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# An Assessment of the Expanded Program on Immunization (EPI) in the Philippines: Challenges and Ways Forward

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# An Assessment of the Expanded Program on Immunization (EPI) in the Philippines: Challenges and Ways Forward

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**Abstract**

The Philippine Expanded Program on Immunization (EPI) has been in existence for almost 40 years. It is one of the major programs of the Department of Health (DOH). The program has the critical objective of providing Filipino children with access to safe and effective vaccines that will protect them from diseases like measles, diphtheria, tetanus, and whooping cough.

The Philippine EPI has achieved many milestones in this regard. There is no doubt that mortality and morbidity due VPDs have declined precipitously over the years, saving the lives of countless of Filipino children. Moreover, polio was certified eliminated in 2000 and maternal and neonatal tetanus in 2017.

Despite this progress, the coverage of basic vaccines has hovered at 70%- 80% in the last 30 years. The program has never achieved its target to fully immunize at least 95% of children.

Here, we assess the performance of the EPI in the Philippines. Central to this assessment is the policy question: why has the country struggled to maintain immunization coverage over the years and repeatedly failed to achieve its national immunization target?

While demand factors like vaccine confidence have contributed to the weak performance of the program, the sharp decline in immunization coverage is largely a result of deep-seated supply-side systems issues related to leadership, planning, and the supply chain that has led to recurring vaccine stock outs in the past decade.

**Keywords:** Philippines, Expanded Program on Immunization, vaccine, supply-side

**Disclaimer:** This article/report reflects the points of view and thoughts of the authors', and the information, conclusions, and recommendations presented are not to be misconstrued as those of the Department of Health (DOH). Furthermore, this article/report has not yet been accepted by the DOH at the time of writing. The material presented here, however, is done in the spirit of promoting open access and meaningful dialogue for policy/plan/program improvement, and the responsibility for its interpretation and use lies with the reader.

**Role of funder:** We would like to express our gratitude to the Department of Health for their support in the funding of the study and sharing of data for analyses. For this assessment, the funders had no role in study design, data analysis, interpretation of results, or preparation of this discussion paper.

## Executive Summary

The Philippine Expanded Program on Immunization (EPI), established in 1976, has been in existence for almost 40 years. It is one of the major programs of the Department of Health (DOH). The program has the **critical objective of providing Filipino children with access to safe and effective vaccines that will protect them from common but deadly diseases like measles, diphtheria, tetanus, and whooping cough.**

**EPIs are a cornerstone of public health in any country**, and the Philippine EPI has achieved many milestones in this regard. There is no doubt that mortality and morbidity due VPDs have declined precipitously over the years, saving the lives of countless of Filipino children. Moreover, polio was certified eliminated in 2000 and maternal and neonatal tetanus in 2017.

Despite progress, the coverage of basic vaccines hovered at 70%- 80% in the last 30 years. The program has never achieved its target to fully immunize at least 95% of children. The sharpest decline in immunization coverage occurred during the last decade (2008 to present). In 2014, immunization coverage has declined to almost 65%, the lowest level since the early 1990's. Currently, the country's immunization coverage is lower than most low-income countries.

Here, we assess the performance of the EPI in the Philippines. Central to this assessment is the policy question: why has the country struggled to maintain immunization coverage over the years and repeatedly failed to achieve its national immunization target?

While demand factors like vaccine confidence have contributed to the weak performance of the program, the sharp decline in immunization coverage is largely a result of deep-seated supply-side systems issues related to leadership, planning, and the supply chain that has led to recurring vaccine stock outs in the past decade. The large decline in immunization coverage in 2014, for instance, was largely a result of vaccine stock outs in the previous year when vaccine confidence of the population was high at 95%.

**Highlights of Philippine EPI performance**

- **National immunization coverage in past three decades was characterized by large fluctuations.** The Philippines has never reached the target of 95% basic vaccination coverage (i.e., for BCG, 3 doses of OPV, 3 doses of DPT, and 1 dose of measles). In contrast, many other countries in the world, including most ASEAN countries, have successfully increased and maintained high levels of coverage.
- **The immunization coverage of most regions has suffered declines in recent years with rate of decline being highly heterogenous.** Region XII and ARMM recorded alarming declines: coverage in the Region XII declined from 80% in 2013 to 40% in 2017 while coverage in ARMM declined from 40% in 2013 to 20% in 2017. Since the 1993 NDHS, ARMM has not had basic vaccination coverage above 50%.
- **Immunization coverage was slightly higher among the rich, but there were relatively less inequities between rich and poor compared to other vertical public health programs.** In 2017, the top 20% richest households had higher coverage for all vaccines

and doses compared to the poorest 60%. But declines in basic immunization coverage over time occurred in all socio-economic groups, with the rich suffering the largest declines.

- **Routine immunization seems to be predominantly delivered in public facilities. Around 95% of children received their last vaccination at public clinics or hospitals**. The high uptake of routine child vaccination in public facilities even among the richer segment of the population sets EPI apart from other public health programs which typically have larger socio-economic inequalities.
- **A substantial number of children were not completing their vaccine series.** In 2017, only 70% had complete basic vaccination. For measles vaccination, almost 30% of children who had their first doses did not complete the required second dose. Based on regression results, children of mothers without education and with limited access to maternal healthcare services were more likely to miss later doses in the vaccination series.
- **Many children, albeit vaccinated, had untimely immunization.** In 2017, only 38% to 65% (depending on the vaccine dose) of immunized children had timely administration based on the recommended vaccination schedule. More alarming is that, overall, among children who were immunized with all eight routine vaccine doses considered, only 11% had timely vaccinations for all doses.

**Financing**

- **Routine child immunization was mainly financed by the public sector, specifically the national government through DOH.** Data on private sector spending on vaccination is neither systematically collected nor analyzed; therefore, the total spending on vaccines in the country remain largely unknown.
- **In terms of resources, the EPI is clearly a priority program of the Department of Health.** In 2020, EPI accounted for 7% of the annual DOH budget. From 2005 to 2020, public spending on EPI dramatically increased even after adjusting for population growth and inflation: expenditures have increased 4-fold after sin tax revenues were allocated to EPI - from PHP 2 billion in 2013 to PHP 7 billion in 2020.
- **Majority of additional DOH EPI funds from sin taxes were spent purchasing new vaccines and not strengthening the health system's ability to deliver said vaccines. In 2017 and 2018, vaccines accounted for almost 97% of the total DOH spending on EPI.** In 2017 and 2018, almost 60% of the total spending for the EPI were spent on the Pneumococcal Vaccine (PCV). Public spending on routine childhood vaccines (BCG, OPV, DPT, HiB, HepB, MCV/MMR) and the vaccine cold chain remained roughly same with slight decreases on a per-capita basis.
- **Only 1%-1.5% of the DOH EPI budget is typically allocated for cold and supply chain and less than 1% for soft components.** Investments on human resources such as capacity building and training were utterly negligible.

**Vaccine supply chain and Human resources**

- **The mode and manner of delivery of routine vaccines by the public sector has remain unchanged over the years:** It is a **government-centric delivery model common in most developing countries with less mature health systems.** The national government plans and procures all the vaccines annually. It employs push and pull distribution models to regional and provincial offices, and central government manages the entire supply chain and logistics.

- **The Philippines sources its vaccine supply either from UNICEF as negotiated procurements or directly from local tenders with competitive bidding.** In recent years, the government has shifted to securing vaccines locally as part of the country's efforts towards vaccine independence. This endeavor, however, has led to failed procurements almost every year. Failed procurements were the primary reason for artificial vaccine stock outs in 2013, and DOH procurement data up to 2019 shows that it continues to occur.

- **Poor strategy and planning, lack of foresight during need's assessment and allocation, inadequate warehouse capacity and logistics system, and other bureaucratic process** such as delayed payments to logistics and suppliers have contributed one way or another vaccine stock outs.

- **The government has poured enormous resources and introduced multiple vaccines in recent years, but it has failed to invest in systems strengthening or the non-vaccine components of the program** to solve recurring problems of stockouts and low immunization coverage. For example, currently, only two technical staff in DOH central office manage the program, spreading themselves too thinly on gigantic tasks - nationwide planning, procurement, logistics, leveraging funds, monitoring, and unplanned supplemental immunization programs to address VPD outbreaks.

**Moving Forward**

The EPI has been existence for almost 40 years. It cannot keep doing the same things, incurring the same problems, and expect things to improve.

To overcome these challenges, the program needs bold leadership and reform. In these reforms, the DOH needs to ensure that the health system and its health human resources can deliver the basic childhood vaccines efficiently, equitably, and in a timely manner - before it even thinks about adding new vaccines that will merely overwhelm the existing weak vaccine cold and supply chain.

Our policy recommendations are divided into short and long-terms solutions:

**A. Short-term solutions**

These solutions aim to **immediately address supply-side constraints**, particularly stock outs:

- In the interim, the DOH should consider procuring all its vaccines from UNICEF until the local procurement system can effectively guarantee the country's supply.

- The DOH should consider multi-year planning and procurement with local manufacturers and carefully interface this with UNICEF. The DOH should avail Multi-Year Obligation Authority (MYOA) from Department of Budget and Management (DBM). This will reduce the uncertainty that comes with annualized procurement.

- The DOH should augment the technical staff of the program. The leadership of the program must have the foresight and critical thinking in understanding the current and future needs of the program, and the ability to communicate these needs within and outside the bureaucracy.

**B. Medium to Long-term solutions**

Medium- and long-term solutions are needed to **optimize efficiency, timeliness, and equity in the uptake of vaccines.** The program must be aligned with the financing and service delivery model as envisioned in the Universal Health Care Act of 2019.

- **Improve planning of vaccine requirements**. The DOH currently uses aggregate census data in estimating needs, which result to poor planning and foresight. The government should explore using actual headcounts and electronic immunization registries in estimating the actual need and monitoring coverage and timeliness of vaccination. This initiative can be possibly pursued with the new Philippine national ID system.
- **Increase immunization coverage and timeliness by expanding to private sector delivery channels**. Given their large and growing presence, the government can tap the private sector to carry out a publicly- financed and privately or publicly delivered EPI. With the private sector, child vaccines can be delivered more routinely and timely than sporadic supplemental vaccination programs. For this to be realized, the government needs to shift its financing scheme from DOH to PhillHealth. The DOH is not allowed to contract out private providers, but PhilHealth can.
- **Increase immunization coverage by allowing more health worker cadres (both from the public private health workers) to provide routine vaccination.** This requires, however, further reconnaissance and amendments of certain laws. In other health systems, non-physicians can administer vaccines or may receive insurance reimbursements.
- **Improve and invest in the vaccine cold and supply chain.** The DOH centrally procures and manages the supply chain - storage, distribution, handling, and stock management, and logistics. The government should create a formal and organized distribution system and explore contracting out the whole supply chain or parts of it to the private sector.
- **Re-design procurement practices to improve efficiency.** The government should find ways to improve efficiency through economies of scale by considering itself (DOH) as the sole or the main procurement entity of vaccines. Both the private and public health facilities will only source its vaccine requirements from the purchasing entity. However, the government should ensure that it has robust supply chain for this to be pursued.

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# An assessment of the Expanded Program on Immunization (EPI) in the Philippines: Challenges and ways forward

*Valerie Gilbert T. Ulep and Jhanna Uy*[1]

## 1. Introduction

The EPI is a public health program managed and implemented by the Disease Prevention and Control Bureau (DPCB) of the Department of Health (DOH). Since its inception in 1976, the Philippine Expanded Program on Immunization (EPI) has been a cornerstone program of DOH with the aim of promoting universal access to effective and safe vaccines. Undoubtedly, the program has saved thousands of Filipino children from disabilities and premature death because of vaccine-preventable diseases (VPDs) like diphtheria, pertussis, tetanus, and measles. Routine vaccination has contributed to substantial improvements in childhood survival and increased life expectancy in the Philippines and globally [1–3].

Perennial challenges in the DOH EPI program remain. The Philippines has struggled to maintain immunization coverage at par with global recommendations for herd immunity as well as reach its target to fully immunize at least 95% of all children.[2]

In this study, we assess the performance of the EPI in the Philippines. Central to this assessment is the policy question: why has the country struggled to maintain immunization coverage over the years and repeatedly failed to achieve its national immunization target?

This assessment has two objectives.

- First, we assess the performance of the EPI in the last three decades in terms of coverage, timeliness, and equity of administration.
- Second, we assess the implementation of the program, by identifying supply-side challenges that could have hindered the achievement of national immunization targets.

## 2. The Philippine Expanded Program on Immunization

**The Expanded Program on Immunization (EPI) has had a long history in the Philippines.** In 1974, the World Health Organization (WHO) conceived of an idea for a global Expanded Program on Immunization [4]. The global EPI aimed to promote and develop immunization programs in all countries, improve vaccination uptake, and establish monitoring systems. The Philippines was one of the first adopters of EPI. In 1976, the Philippines through a presidential decree (PD 996) established the national EPI with a mission to promote universal access to safe and effective vaccines for common vaccine-preventable diseases (VPDs). The country's

1 Research Fellow and Supervising Research Specialist, respectively, at the Philippine Institute for Development Studies. Both Ulep and Uy are co-first authors.

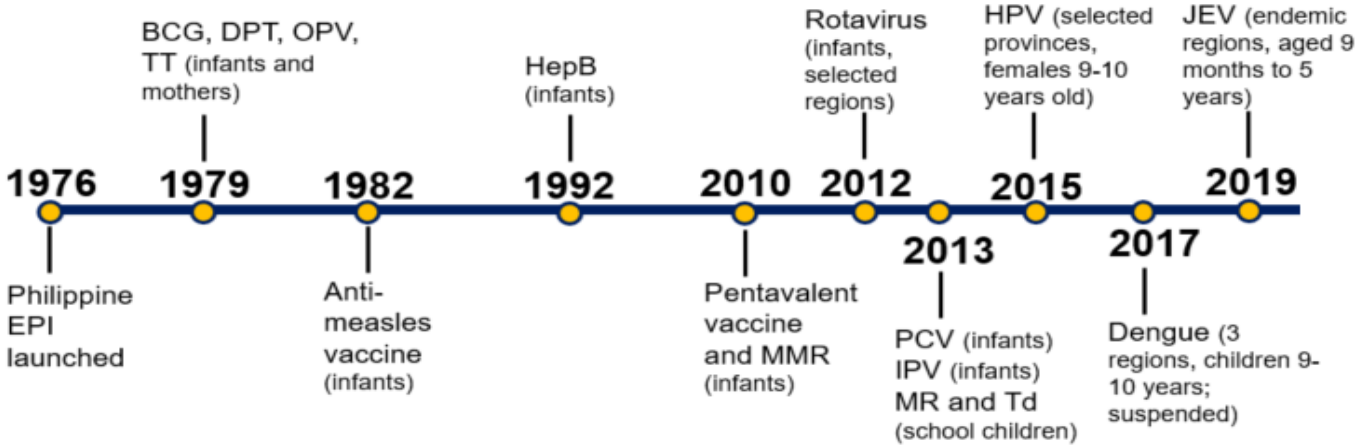
The authors would also like to thank Dra. Anna Ong-Lim of the Pediatric Infectious Disease Society of the Philippines, Dr. Mariella Castillo of UNICEF, and Dr. Carla Ante Orozco of UNICEF for their comments and valuable insights on the topic at hand.

2 This target is written in the DOH National Objectives for Health 2017-2022.

commitment to strengthen the implementation of EPI was once again reinforced through Republic Act no. 10152 of 2011 which mandates free routine vaccination for for 11 VPDs.

**The included vaccines under the EPI have expanded over the years** (Figure 1)**.** Only six (6) VPDs were initially targeted as part of routine basic vaccination in the early era of the EPI (1976-1982). These were tuberculosis, poliomyelitis, diphtheria, whooping cough, tetanus, and measles. Hepatitis B was the seventh VPD included in 1992 [5]. In the last decade alone, the DOH expanded significantly to target more age groups and add new vaccines (Figure 1). Noteworthy are the addition of the second dose of measles vaccine in 2010 and inclusion pneumococcal conjugate vaccine (PCV) in 2013 and, most recently, the Japanese encephalitis vaccine for endemic areas in 2019.

**Figure 1. Evolution of Expanded Program of Immunization in the Philippines (1976-2019)**




Source: Department of Health, 2018; Lopez et al., 2018; Department of Health, 2017; Department of Health, 2019; Wilder-Smith et al., 2019.

The core of the DOH EPI today remains to **be routine vaccination for children 0 to 12 months.** The vaccination schedule for children is summarized in Table 1.

**Table 1. Philippine national immunization schedule for children 0 to 12 months of age**

| Vaccine / Antigen | Disease | Doses | Schedule |
|---|---|---|---|
| BCG (Bacillus Calmette–Guerin) | Tuberculosis | 1 | Birth (within 24 hours) |
| HepB (monovalent) | Hepatitis B | 1 | Birth (within 24 hours) |
| Pentavalent vaccine (DPT-HepB -HiB) | Diphtheria, tetanus and pertussis<br>Hepatitis B<br>Hemophilus influenzae type B<br>Meningitis | 3 | 6, 10, 14 weeks |
| OPV (Oral polio vaccine) | Poliomyelitis | 3 | 6, 10, 14 weeks |
| IPV (Inactivated polio vaccine) | | 1 | 14 weeks |
| PCV (Pneumococcal conjugate vaccine) | Pneumococcal infections (e.g. meningitis) | 3 | 6, 10, 14 weeks |
| MCV (measles containing vaccine) and MMR (Measles, mumps, rubella) | Measles, mumps, rubella | 2 | 9-12 months, 12-15 months |

Source: Pediatric Infectious Disease Society of the Philippines, 2019

## 3. Methods

The table below summarizes the study components, its data sources, and the executed analyses.

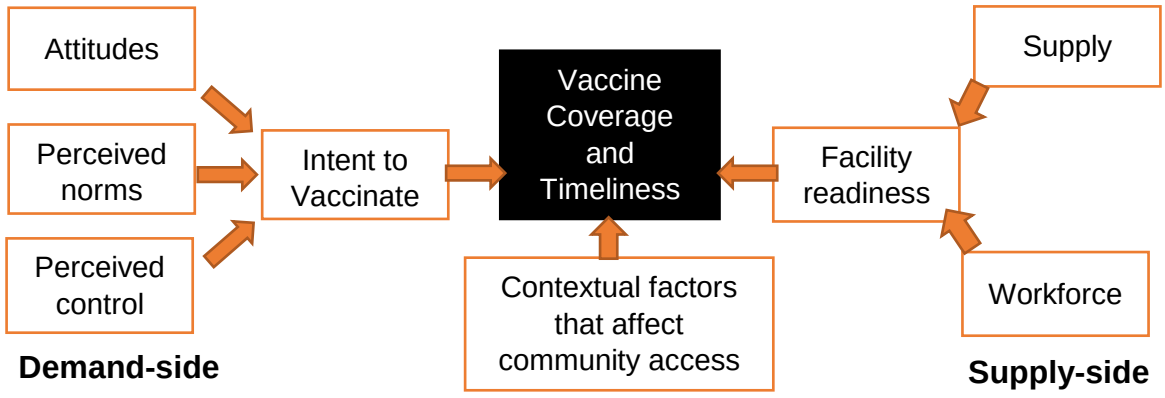
**Table 2. Summary of study components and methods**

| Components | Data Source | Data Analysis |
|---|---|---|
| 1. EPI reach, timeliness, equity | Available nationally representative surveys and surveillance data from DOH, WHO, and UNICEF | Descriptive statistics<br>Regression modelling<br>Equity analysis |
| 2. EPI public expenditures | DOH administrative data: accounting data (registry of allotments, obligations, and disbursements) and procurement monitoring reports | Descriptive analysis of expenditures |
| 3. EPI supply-side factors | Review of literature, EPI documents, and past assessments<br>Interviews with two Philippine EPI experts | Thematic and narrative analyses |

**Analytical Framework:** The goal of the EPI is to reduce the burden of VPDs by increasing immunization coverage and timeliness. Determinants of immunization coverage and timeliness may be any of:

- **Demand-side**: Socio-economic characteristics and knowledge/attitudes/practices of households and caregivers that leads to the intent to vaccinate.
- **Supply-side**: Supplies, human resources, funds, equipment, and other resources and processes necessary to ensure that a facility can provide vaccination services to children when their caregivers wish to avail of them.
- **Contextual factors**: Geographic distance, financial affordability, and cultural acceptability of immunization services that facilitate or hinder parent/caregiver access to immunization services.

**Figure 2. Framework summarizing determinants of vaccine coverage and timeliness**




Source: Phillips et al., 2017; Masters et al., 2019

We use this framework as a guide in assessing the performance of the EPI in the Philippines. The **following sections of this paper are organized as follows:**

- Section 4: We assess the performance of the country's EPI in the last 30 years, looking at the incidence of and deaths due to VPDs, vaccine coverage, immunization dropouts for multi-dose vaccines, and the timeliness of vaccine administration. We also shed light on some demand-side determinants.

- Section 5: We outline EPI supply-side challenges in the realm of financing, national vaccine cold and supply chain, and human resources and leadership.

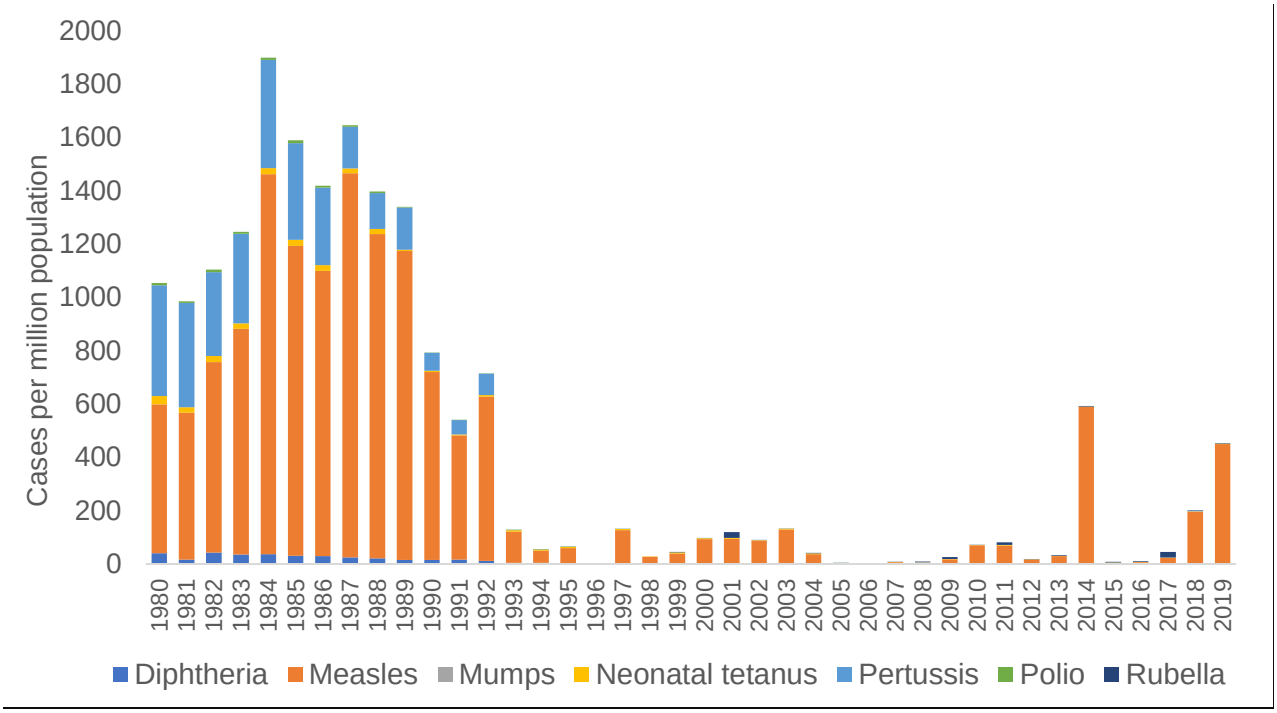
- Section 6: We conclude the paper and provide overarching short-term and long-term recommendations.

## 4. Performance of the EPI

### *4.1. Burden of Vaccine-Preventable Diseases*

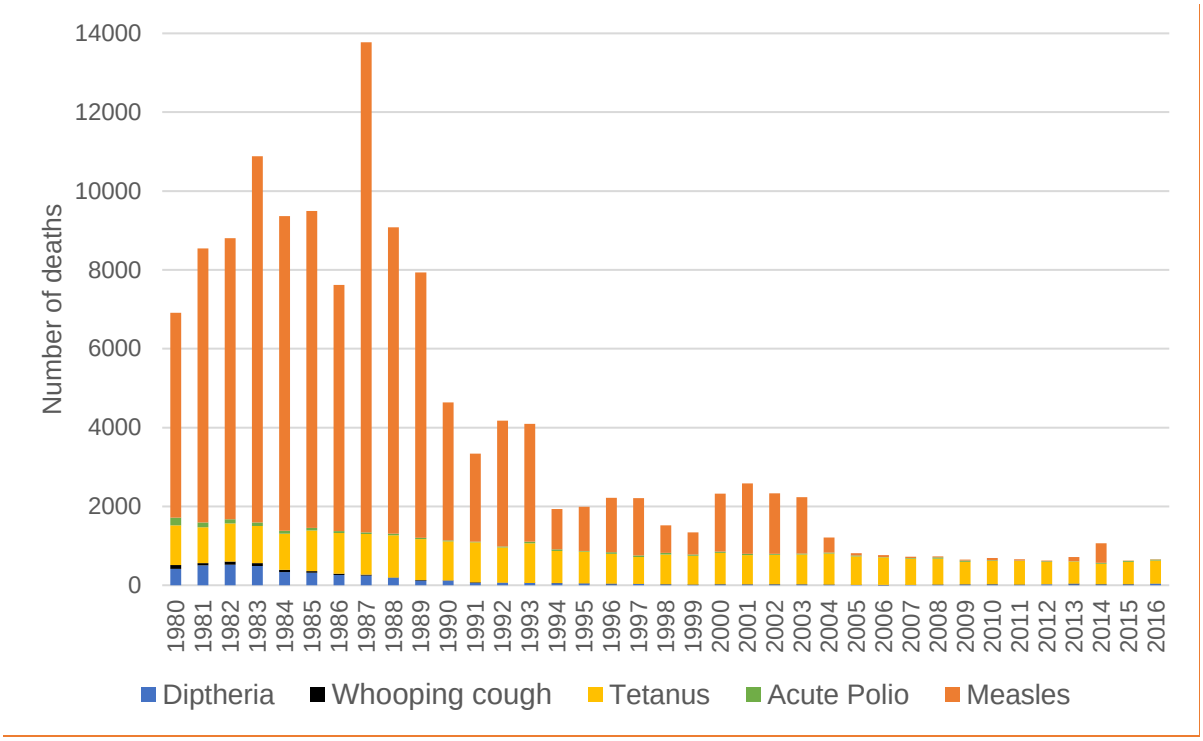
The burden of VPDs in any country is greatly influenced by the uptake of childhood vaccinations and the strength of its immunization programs [14]. **There is no question that morbidity and mortality due to VPDs have declined significantly after the introduction of the EPI.** In the early 1980s, thousands VPD cases were recorded every year, particularly for measles and pertussis (Figure 3). By the mid-1990s, the number of VPD cases and deaths declined sharply (Figure 4). The Philippines was certified to have eliminated Polio in 2000 as well as maternal and neonatal tetanus in 2017.

**Figure 3. Cases of Vaccine-Preventable Diseases, 1980-2019**




Source: Analysis of data from the WHO vaccine-preventable diseases monitoring system

**Figure 4. Deaths due to Vaccine-Preventable Diseases (VPDs), 1980-2016**




Source: Analysis of data from the DOH FHSIS annual reports

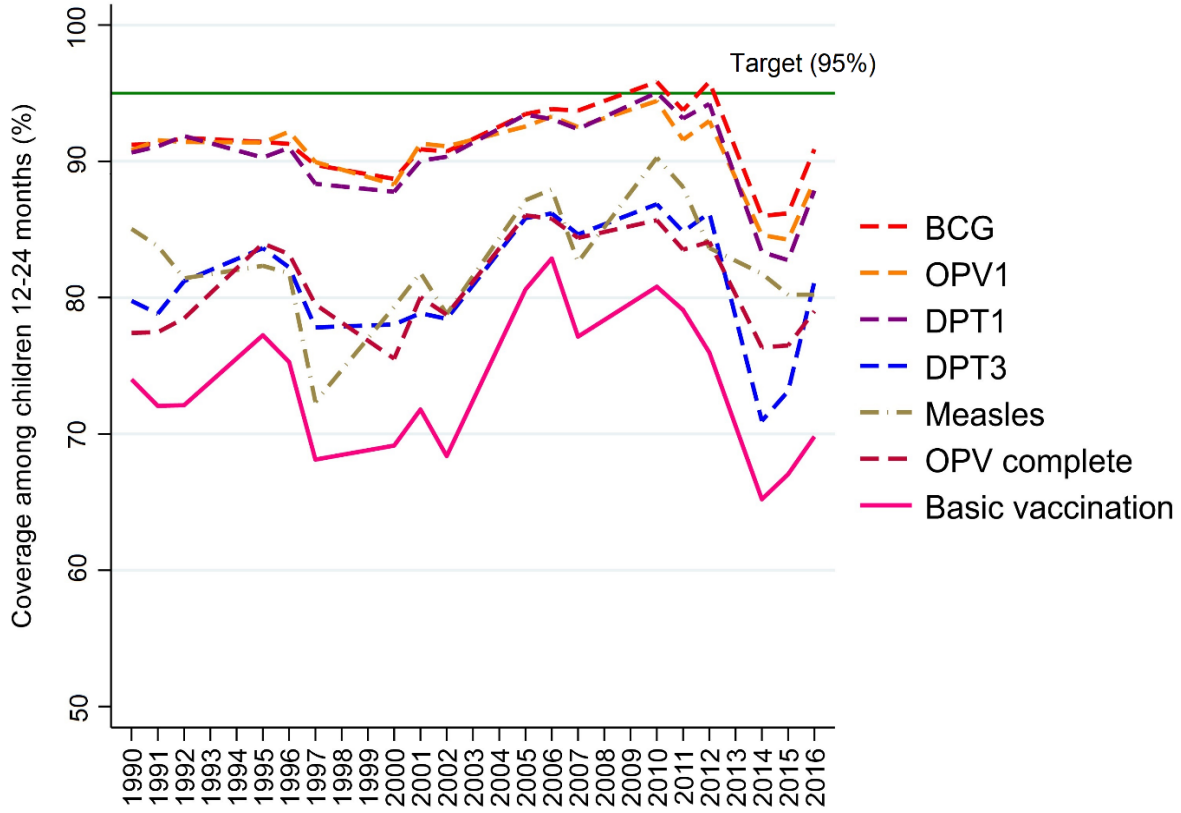
**Despite success in reducing the burden of VPDs, occasional disease outbreaks continue to occur.** In the last decade, measles outbreaks occurred in 2014, 2018, and 2019 (spikes in Figure 3), recording 58,848, 20,827, and 48,525 cases, respectively [16, 17]. In 2019, the Philippines had two cases of vaccine-derived poliovirus after the country was declared polio-free in 2000.[3] The occasional outbreaks suggest long-standing problems of under-vaccination, untimely administration, and failure to reach and maintain herd immunity levels.

*4.2. Immunization Coverage – National, Regional, and Equity*

Immunization coverage in past three decades was characterized by large **fluctuations. The Philippines has never reached the target of 95% basic vaccination coverage** (i.e., for BCG, 3 doses of OPV, 3 doses of DPT, and 1 dose of measles). Figure 5 shows that coverage for basic vaccines among children 12-24 months has been remarkably unstable over time. In 2002, coverage started to increase steadily and was sustained until 2012 for all basic vaccines until 95% coverage was achieved for BCG and the first doses of DPT and OPV. Then coverage suddenly declined sharply in 2013 with basic vaccination coverage dipping to its lowest point (65%) in 2014, even lower than the levels in the 1990s. The incidence of VPDs follow fluctuations in immunization coverage; The measles outbreak in 2014 can be attributed to large decline in coverage in the previous years (see Figure 6).

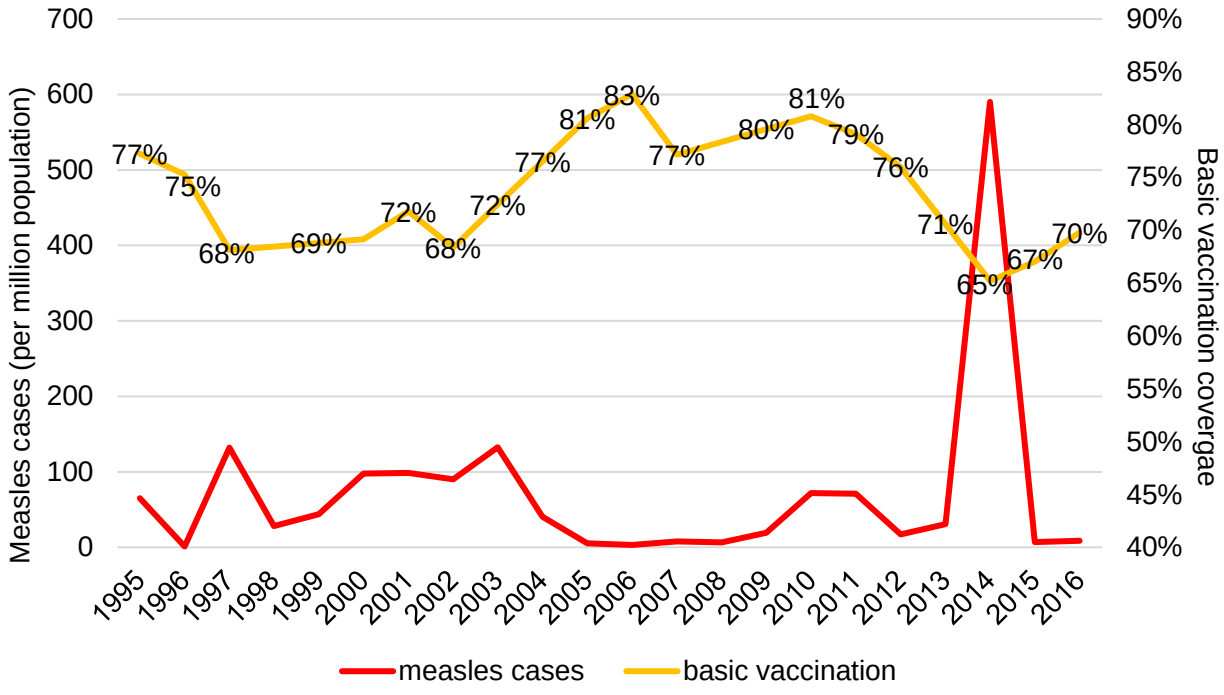
[3] Note that these two cases were vaccine-derived poliovirus type 2 which are very rare genetically mutated strains of polio from the oral vaccine. Communities with persistently low coverage for oral and inactivated polio vaccines and poor sanitation allow transmission of this strain. Over time the virus may regain its ability to cause disease. High immunization coverage with OPV and IPV protects the community from both wild and vaccine-derived poliovirus types.

**Figure 5. Vaccination by birth cohort in the Philippines, 1990-2016**




Source: Analysis of National Demographic and Health Survey (NDHS) 1993-2017

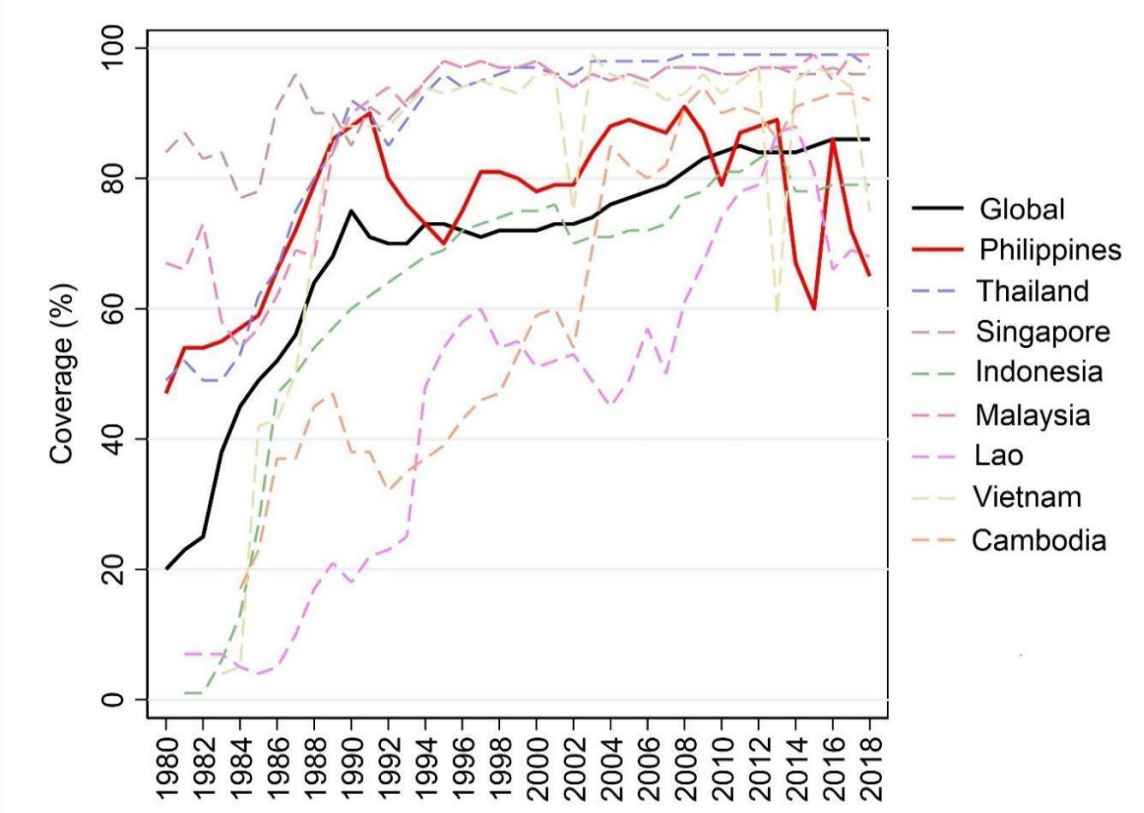
**Figure 6. Immunization coverage and measles cases, 1995-2016**




Source: Analysis of annual surveillance data from WHO VPD monitoring system and NDHS 1993-2007

In contrast, the global average, and many other countries in the world, including most ASEAN countries, have successfully increased, and maintained high levels of coverage. Figure 7 shows a comparison of DPT3[4] coverage among the Philippines, the global average, and other ASEAN countries. From 1980-83, the Philippines had a DPT3 coverage (47%) that was more than twice that of the global average (20%) and much better than the coverages in Vietnam, Cambodia, Indonesia, and Lao. Past 2012, as global coverage and coverage in ASEAN countries improved, the Philippines was not able to maintain its past gains. In 2017, DPT3 coverage in the Philippines (72%) was lower than the world's poorest countries like Burundi (90%), Malawi (92%), and Liberia (84%). Among ASEAN countries, the Philippines registered the lowest DPT3 coverage (65%) in 2018.

**Figure 7. DPT3 Coverage in the Philippines and other ASEAN countries, 1980-2018**




Source: Analysis of WHO-UNICEF coverage estimates data

**Like the national trend, immunization coverage in regions varied over time.** Over the last three decades, the immunization coverages in all regions (except Davao) were characterized by large fluctuations and a decline in 2013 (Figure 8). Region XII and ARMM recorded alarming declines: coverage in the Region XII declined from 80% in 2013 to 40% in 2017 while coverage in ARMM declined from 40% in 2013 to 20% in 2017. Since the 1993 NDHS, ARMM has not had basic vaccination coverage above 50%.

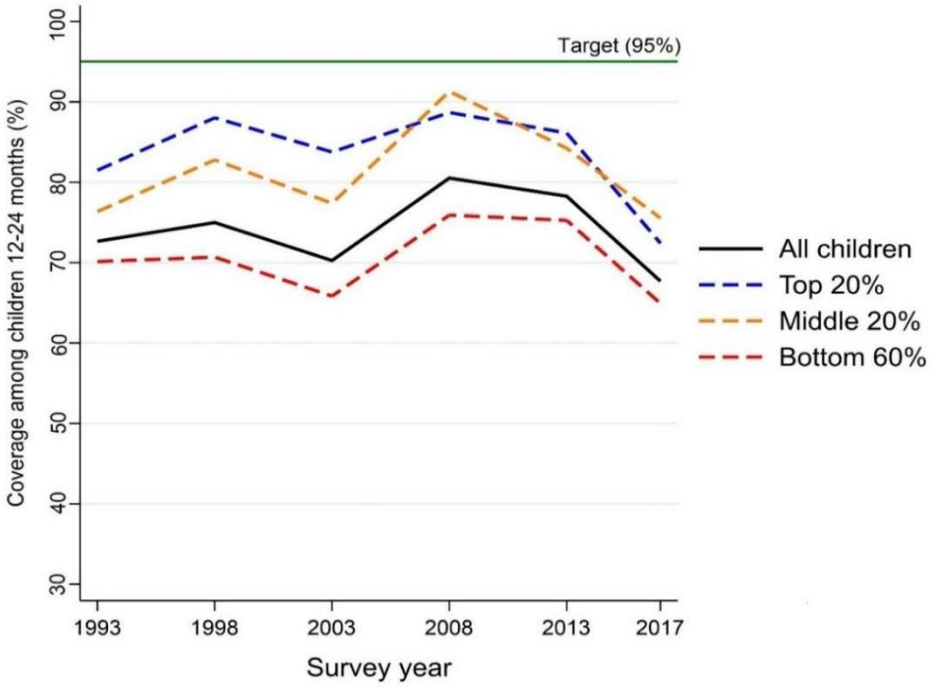
4 The coverage for the third dose the DPT vaccine is tracked globally as a metric for the performance of EPIs or utilization of routine immunization systems [18]

**Figure 8. Basic vaccination coverage, by region, 1990-2017**


Source: Analysis of the NDHS 1993-2017

**Immunization has a socio-economic gradient across wealth quintiles.** Children from poorer households had lower coverage compared to richer households (Figure 9). Based on the 2017 NDHS, basic vaccination coverage among children from the top 40% wealthiest households was 75% compared to the 60% of the bottom 60% of households. However, all socio-economic groups experienced decreases in basic vaccination coverages post-2013.

**Figure 9. Basic vaccination coverage, by socio-economic status, 1980-2018**




Source: Analysis of the NDHS 1993-2017

Overall, the inequality associated with immunization coverage is only moderately pro-rich. Figure 10 shows concentration curves[5] for basic vaccination coverage and skilled birth attendance (SBA). Compared to SBA, the curve for basic vaccination is quite near the line of equality (45-degree line). In other words, the difference in the uptake of basic vaccination between the rich and the poor is not that large. This disparity has not changed over last thirty years (between 2013 and 2017; blue vs. red curve). In contrast, the gap in SBA and other maternal child health services, albeit having decreased over time (brown vs. green curve), is still greater than that of the inequality in basic vaccination.

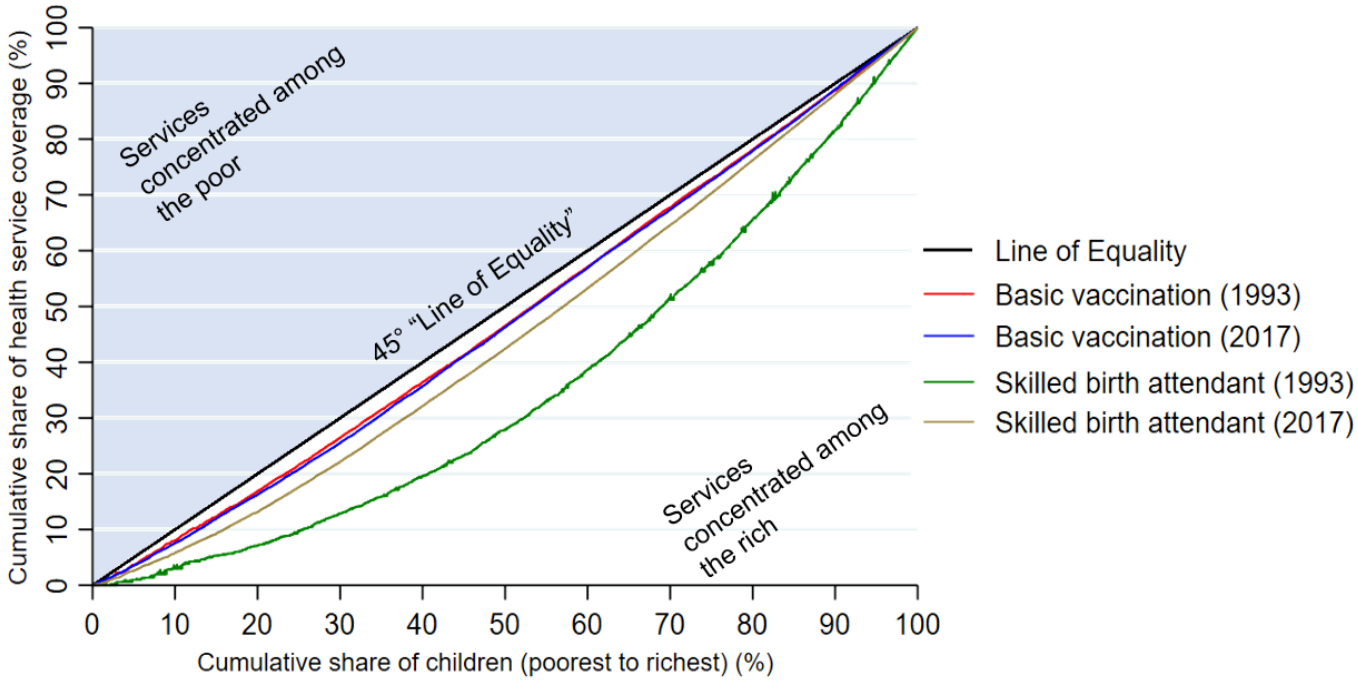
**Routine immunization seems to be primarily delivered in the public sector.** Analysis of NDHS data shows that around 95% of children received their last vaccination at a public

[5] Concentration curves are commonly used to identify wealth or income inequality in the utilization of health services. Concentration curves plot the cumulative percentage of the health care utilization (e.g., basic vaccination coverage) on the y-axis against the cumulative percentage of the population ranked by socio-economic status, beginning with the poorest and ending with the richest, on the x-axis.

If children of all wealth quintiles received an equal proportion of immunization coverage, the curve would coincide with the 45° line or the "line of perfect equality." If the curve lies above the line of equality, coverage is concentrated among the poor; when the curve lies below the line of quality, coverage is concentrated among the rich.

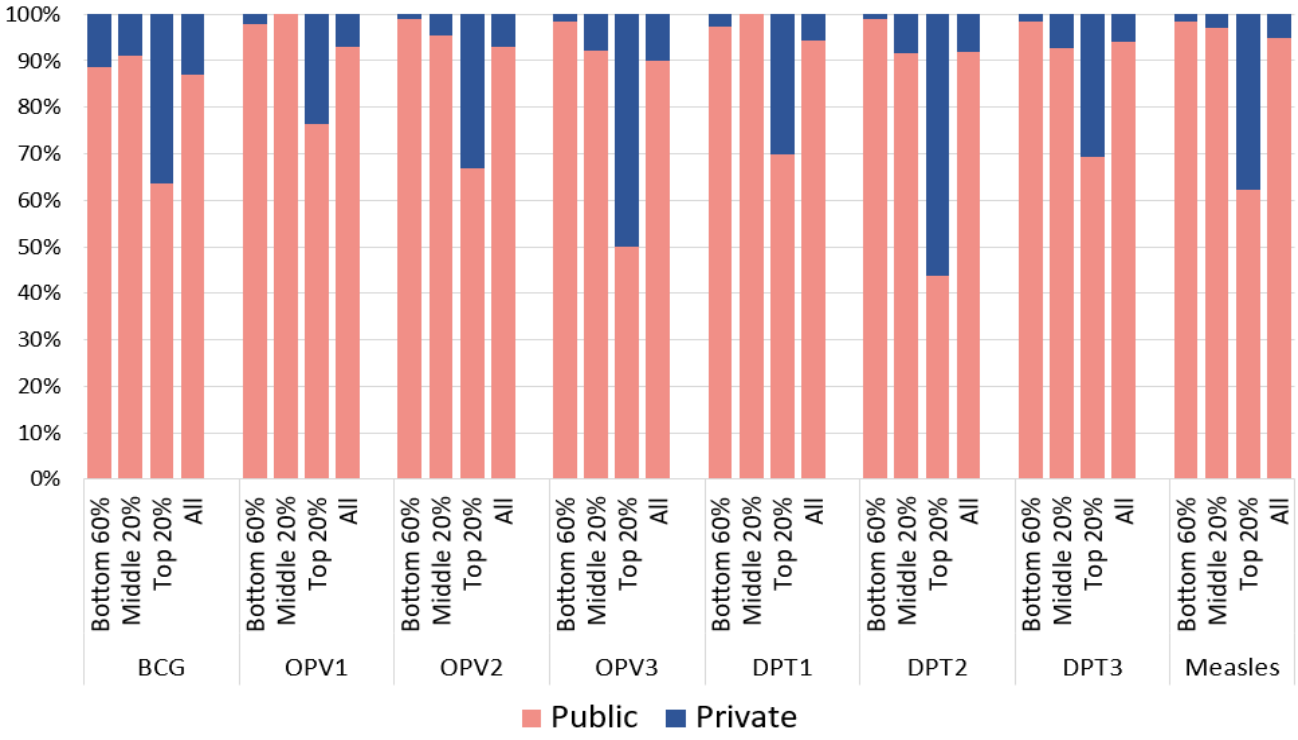
facility. Richer households were more likely to get immunized in the private sector, especially for later doses in a series (Figure 11).

**Figure 10. Concentration curves of basic vaccination and skilled birth attendance**




Source: Analysis of the NDHS 1993-2017

**Figure 11. Facility of last immunization by vaccine/dose and socio-economic status, 2017**




Source: Analysis of the NDHS 2017

Notes: The NDHS only asks about the facility of the *last immunization*. There is no data on the facility for each dose. This estimate is merely a proxy for the share of public/private sector delivery of immunizations services.

### *4.3. Vaccination dropouts*

Metrics on immunization dropouts reflect an immunization program's ability to reach a child multiple times for vaccines with more than one dose. Thus, it gives insight into barriers to return such as stock-outs, errors in vaccination scheduling for a child, inadequate caregiver education, or lack of tracking and reminding systems [20–22].

Table 3 shows the percentage (%) of children not completing their succeeding vaccine doses for OPV, Pentavalent vaccine, and measles vaccine. **For measles vaccination, almost 30% of children who had their first doses did not complete the required second dose.**

The effect of socio-demographics factors on the completion of vaccine varies considerably not only by vaccine and dose. In general, based on regression results, **children of mothers without education and with limited access to maternal healthcare services were more likely to miss the second or third doses**. For instance, those who were born at home or those without adequate prenatal quality are more likely to drop out or miss their child's second and third polio and pentavalent vaccine doses.

**Table 3. Vaccination dropout for Polio, Pentavalent, and Measles, 2017**

| | **OPV 1 to 2** | **OPV 2 to 3** | **Penta 1 to 2** | **Penta 2 to 3** | **Measles 1 to 2** |
|---|---|---|---|---|---|
| Children with vaccination cards, immunized with prior dose, and meet minimum age of next dose | n=2922 | n=2630 | n=2973 | n=2668 | n=1564 |
| **Overall Dropout (%)** | **3.9** | **5.8** | **3.2** | **5.5** | **30.0** |
| **A. Maternal Characteristics** | | | | | |
| Educational attainment | | | | | |
| None | 7.5 | 5.6 | 8.0 | 9.6 | 35.7 |
| Primary | 8.3 | 6.1 | 6.2 | 6.0 | 31.4 |
| Secondary or higher | 1.9 | 5.7 | 1.6 | 4.9 | 28.9 |
| **B. Barriers to Health Care and Health Care Utilization** | | | | | |
| Money | | | | | |
| *No problems* | 3.3 | 5.4 | 2.4 | 5.7 | 27.4 |
| *Big problem* | 4.5 | 6.3 | 4.1 | 5.3 | 32.9 |
| Geographic distance | | | | | |
| *No problems* | 3.9 | 5.4 | 3.0 | 5.7 | 28.6 |
| *Big problem* | 3.7 | 7.0 | 3.8 | 5.0 | 34.3 |
| Antenatal care | | | | | |
| *Less than 4 visits or not seen by skilled health staff* | 9.6 | 4.7 | 7.5 | 11.6 | 37.6 |
| *At least 4 visits and seen by a skilled health staff* | 3.0 | 6.0 | 2.6 | 4.7 | 29.0 |
| Delivery by a skilled health staff | | | | | |
| *No* | 10.0 | 9.6 | 9.2 | 8.7 | 38.0 |
| *Yes* | 3.2 | 5.4 | 2.5 | 5.2 | 29.2 |
| Place of delivery | | | | | |

| | OPV 1 to 2 | OPV 2 to 3 | Penta 1 to 2 | Penta 2 to 3 | Measles 1 to 2 |
|---|---|---|---|---|---|
| *Home/other* | 7.2 | 9.0 | 7.9 | 9.0 | 35.4 |
| *Public hospital* | 2.9 | 5.9 | 2.1 | 5.0 | 30.8 |
| *Public health center* | 2.1 | 5.7 | 2.2 | 5.5 | 34.4 |
| *Private facility* | 4.7 | 3.9 | 3.1 | 4.4 | 21.5 |
| **C. Household Characteristics** | | | | | |
| Type of residence | | | | | |
| *Rural* | 4.4 | 6.7 | 4.1 | 6.0 | 32.5 |
| *Urban* | 3.2 | 4.8 | 2.1 | 4.9 | 27.0 |
| Wealth quintile | | | | | |
| *Quintile 1 - Poorest* | 5.6 | 5.5 | 6.1 | 7.0 | 35.5 |
| *Quintile 2* | 3.8 | 8.7 | 3.7 | 7.0 | 31.8 |
| *Quintile 3* | 2.0 | 5.4 | 1.9 | 5.1 | 27.5 |
| *Quintile 4* | 4.3 | 2.3 | 1.3 | 3.0 | 30.8 |
| *Quintile 5 - Richest* | 2.8 | 6.4 | 1.6 | 4.2 | 20.2 |

Source: Analysis of NDHS 2017

### *4.4. Timeliness of vaccination administration*

In this subsection, we reiterate select findings of our past paper "Too Early, Too Late: Timeliness of Child Vaccination in the Philippines" to complete the entire picture of EPI performance. For more details, readers may refer to the original paper [23].

Traditionally, EPI performance has been measured by coverage because it is an important proxy for population immunity and VPD incidence tracks closely to coverage. The National Objectives for Health (NOH), an official document that outlines medium-term health system targets of the DOH, only includes coverage as an indicator of the EPI's success [24].

However, the importance of the timeliness of vaccine administration as an important metric of EPI performance is increasingly being recognized globally [12]. Coverage is a measure of *completion* of the immunization schedule, but high completion does not necessarily mean timely vaccination. Childhood protection to against to disease is maximized only when vaccines are delivered in a *timely manner within the recommended ages*. This is the reason why vaccination schedules exist. Vaccination schedules are determined by accounting for local disease epidemiology, and they have an underlying goal of eliciting immunity in children before they are exposed to infectious diseases [25]. Late doses increase a child's duration at risk for VPDs while early doses or improperly spaced doses may decrease immune response to vaccine [25, 26].

Among children immunized with all basic vaccine (8 doses), only 10.6% had all their vaccines and doses administered on time (Table 4); there is no difference among of socio-economic class for this metric. There were, however, differences if timeliness is measured per vaccine dose. Timely administration for individual vaccines from 38% to 67% in 2017 (review [23] for detailed data). From the 1993 to 2017 rounds, the timeliness of BCG (12.9% to 64.6%), OPV1 (16.8% to 39.5%), and DPT1 (16.4% to 37.5%) improved significantly. Children of the top 20% richest households (83.2%) were much more likely to receive the BCG birth dose within the recommended schedule of birth to 2 weeks compared to children of the bottom 60% (58.6%).

**Table 4. Coverage and timeliness of basic vaccination, 1993-2017, Philippines**

| NDHS Year | All children 12-24 months | | Top 20% in wealth | | Bottom 60% in wealth | |
|---|---|---|---|---|---|---|
| | Coverage (%) | All Timely (%) | Coverage (%) | All Timely (%) | Coverage (%) | All Timely (%) |
| 1993 | 71.9 | 2.1 | 78.3 | 3.6 | 70.0 | 1.6 |
| 1998 | 72.6 | 2.1 | 85.1 | 3.3 | 68.9 | 1.5 |
| 2003 | 69.8 | 2.6 | 80.4 | 4.3 | 66.8 | 1.9 |
| 2008 | 79.3 | 5.3 | 86.6 | 5.4 | 75.1 | 4.0 |
| 2013 | 77.2 | 9.3 | 85.8 | 12.4 | 74.0 | 7.0 |
| 2017 | 69.4 | 10.6 | 74.4 | 10.5 | 65.7 | 9.2 |

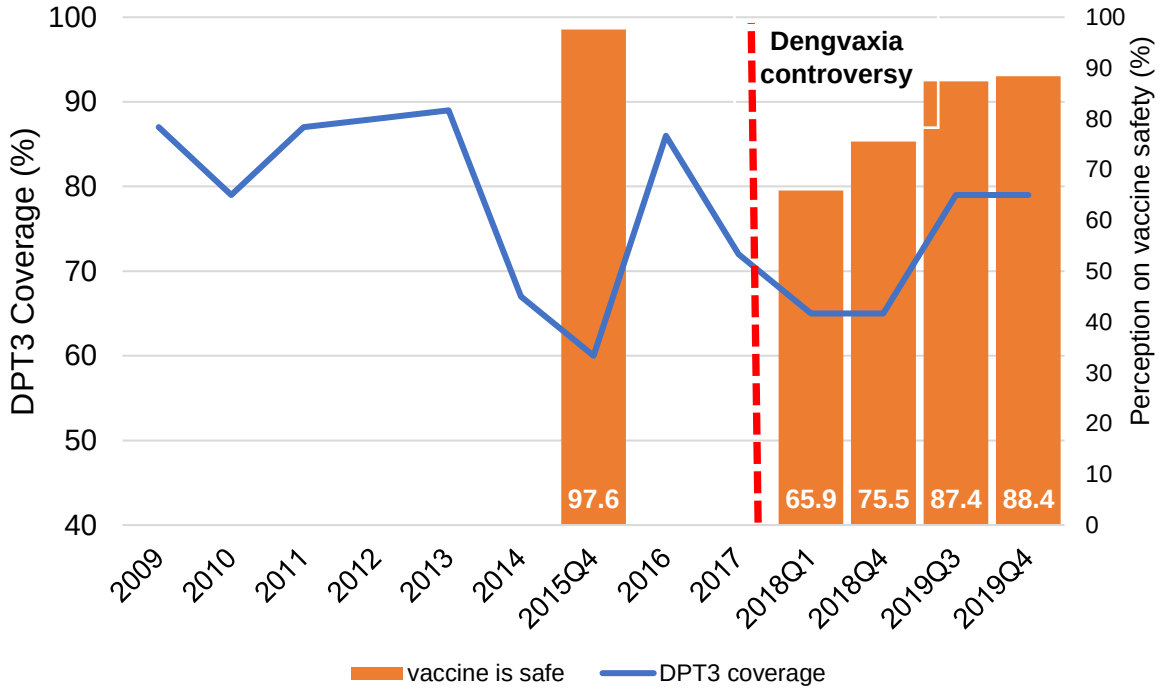
Source: Analysis of NDHS 1993-2017 rounds

*4.6. Demand-Side: Vaccine Confidence*

Depending on the period, the decline in immunization coverage in recent years could be partly explained by both supply and demand factors. Supply factors include health system challenges that could lead to vaccine stockouts in health facilities while demand factors affect the intent of the household to vaccine their children.

We argue that the large decline in coverage in 2014 could be attributed to vaccine stock outs and less because of demand-side factors. The supply factors are elaborated on in Section 5 of this paper. Based on vaccine confidence surveys, almost 97% of the population in 2014 agreed that vaccines were safe, but coverage was the lowest in decades (Figure 12).

**Figure 12. DPT3 coverage and perception on vaccine safety**




Source: Coverage data from WHO-UNICEF and vaccine confidence data from Philippine Survey and Research Center (PSRC)

Vaccine coverage was improving after 2014, but when vaccine confidence in the safety of vaccines plummeted to 66% in 2018 following the Dengvaxia controversy,[6] coverage declined concomitantly. The decline was larger among the richer population (review Figure 9) which also experienced larger decreases in vaccine confidence: In 2018, based on PSRC survey data, only 63% of the population belonging to class ABC agreed that vaccines are safe compared to 70% of their poorer counterparts (class D and E). However, the next section shows that supply challenges remained during this period and contributed to declines in coverage in recent years.

## 5. Supply-side challenges in EPI

In the previous section, we assessed the performance of the Philippine EPI in terms of burden of VPDs, immunization coverage, drop-outs in vaccine series, and timeliness of administration. We also touched about vaccine confidence as a demand-side factor that affects the vaccine uptake. Now, we present **supply-side factors that influence vaccine coverage and timeliness**. This section is divided into financing, national vaccine supply and cold chain, and human resources and governance.

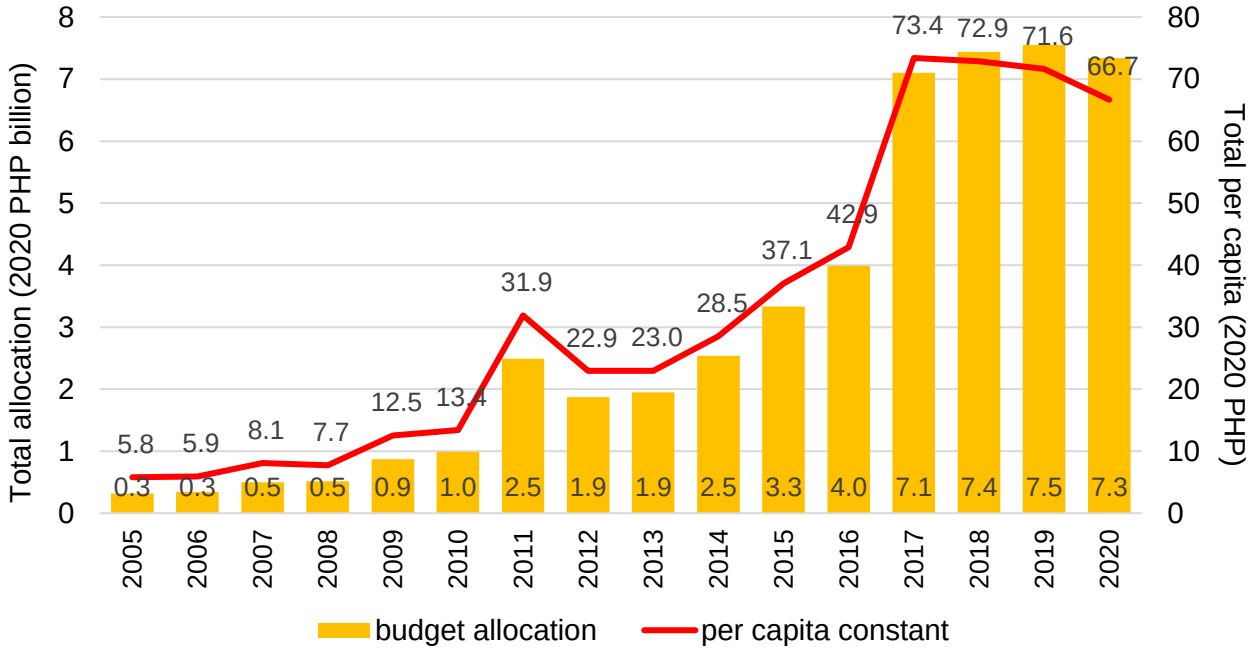
### *5.1. Financing*

**Routine child immunization was mainly financed by the public sector, specifically the national government through DOH.** Data on private sector spending on vaccination is neither systematically collected nor analyzed; therefore, the total spending on vaccines in the country remain largely unknown [27]. However, given that routine childhood vaccination seems to be largely delivered in the public sector even among the richer segment of the population (review Figure 11), we hypothesize that EPI spending is largely from the public sector. PhilHealth does not have an immunization package, but it does include birth doses of BCG and Hepatitis B as part of reimbursements in the Newborn Care Package instituted in 2006. Nevertheless, since the DOH procures majority of the vaccine and even the disposable supplies (e.g., syringes, safety collector boxes) required by the country, we assume that DOH accounts for the lion share of total public spending for immunization in the Philippines.

**In terms of budget allocation, the EPI is clearly a priority program of the Department of Health.** In 2020, DOH allocated around PHP 7.3 billion, equivalent to about 7.2% of the DOH's total budget of PHP 100.56 billion. From 2005 to 2020 public spending on EPI had increased sharply, with the program receiving massive infusion of funds after the passage of Sin Tax Law in 2012 (RA 10351). Public spending increased by almost 4-folds, from PHP 2 billion in 2013 to PHP 7 billion in 2020 (See Figure 13). Likewise, after adjusting for population growth and inflation, public spending per person has increased from PHP 6 per person in 2005 to PHP 67 per person in 2020.

[6] Dengvaxia was subject to a large controversy following Sanofi's analysis which suggests that the vaccine risk of severe dengue and hospitalizations. Distribution of vaccine has been suspended in the country due to the fear resulting from this controversy. The controversy was said to have increased vaccine hesitancy in the country.

**Figure 13. Budget allocation of DOH Expanded Program on Immunization**




Source: Analysis of DBM National Expenditure Program data from FY 2005-2020

Majority of public spending and increase in DOH EPI funds were spent on adding and paying for relatively new vaccines in the program. The sin taxes were used to introduce the pneumococcal vaccine (PCV) and human papilloma virus (HPV) in 2013 and 2014, respectively (review Figure 1) [8]. While these vaccines are considered a new and underutilized vaccines recommended by the WHO for inclusion in EPIs, PCV specifically is much more expensive than core routine vaccines: Based on the EPI's procurement project management plans for 2017-2019, PCV costs around PHP 800-870 per dose compared to PHP 7-70 per dose for BCG, polio, pentavalent, and MMR vaccines.

Table 5 shows that more than 70% of the total spending on vaccines (excluding service delivery) in 2018 and 2019 were accounted for by the PCV and HPV vaccine. This is confirmed by more DOH procurement monitoring data from 2013 to 2019 (Figure 14) which also shows that spending on routine child vaccines remained the relatively stable over the same period.

**Majority of the EPI budget is spent on vaccines.** In 2017 and 2018, vaccines (and their import taxes) accounted for almost 97% of the total DOH EPI disbursements (Table 6). Only a small share was accounted for service delivery of the program (including capacity building). Around 1%-1.5% were allocated for the cold and supply chain and less than 1% for soft components, which includes capacity building, media, promotion, and research.

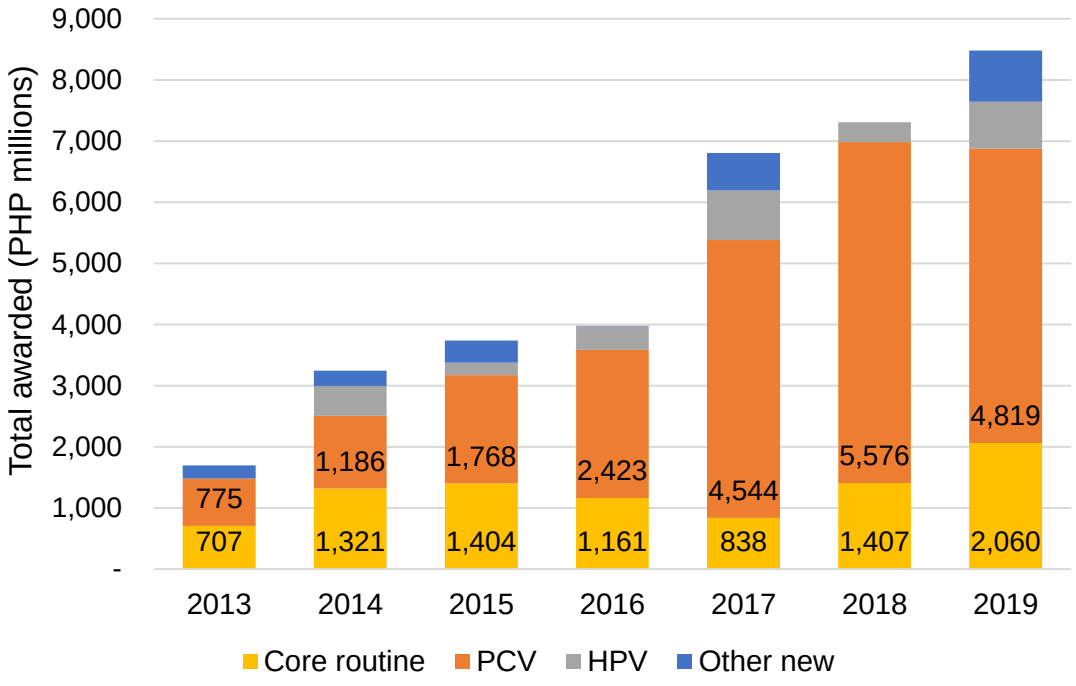
**Table 5. DOH expenditures for vaccines for 2017 and 2018, millions of pesos (`000,000s)**

| | 2017 | | 2018 | |
|---|---|---|---|---|
| **Vaccines** | **Disbursed** | **Share** | **Disbursed** | **Share** |
| **Total (excluding taxes)** | **7,398.93** | **100%** | **7,061.40** | **100%** |
| **Basic routine (for infants)** | **1,705.06** | **24%** | **1,913.50** | **27%** |
| BCG | 47.99 | 1% | - | - |
| Hepatitis B | - | - | - | - |
| Polio | 412.02 | 6% | 416.25 | 6% |
| Pentavalent | 490.55 | 7% | 481.96 | 7% |
| Tetanus-diphtheria | 62.76 | 1% | 56.05 | 1% |
| Measles | 691.74 | 9% | 959.24 | 14% |
| **Relatively new vaccines** | **5,693.77** | **77%** | **5,147.91** | **73%** |
| PCV (for infants) | 4,692.59 | 63% | 4,822.91 | 68% |
| HPV (for girls 9-10 years) | 738.68 | 10% | 325.00 | 5% |
| Influenza (for seniors) | 262.50 | 4% | - | - |

Source: Authors' analysis of DOH registry of allotments, obligations, and disbursements (RAOD) data

Notes: [1] Program RAOD data analyzed were from the Expanded program of immunization, Family Health Nutrition and Responsible Parenthood, and Public Health Management (started in 2018 for DOH-DPCB soft components). [2] The analysis for 2017 includes the continuing appropriations (CONAP) from 2016 funds. [3] "--"means no expenditures were recorded in the RAOD

**Figure 14. Total value of successfully awarded and procured vaccines**




Source: Authors' analysis of the DOH Procurement Monitoring Reports (PMRs) from 2013-2019

Note: There may be slight differences with totals compared to Table 5 because (1) The PMRs measure contracts awarded, but not necessarily disbursed. (2) There may be differences in the actual year of disbursements according to the RAOD compared to when the contract was awarded. (3) There may be contracts awarded and disbursed, but not recorded in the RAOD as of the time we obtained the data.

**Table 6. DOH expenditures on EPI for 2017 and 2018, millions of pesos (`000,000s)**

| | 2017 | | 2018 | |
|---|---|---|---|---|
| **Vaccines** | **Disbursed** | **Share** | **Disbursed** | **Share** |
| **Total** | **7,762.46** | **100%** | **7,596.86** | **100%** |
| **A. Vaccines** | **7,398.93** | **95.3%** | **7,061.40** | **93.0%** |
| **B. Vaccine import taxes** | **119.09** | **1.5%** | **266.43** | **3.5%** |
| **C. Safe injection supplies** | **140.66** | **1.8%** | **26.86** | **0.4%** |
| *Auto-disable syringes* | *101.11* | 1.3% | - | - |
| *Reconstitution syringes* | *11.25* | 0.1% | *3.57* | 0.0% |
| *Safety collector boxes* | *28.3* | 0.4% | *23.28* | 0.3% |
| **D. Supplemental immunization activities** (measles and polio) | **8.56** | **0.1%** | **92.59** | **1.2%** |
| **E. Cold and Supply Chain** | **70.83** | **0.9%** | **143.21** | **1.9%** |
| *Brokerage and storage* | *0.4* | 0.0% | *5.00* | 0.1% |
| *Transport* | *39.85* | 0.5% | *105.62* | 1.4% |
| *Warehouse* | *30.58* | 0.4% | *32.59* | 0.4% |
| **F. Equipment** (vaccine carriers) | **11.11** | **0.1%** | **-** | **-** |
| **G. Soft Components** | **13.28** | **0.2%** | **6.37** | **0.1%** |
| *Media and News* | *0* | 0.0% | *5.75* | 0.1% |
| *Research and monitoring* | *13* | 0.2% | - | - |
| *Training and Events* | *0.28* | 0.0% | *0.62* | 0.0% |

Source: Authors' analysis of DOH registry of allotments, obligations, and disbursements (RAOD) data

**Notes**: [1] Program RAOD data analyzed were from the Expanded program of immunization, Family Health Nutrition and Responsible Parenthood, and Public Health Management (started in 2018 for DOH-DPCB soft components). [2] The analysis for 2017 includes the continuing appropriations (CONAP) from 2016 funds.[3] "--"means no expenditures were recorded in the RAOD

### *5.2. National Vaccine Supply and Cold Chain*

In this section, we identify and assess the challenges starting from **procurement until distribution of vaccines**. Challenges in each step have adverse impact on availability of critical vaccines and contribute to stockouts at the facility-level.

**Table 7. Features of vaccine supply chains**


### A. Planning and Procurement

As mentioned, **the DOH centrally procures vaccines for the whole country.** The DOH EPI prepares a vaccine procurement and allocation plan before it goes through the usual process of the government in accordance with the Government Procurement reform Act of 2003. The program determines the demand for the year based on the ***projected aggregate*** **number of newborns for the year** based on census data from the Philippine Statistical Authority (PSA). As part of standard global practice, a buffer stock should be added to estimated demand, but it is unclear if this is followed conscientiously. It is also **unclear how herd immunity thresholds**

**(HIT) are accounted** for in estimated demand for a particular year. **Unvaccinated children from the previous years, should be included otherwise the vaccine-naïve population accumulates, which eventually lead to outbreaks** and the need for supplemental immunization activities for catch-up vaccinations.

Once the plan is prepared, the DOH Procurement Services of DOH facilitates the procurement of the vaccines. The Bids and Awards Committee (BAC) Secretariat consolidates the plan and recommended before approval of the procuring entity.

The Philippines sources its vaccine supply either from the United Nations Children's Fund (UNICEF) or directly from local tenders. The Philippine government usually enter negotiated procurement with UNICEF through the Vaccine Independence Initiative (VIII), which was established by UNICEF and WHO in 1991 to help lower-middle income countries (LMICs) like the Philippines to participate in pooled procurement and benefit from economies of scale. The VII enables LMICs to eventually be self-reliant with respect to vaccine procurement and management [28].

In recent years, the DOH has been attempting to procure vaccine directly from manufacturers, which typically undergo competitive procurement process. While such endeavor is part of the country's long-term efforts towards vaccine independence, this has put uncertainty on the vaccine supply of the country as failed local biddings for national supply have been recurring. Table 8 shows the procurement results of EPI from 2013 to 2019. The primary mode of procurement for vaccines differs over time. Negotiated procurement (primarily with UNICEF) was prominent in 2013, 2014, and 2017. Competitive bidding was prominent in 2014 onwards, but it resulted to high levels of bidding failures especially for the basic routine vaccines (i.e., BCG, HepB, Polio, Penta (DPT-HepB-HiB), measles).

**Table 8. Results of DOH EPI vaccine procurements, 2013 - 2019**

| | Basic routine (N=84) | | Relatively new (N=44) | |
|---|---|---|---|---|
| **Year, n (number failed)** | **Competitive** | **Negotiated** | **Competitive** | **Negotiated** |
| 2013 | 1 (1) | 6 (0) | 0 (0) | 5 (0) |
| 2014 | 4 (1) | 8 (0) | 2 (1) | 4 (1) |
| 2015 | 16 (11) | 3 (1) | 9 (3) | 0 (0) |
| 2016 | 12 (5) | 3 (0) | 7 (1) | 2 (0) |
| 2017 | 1 (0) | 7 (0) | 4 (0) | 0 (0) |
| 2018 | 2 (1) | 6 (0) | 6 (3) | 1 (1) |
| 2019 | 8 (6) | 7 (0) | 4 (0) | 0 (0) |

* Excluded cancelled or repeat order items.

Source: Authors' analysis of the DOH Procurement Monitoring Reports (PMRs) from 2013-2019

Notes: Basic routine vaccines: BCG, HepB, Polio, Pentavalent (DPT-HepB-HiB), measles; Relative new vaccines: PCV, HPV, influenza, rotavirus, JEV

**When local tenders fail, the government resorts to emergency procurement with UNICEF**. For emergency procurements, the request would come in the second or even third quarter of the current year whereas UNICEF requires countries to commit on orders September of the *prior year*. KII respondents commented that late requests and payments (3-5 months) result to delayed delivery of vaccines when stock outs are already occurring. For example, emergency procurement with UNICEF happened in 2015 and 2019 when there were failed local bidding for Pentavalent vaccine and measles vaccines, respectively, and vaccine stores were at stock-out levels (Table 9). These **last-minute requests and failed commitments do not make the Philippines a "responsible customer" in the global vaccine market** where countries must queue for vaccines, particularly for those with only one global supplier (e.g., MMR). Table 9Table 9 shows the pattern **of failed competitive bids and that the number of days 'spent' on failed bids in 2015 and 2019 was upwards of 100 days.**

**Table 9. Failed procurement of vaccines in 2015 and 2019**

| COBAC ID | Procurement Mode | Start Date* | Fail Date | Days Delay |
|---|---|---|---|---|
| **2015** | | | | |
| **A. BCG** | | | | |
| 2015-087 | Competitive bidding | Mar 6, 2015 | Mar 31, 2015 | 117 |
| 2015-087A | Competitive bidding | May 21, 2015 | Jun 23, 2015 | |
| NP NO. 2015-015 | UNICEF - negotiated | Jul 1, 2015 | | |
| **B. Pentavalent** | | | | |
| 2015-086 | Competitive bidding | Mar 6, 2015 | Mar 31, 2015 | 166 |
| 2015-086-A | Competitive bidding | Apr 7, 2015 | May 12, 2015 | |
| 2015-158 | Competitive bidding | Aug 19, 2015 | | |
| EP NO.2015-003 | UNICEF - negotiated | | | |
| **C. Measles** | | | | |
| 2015-080 | Competitive bidding | Mar 6, 2015 | Mar 31, 2015 | 157 |
| 2015-085 | Competitive bidding | Mar 6, 2015 | Mar 31, 2015 | |
| 2015-085-A | Competitive bidding | May 12, 2015 | Jun 23, 2015 | |
| NP-UNICEF-014-2015 | UNICEF - negotiated | | Jul 8, 2015 | |
| 2015-111 | Competitive bidding | Apr 28, 2015 | | |
| 2015-111-A | Competitive bidding | Jun 29, 2015 | Jul 27, 2015 | |
| 2015-111-B | Competitive bidding | Aug 10, 2015 | | |
| **2019** | | | | |
| **A. BCG** | | | | |
| 2019-143 | Competitive bidding | Oct 30, 2018 | Dec 3, 2019 | 141 |
| 2019-143-B | UNICEF - negotiated | Mar 20, 2019 | | |
| **B. Hepatitis B** | | | | |
| 2019-111 | Competitive bidding | Oct 30, 2018 | Feb 26, 2019 | 185 |
| 2019-111-B | UNICEF - negotiated | May 3, 2019 | | |
| **C. Polio** | | | | |
| 2019-222 | Competitive bidding | Feb 4, 2019 | Aug 4, 2019 | 151 |
| 2019-222-B | UNICEF - negotiated | Jul 5, 2019 | | |

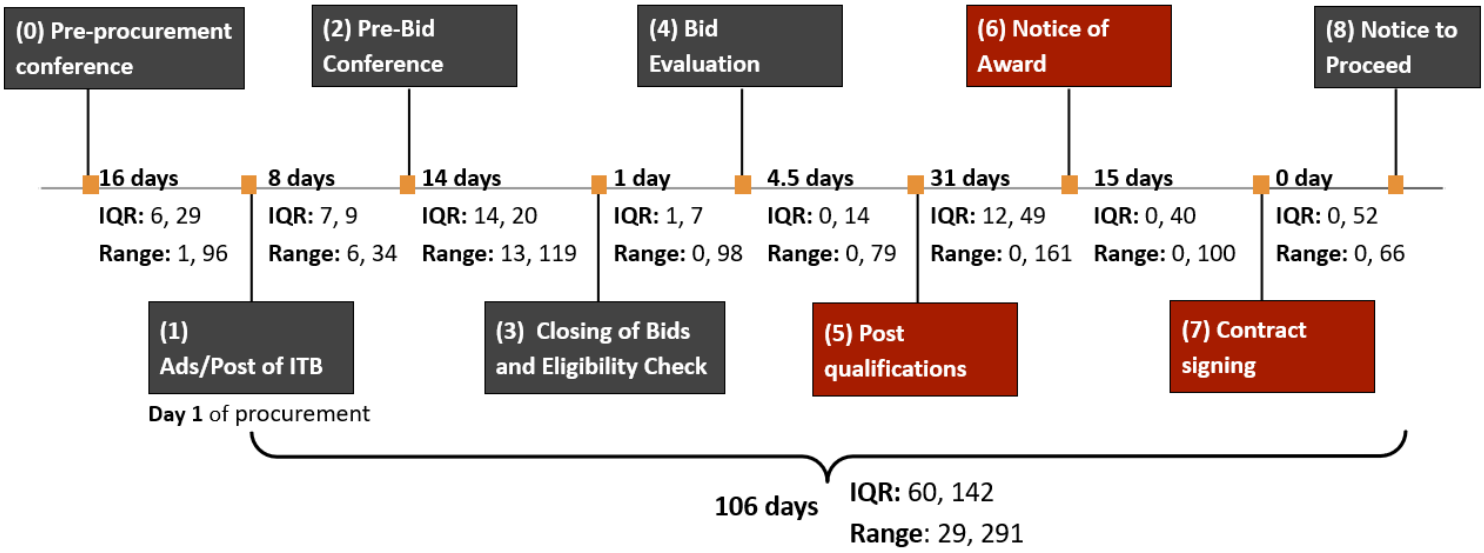
| COBAC ID | Procurement Mode | Start Date* | Fail Date | Days Delay |
|---|---|---|---|---|
| **D. Measles** | | | | |
| 2019-245 | Competitive bidding | Oct 30, 2018 | Feb 27, 2019 | 203 |
| 2019-245-B | UNICEF - negotiated | May 21, 2019 | | |
| 2019-117-A | UNICEF - negotiated | Feb 26, 2019 | | |
| 2019-172-A | UNICEF - negotiated | Feb 4, 2019 | | |
| **E. Tetanus-Diphtheria** | | | | |
| 2019-102 | Competitive bidding | Jan 16, 2019 | Feb 26, 2019 | 63 |
| 2019-102-B | UNICEF - negotiated | Mar 20, 2019 | | |

Source: Authors' analysis of the DOH Procurement Monitoring Reports (PMRs) from 2013-2019

Notes: Start date is the date of the pre-procurement conference.

**Procurements typically follow a one-year procurement period.** Figure 15 shows the detailed steps in vaccine procurement, including the median duration of each step. More than half of all awarded competitive bids for vaccines or EPI supplies took **more than 100 days to successfully procure**. **Bottlenecks** in procurement usually occur in the steps of **post-qualification, notice of award, and contract signing**.

**Figure 15. Median time between procurement steps for awarded competitive bids, 2013-2019 (n=62)**



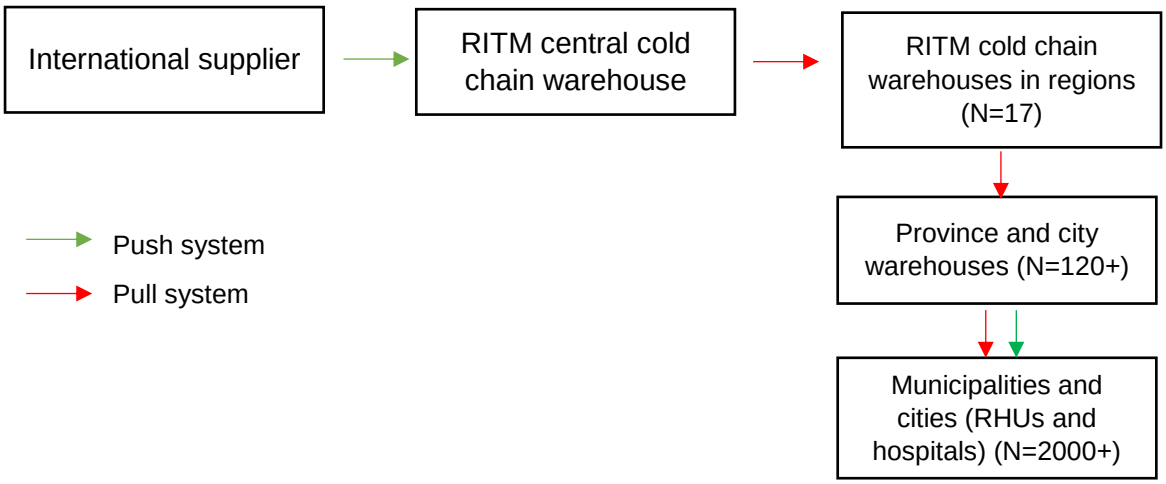

Source: Authors' analysis of the DOH Procurement Monitoring Reports (PMRs) from 2013-2019

## B. Storage

The responsibility of international supplier typically ends at the port. It is the responsibility of the DOH to prepare the paperwork and payment of duties and taxes before the vaccine are transported to Research Institute for Tropical Medicine (RITM) cold chain warehouse. Our key informant revealed that in the past, **there were delays in preparing documents that resulted in vaccines being held at port for a long duration.** The Bureau of Customs will not release vaccines if duties and taxes are not settled and the DOH needed to pay additional cost for cold chain at the port to avoid spoilage of vaccines.

The centrally procured vaccines are then stored in government-owned warehouses and allocated to regions and provinces using pull and push vaccine distribution models (Figure 16). That is, the central office allocates vaccines and regional health offices also makes requests. The transportation from central to regional offices are outsourced to a third-party logistics company.

**Figure 16. Vaccine supply flow in the public system**




Source: Adapted from Nfor et al., 2017

**The storage at RITM is inadequate and can accommodate only a three-month vaccine supply.** RITM has six (6) storage room, of which four (4) are cold rooms (above zero; +4 C) with a capacity of 110,000 liters, one (1) freezer (below zero; -15 C) with a capacity of 7,000 liters, and dry room with a capacity of 13,000 liters [30]. According to WHO and UNICEF's 2017 Effective Vaccine Management (EVM) assessment for the Philippines [30]:

> *"Expansion of the storage capacity is not possible due to the premises. This is a very serious situation and exposes the Philippines to unacceptable risk of stock-outs and very slow response to disease outbreaks."*

Moreover, this means that vaccine procurement and delivery must be split into four (4) tranches in the year. Ideally, storage capacity should be enough for the annual supply plus the minimum three (3) months [or 6 months if possible] buffer stock for delays in procurement and outbreaks.

**Stock out of vaccines was common in the last 10 years.** Table 10 shows the gap in year-end supply at the national storage which illustrate how annual vaccine supply requirements and buffer stocks are not being met for the basic routine vaccines, with stock outs occurring from 2008 to 2018 for many of these vaccines. Table 16 show the duration of stock outs per vaccine. Most of the vaccine stock outs in recent years were where when procurement was attempted locally. From **2013-2015, the stock out in pentavalent stock out lasted for nine months and severely affected immunization services**; this was an artificial stockout due to failed local procurement as there was no recorded shortage in the global market.

**Table 10. Levels of vaccine stocks in national storage from 2016-2019**

| Vaccine | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|
| BCG | +5.5 million | +4.1 million | +2.1 million | - 2.5 million |
| Hepatitis B | +1.6 million | -0.47 million | +0.83 million | +0.06 million |
| OPV | -3.6 million | +2.1 million | -2.2 million | +3.5 million |
| IPV | -1.3 million | -0.6 million | -0.04 million | -0.26 million |
| Pentavalent | +1.6 million | -3.4 million | -1.7 million | no data |
| MMR | +0.2 million | -0.16 million | -1.3 million | -4.96 million |

Source: data from RITM collated by UNICEF and WHO Philippines

Note: green = excess of annual requirement; red = deficits

**Table 11. Duration of vaccine stock outs at the national level**

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|
| **Hepatitis B** | 6 months | | 1 month | | | |
| **Pentavalent** | | 9 months | 2 months | 9 months | | |
| **IPV** | | | | | 6 months | 3 months |
| **OPV** | | | | | 1 month | 3 months |
| **PCV** | | | | | 1 month | 4 months |

Source: data from RITM collated by UNICEF and WHO Philippines

**Inefficiencies in the distribution of vaccines to LGUs are also common**. The vaccines from the central office are "pushed" to regional or provincial stores primarily by plane or boat with road transportation contracted to third-party logistics (3PL) companies [30]. There is no **organized system for distribution:** past regional and selected provincial stores, lower-level LGUs have the responsibility of collecting vaccines using their own vehicles. According to a study on DOH warehousing done October 2017, the 3PLs have difficulty fulfilling quarterly deliveries of DOH supplies (not just vaccines) which delays the release of commodities, leading some regional warehouses to receive only two of the four shipments per year [29]. Moreover, the stocks and inventory of vaccines (as well as other DOH supplies) in health facilities are not electronically monitored [29]. **This leads LGUs to be prone to over or understocks of vaccines.** In 2017, the RITM piloted barcode system or "Web Based Vaccination Supply Stock Management", but this needs more investment and scale up

*5.3. Human Resources and Leadership*

While the DOH has poured enormous resources into introducing new vaccines and reaching more age groups in recent years, backend technical workforce has remained scarce. Currently, the EPI only has only two (2) technical staff in the DOH central office (one program manager and one cold chain manager) and one (1) in every region with other functions. These staff have gigantic tasks, including nationwide planning, procurement, cold and supply chain, leveraging funds, health promotions, monitoring, and supplemental or catch-up vaccination. The inadequate number of staff pose challenges to deliver one of the major programs of the Department. This is coupled with a lack of succession planning in the DOH and recurrent leadership transfers that lead to a loss of institutional memory and knowledge.

Moreover, we saw in subsection 5.1 on Financing that there were **negligible investments in capacitating health human resources (HHR) in DOH and LGUs for the expanded EPI.** As the number of vaccines to administer increases, so does the need for a well-trained health workforce, especially in LGUs who have the primary responsibility of delivering immunization services. Not only do HHR need to be better trained in safe immunization skills, but they also need management and supportive supervision skills [31]. This is because the increased number of vaccines to deliver to the population means increased responsibilities for volume of service delivery, finances, logistics of the cold chain, and data management; Errors in any part of the vaccine cold and supply chain will be much more costly to the health system and in terms of risk to children [32].

Overall, there seems to be a lack of leadership and urgency in addressing the recurring patterns of stockouts and low immunization coverage seen in the past decade. As mentioned, majority of the increased EPI funding accrued through sin taxes was spent in procuring new and underutilized vaccines, with the JEV vaccine introduced in 2019 for select high-prevalence areas. While it is commendable that DOH has expanded the EPI, it has not invested in systems strengthening or the non-vaccine components of the program - modern logistics and supply chain, stock monitoring, business intelligence, and warehousing. That is, it has kept adding vaccines to the DOH EPI without first ensuring that the current system and LGUs has the capacity to deliver the basic childhood vaccines, not to mention the new ones, efficiently, equitably, and in a timely manner. The unplanned supplemental immunization activities (SIA) to suppress sudden outbreaks also reflect this. The SIAs are not efficient because they disrupt routine immunization and health care: HHRs in LGUs and in other DOH programs are fielded out for SIAs when they have their own tasks and programs to focus on.

## 6. Conclusions and Recommendations

The Philippine Expanded Program on Immunization should aim for **both high immunization coverage levels and timely administration of vaccines**. The Philippine EPI has shown **inconsistent performance in the last few years**. We outlined both demand and supply factors that could explain the country's weak performance. The central insight of initial results from this paper is that **without large investments and pathbreaking reforms in the current system of delivery, financing, and leadership, universal coverage targets will remain quixotic,** at best. Moreover, the DOH needs to **ensure that the health system and its health human resources can deliver the basic childhood vaccines** efficiently and in a timely manner - before it even thinks about adding new vaccines that will merely overwhelm the existing weak vaccine cold and supply chain.

Our policy recommendations are divided into short and long-terms solutions:

**A. Short-term solutions**

These solutions aim to **immediately address supply-side constraints**, particularly stock outs:

- In the interim, the DOH should consider procuring all its vaccines from UNICEF until the local procurement system can effectively guarantee the country's supply.
- The DOH should consider multi-year planning and procurement with local manufacturers and carefully interface this with UNICEF. The DOH should avail Multi-Year Obligation Authority (MYOA) from Department of Budget and Management (DBM). This will reduce the uncertainty that comes with annualized procurement.
- The DOH should augment the technical staff of the program. The leadership of the program must have the foresight and critical thinking in understanding the current and future needs of the program, and the ability to communicate these needs within and outside the bureaucracy.

**B. Medium to long-term solutions**

Medium- and long-term solutions are needed to **optimize efficiency, timeliness, and equity in the uptake of vaccines.** The program must be aligned with the financing and service delivery model as envisioned in the Universal Health Care Act of 2019.

- **Improve planning of vaccine requirements**. The DOH currently uses aggregate census data in estimating needs, which result to poor planning and foresight. The government should explore using actual headcounts and electronic immunization registries in estimating the actual need and monitoring coverage and timeliness of vaccination. This initiative can be possibly pursued with the new Philippine national ID system.
- **Increase immunization coverage and timeliness by expanding to private sector delivery channels**. Given their large and growing presence, the government can tap the private sector to carry out a publicly- financed and privately or publicly delivered EPI. With the private sector, child vaccines can be delivered more routinely and timely than

sporadic supplemental vaccination programs. For this to be realized, the government needs to shift its financing scheme from DOH to PhilHealth. The DOH is not allowed to contract out private providers, but PhilHealth can.

- **Increase immunization coverage by allowing more health worker cadres (both from the public private health workers) to provide routine vaccination.** This requires, however, further reconnaissance and amendments of certain laws. In other health systems, non-physicians can administer vaccines or may receive insurance reimbursements.

- **Improve and invest in supply chain and health human resources.** The DOH centrally procures and manages the supply chain - storage, distribution, handling, and stock management, and logistics. The government should explore contracting out the whole supply chain or parts of it to the private sector.

- **Re-design procurement practices to improve efficiency.** The government should find ways to improve efficiency through economies of scale by considering itself (DOH) as the sole or the main procurement entity of vaccines. Both the private and public health facilities will only source its vaccine requirements from the purchasing entity. However, the government should ensure that it has robust supply chain for this to be pursued.

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