICEF Joint Reporting Form (JRF), and was projected forward until 2020 using a five-year

[2] DTP-HepB-Hib refers to the diphtheria-tetanus-pertussis-hepatitis B-Haemophilus influenzae type b vaccine, also known as pentavalent.

[3] *Supplementary immunization activities (SIAs)* are defined through accelerated disease control (ADC), elimination, or eradication initiatives (e.g., polio eradication campaigns) that go beyond routine immunization.

[4] Shared transportation refers to any transportation which is utilized for multiple purposes, including but not limited to immunization.

[5] Shared personnel are defined as resources that are not specific to immunization and are used by different programs or activities in the health sector.