

# The Cost of Delivering Vaccines Using Different Delivery Strategies in High Coverage Areas in Indonesia

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This study was conducted by the Center for Family Welfare (Pusat Penelitian Keluarga Sejahtera (PUSKA)) at the University of Indonesia in Jakarta, Indonesia, in collaboration with the National Institute of Health Research and Development (NIHRD) and the Ministry of Health, as part of the Immunization Costing Action Network (ICAN). ICAN was facilitated by ThinkWell and John Snow, Inc. (JSI) and supported by the Bill & Melinda Gates Foundation.



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## EXECUTIVE SUMMARY

### Background

Indonesia has transitioned from a donor- to self-funded immunization program and is facing the dual challenge of achieving high and equitable coverage of life-saving vaccines while introducing new vaccines. Accessible, evidence-based, and accurate information on the cost of delivering vaccines is becoming more critical to inform budgeting, planning, and policymaking to ensure government at all levels has sufficient financial resources to deliver vaccines.

In Indonesia's decentralized health system, immunization is partially funded and managed at district and city level. Autonomous local governments are responsible for ensuring sufficient budget for vaccine delivery costs, also called operational costs. In general, fiscal capacity of districts and cities is low. Budget execution and accountability is also challenged. Cost evidence can support improved resource mobilization and more efficient delivery of immunization services.

Although several immunization program costing studies have been done in Indonesia, all previous studies were limited to specific antigens especially for new vaccines, such as Hib, Typhoid, Dengue and Japanese Encephalitis. Prior to this work, there was no study on the cost of delivering the basic immunization program at district and city level. The lack of cost evidence may have contributed in part to the low funding for operational costs.

Our study therefore aimed to estimate the district/city level costs incurred for immunization delivery that contributes to achievement of high coverage, using a combination of delivery strategies (see Box 1 for exact research question). Costs incurred for immunization delivery are often referred to as immunization delivery costs

### Box 1. Research Question and Key Findings

Research question: Using a combination of different delivery strategies (puskesmas, posyandu and schools), what are the district/city level costs incurred for immunization delivery that contribute to achievement of high coverage?

#### Key findings:

- There is large variation in total and unit costs between districts/cities, facilities, and vaccine delivery strategies:
  - Immunization delivery costs (facility average) ranged from approximately IDR 100 million to IDR 160 million (US\$7,324 to US\$12,000); at DHO-level, total costs ranged from 113 million to 426 million (US\$8,395 to US\$31,852).
  - Cost per dose ranged from IDR 9,824 to IDR 43,421 (US\$0.73 to US\$3.22) (facility and DHO-level average).
  - Cost per basic fully immunized child (FIC) ranged from IDR 138,549 to IDR 724,603 (US\$10.26 to US\$53.67) (facility and DHO-level average).
  - By delivery strategy, average cost per dose to deliver a vaccine is lowest at schools (ranging from IDR 4,904 to IDR 25,758, or US\$0.36 to US\$1.91), followed by posyandu (IDR 9,806 to IDR 48,705, or US\$0.73 to US\$3.61) and then puskesmas (IDR 15,295 to IDR 83,237, or US\$1.13 to US\$6.17) (facility and DHO-level average).
  - Increased volume per facility or per delivery strategy is associated with increased efficiency. At higher volumes, fixed costs are spread over more doses and the cost per dose and per FIC decreases.
- Salaried labor, transport/fuel and cold chain equipment & energy are the main cost drivers at the facility level.

#### Use of findings:

- Study results can be used to inform budgeting and planning in the sampled areas and in other districts/cities which have similar characteristics to those in the sample. Results can also be used to update existing cost norms for budgeting and benchmarking.
- Results were presented at the Joint Appraisal and Total System Effectiveness workshops in 2019, and to key stakeholders involved in the development of the National Medium-Term Development Plan 2020-2024 and the National Health Plan.

(IDCs) or operational costs. These are the costs associated with delivering immunization services to target populations; in the context of Indonesia, this is exclusive of vaccine and consumables costs. Since our study aims to inform budgeting and planning, we focused on financial costs, that is, financial outlays incurred by government; volunteer time and the value of any donated items are excluded.

In terms of delivery strategies, we looked at the three delivery strategies currently used as part of routine immunization:

- Routine facility-based delivery at the *puskesmas* (health center): usually limited to one day per week to serve babies and children that visit the facility on that particular day.
- Outreach activities at the *posyandu* (integrated health post): delivered once a month at agreed-upon spots (usually village office or house of a community member). An estimated 80% of immunization services are delivered at the *posyandu* (ThinkWell, 2017).
- School-based program: delivered twice a year at *elementary schools*, targeting first through third graders.

The first two strategies target children aged <13 months (basic immunization) and children aged 13 months to 3 years (advanced immunization), while the school-based program is only for school-aged children. The vaccines included in our study for these target groups are HepB 0, BCG, OPV4, DTP/HB/Hib3, Measles (basic immunization); DTP/HB/Hib4, Measles (advanced immunization); and Measles, DT, Td (school-based strategy).

We chose to focus on high coverage areas that otherwise represent a variety of characteristics and contexts present in Indonesia under the assumption that high coverage areas were more adequately funding their immunization delivery operational costs than low coverage areas. Therefore, cost findings might give us an indication of what other districts/cities should be spending to achieve high coverage.

During the period 2016-2019, ThinkWell and JSI provided technical support to the costing study within the context of the Immunization Costing Action Network (ICAN), a research and learning community working to increase the visibility, availability, understanding, and use of immunization delivery cost information. ICAN supported three countries – Indonesia, Tanzania and Vietnam – to build country capacity to generate and use cost evidence to inform planning, budgeting and decision making for the immunization program.

## Methods

The study used ingredients-based costing from a government perspective to retrospectively estimate the full, financial immunization-related delivery costs incurred at the district/city, sub-district, and village levels during the 2016 EPI fiscal calendar (January to December 2016). National and provincial-level costs were excluded, in line with the study objective to estimate subnational resource requirements for immunization. We focused on routine immunization, defined as services provided regularly as part of the government program at *puskesmas*, *posyandu* and schools; immunization services provided by private providers and any supplementary immunization activities taking place during the study period were excluded.

The sample included two of the country's 34 provinces: East Java and Central Borneo. In each province, we collected data from one district and one city, for a total of two districts and two cities. We sampled puskesmas, posyandu and elementary schools within each district/city for a total sample of 24 puskesmas, 48 posyandu, and 48 elementary schools.

For each of the four sampled districts/cities, we present weighted average total facility costs and unit costs (cost per dose and per basic fully immunized child (FIC), defined as a child who has completed the last dose of basic immunization (i.e., up to 13 months)). We present costs by delivery strategy (puskesmas, posyandu and school-based). We also analyze the main cost-driving activities and line items. All unit cost results are volume-weighted, meaning we summed total costs and divided by total output (either doses or FICs) as opposed to calculating simple averages based on facility values.

All results are presented in 2016 Indonesia Rupiah (IDR) and US dollars (USD) using a conversion rate of 13,500 IDR = 1 USD. Summary USD results are included in the main text, with further explanation in Annex 3.

### Findings and Discussion

This study found large variation in delivery volumes, total costs and unit costs between districts/cities, facilities, and vaccine delivery strategies in four sampled districts/cities in East Java and Central Borneo provinces. A summary of results is shown in Table 1.

**Table 1. Summary of findings (2016 IDR)**

Findings	District		City	
	Ponorogo	Pulang Pisau	Malang	Palangka Raya
<b>Total immunization delivery cost</b>				
Facility average	7,958	9,593	7,324	11,998
DHO level	297,825,042	113,331,392	426,022,355	156,311,589
<b>Cost per dose</b>				
Facility average	14,799	39,893	7,415	10,790
DHO level	1,854	3,528	2,409	2,058
<b>Cost per FIC*</b>				
Facility average	254,991	668,191	103,159	175,212
DHO level	28,640	56,412	35,390	29,228
<b>Cost per dose by delivery strategy (including facility- and DHO-level costs)</b>				
Puskesmas average	41,581	83,237	15,295	19,351
Posyandu average	17,648	48,705	9,806	12,085
School average	7,732	25,758	4,904	6,940

\* A basic FIC is a child who has completed the last dose of basic immunization (i.e. up to 13 months).

We believe these differences are largely explained by service delivery volumes, since there is a clear, inverse relationship between volume per facility or per delivery strategy and unit costs: as more doses are delivered and more children are fully immunized, cost per dose and per FIC decreases. This is likely because most immunization delivery costs in Indonesia are fixed as opposed to variable, and are spread over more doses as volumes increase, thereby decreasing the cost per dose or FIC. School-based delivery in Indonesia achieves high volumes during two annual sessions, resulting in lower unit costs. The very small number of doses (less than 20% nationwide) delivered at puskesmas lead to higher unit costs. Some of the differences in delivery volume are largely driven by geography, population and population density. Facilities in urban cities delivered more doses on average than facilities in more rural districts, and had a lower average cost per dose. Urban facilities are likely to be located closer to communities, making them easier to reach and driving up coverage levels. Rural areas may also require greater travel distances.

By district/city, the highest volumes and lowest unit costs are in Malang, whereas the lowest volumes and highest unit costs are in Pulang Pisau. Malang is a small, highly dense urban area with a high number of doses delivered, whereas Pulang Pisau is a sparsely populated, vast rural area where staff travel large distances to remote posyandu, but deliver few doses given the small population. Extra per diem and travel allowances given in this district, along with high vehicles and vehicle maintenance costs due to the large distances travelled, help account for high costs. Palangka Raya, despite being officially classified as a city, is another large area with a small population; in this city they use a higher number of staff to deliver immunization services, driving up salaried labor costs. In addition to these important differences in findings by district/city, within districts/cities we also see differences by facility. Although the purpose of this study was not to delve into these differences, we found that total costs vary across facilities with similar delivery volumes, and volumes vary at facilities with similar total costs. Without further research, it is not clear why we see these variances, but utilizing or reallocating spare capacity and keeping delivery volumes high can help improve efficiency.

This study has only looked at financial costs, since the main purpose was to inform budgeting for operational costs at district/city level. The current immunization delivery policy in Indonesia makes heavy use of volunteers, whose non-remunerated time is not included in our study. A change in policy which would require remuneration of this cadre would increase the average cost per dose by 5% to 24% depending on the district/city.

These findings are largely in line with the global evidence about immunization delivery costs, although comparisons are challenging given differences in the costs and contexts compared. Our financial cost of IDR 9,806 to IDR 83,237 (US\$0.73 to US\$6.17) per dose for those vaccines included in basic and advanced immunization through puskesmas and posyandu delivery coincides with the global estimate from low- and middle-income countries (LMICs) of \$0.75 to \$9.45 per dose for delivering a schedule of vaccines to children under one at health facilities and through multiple strategies (Vaughan, et al., 2019). For school-based delivery, the global estimates of US\$1.95 to US\$2.24 (financial costs) per dose are higher than our estimates of IDR 4,904 to IDR 25,758, or US\$0.36 to US\$1.91 (financial costs).

### Opportunities for Use of Results

Although the sample of the ICAN study is not large enough to be nationally representative, and large geographical, epidemiological, demographic and socio-economic differences across the country mean costs can vary significantly by area, the findings are the most up to date immunization delivery cost evidence available for Indonesia. In addition to using these findings to inform budgeting and planning in the sampled districts/cities, an annual process which takes place from January to September, methods could be explored for adjusting the data to fit districts/cities with similar characteristics to the four sampled. The results can also be used at central level to update the Health Operational Cost Guidelines which are used to determine the Special Allocation Fund for the Immunization Program. They may also be useful in information budget exercises for new vaccine introduction.

Study results have been presented to BAPPENAS, MOH, and other key stakeholders involved in the development of the National Medium-Term Development Plan 2020-2024 and the National Health Plan, both taking place in late 2019. Presentations on results were made at the Joint Appraisal meeting in June 2019, at the International Health Economics Association congress in July 2019, and at the Total Systems Effectiveness workshop in October 2019. Additional opportunities may arise in 2020 for consideration of use of results, including presentation to other audiences such as the Indonesian Technical Advisory Group on Immunization (ITAGI) and ICC.