

Pneumonia & Diarrhea

Progress Report

**Sustainable
Progress in the
Post-2015 Era**

2015



Contents

Executive Summary	4
Global Burden of Pneumonia and Diarrhea in Children	5
Evaluating Progress in the 15 Highest Burden Countries	6
Key Progress Updates	7
Introduction	8
Pneumonia and Diarrhea – Major Threats to Child Health and Survival	8
Measuring and Evaluating Country Progress	8
GAPPD Intervention Scoring	10
Key Findings: GAPPD Package Coverage	11
Key Findings: Prevention through Vaccination	17
DTP3 Coverage	18
Measles Coverage	18
Hib Vaccine Coverage	18
PCV Coverage	19
Rotavirus Vaccine Coverage	19
Striving to Achieve and Maintain High, Equitable Vaccine Coverage	20
Country Highlights	21
India	22
Indonesia	23
Nigeria	25
Key Findings: Protection	27
Exclusive Breastfeeding	28
Key Findings: Treatment	29
Pneumonia Treatment: Care by Appropriate Health Care Provider and Antibiotics	30
Diarrhea Treatment: Oral Rehydration Salts (ORS) and Zinc	31
Sustainable Progress in the Post-2015 Era	32
Vaccine Financing	34
Impact of Changing Levels of Gavi Support	35
Immunization Systems, Supply Chains, and Decision Making Capacity	36
Capacity to Scale Up Interventions and Sustain Progress	38

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Executive Summary



Executive Summary

Global Burden of Pneumonia and Diarrhea in Children



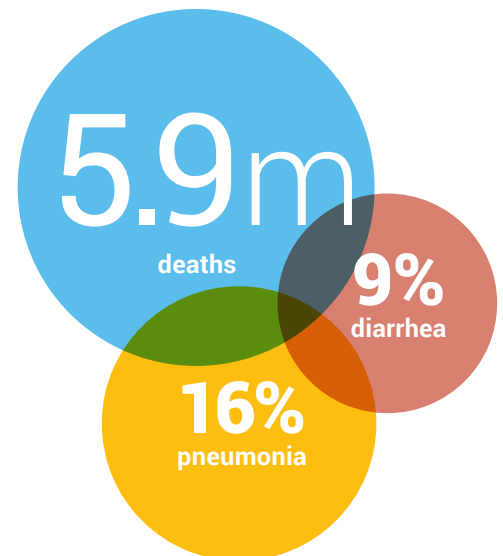
Every minute, six children die from pneumonia or diarrhea. Together, these diseases claimed the lives of nearly 1.5 million children under the age of five in 2015.

This year, 2015, marks the end of the Millennium Development Goals (MDGs), and an opportunity to reflect on the drastic improvements in child health and survival that have been achieved over the past decades along with the need for sustained improvement. In 2015, the mortality rate in children under the age of five years is less than half (43 deaths per 1,000 live births) of what it was in 1990 (91 deaths per 1,000 live births). However, this still falls short of the MDG4 target of reducing under-five mortality by two-thirds between 1990 and 2015. This reality serves as a stark reminder of the work that remains to be done and the continued investments that are required to accelerate the pace of progress in the post-2015 era.

In 2015, a projected 5.9 million children around the world will die before reaching their fifth birthday.¹ **Of these 5.9 million deaths, pneumonia was responsible for 16% and diarrhea was responsible for 9%, making them two of the leading killers of children worldwide.** Together, these diseases claimed the lives of nearly 1.5 million children under the

age of five in a single year. The lives of six children are lost with each passing minute. Although the number of child deaths in 2015 decreased compared to 2013 (6.4 million), the overall contribution of pneumonia and diarrhea to those deaths has remained rather steady (15-16% for pneumonia and 9% for diarrhea) over those two years.¹

In addition, pneumonia and diarrhea mortality in young children continues to be disproportionately concentrated in a few countries, year after year. **Seventy-two percent of the global burden of pneumonia and diarrhea child deaths occur in just 15 countries, even though they are home to only 55% of the world's under-five population.**



Of these 5.9 million deaths, pneumonia was responsible for 16% and diarrhea was responsible for 9%, making them two of the leading killers of children worldwide.

Evaluating Progress in the 15 Highest Burden Countries

This 2015 Pneumonia and Diarrhea Progress Report evaluates the progress of the 15 countries with the greatest burden of under-five pneumonia and diarrhea deaths in implementing high-impact interventions outlined in the Global Action Plan for the Prevention and Control of Pneumonia and Diarrhea (GAPPD)³, where data are available, and evaluates the need to accelerate the implementation of select interventions and assure sustainability of that progress.



Collectively, these ten interventions are evaluated and summarized into an overall GAPPD score, developed by the International Vaccine Access Center (IVAC) at the Johns Hopkins Bloomberg School of Public Health. These GAPPD scores are used to assess and compare progress over time in the highest-burden countries with the greatest number of pneumonia and diarrhea deaths in children under the age of five years. GAPPD scores are a calculated average of countries' coverage levels for the ten GAPPD indicators, using the most recent data available.



The coverage targets for interventions included in this report are:

90% for vaccinations

Pertussis vaccine

Measles vaccine

Haemophilus influenzae type b (Hib) vaccine

Pneumococcal conjugate vaccine

Rotavirus vaccine



90% for pneumonia and diarrhea treatments

Treatment of children with suspected pneumonia by a health care provider

Antibiotic use in children with suspected pneumonia

Oral rehydration salts (ORS) for children with diarrhea

Zinc supplements for children with diarrhea



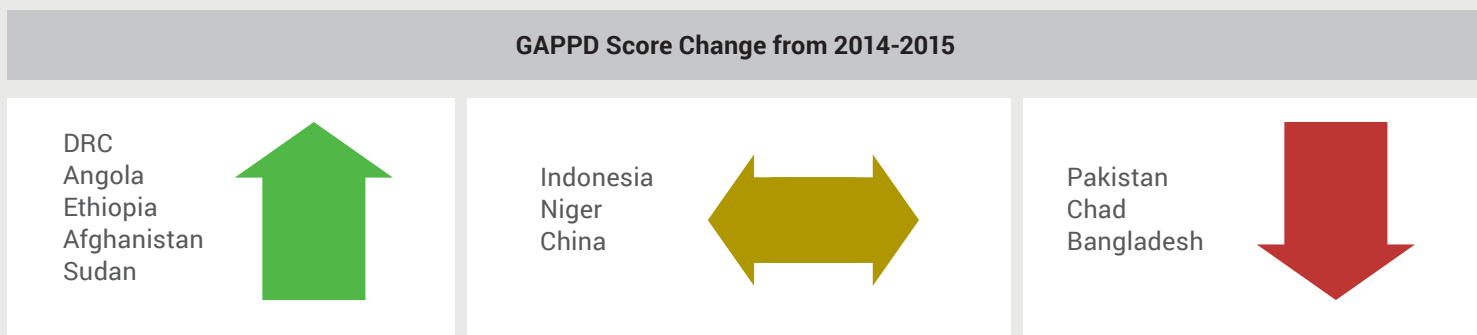
50% for exclusive breastfeeding

Exclusive breastfeeding for the first 6 months of life

Key Progress Updates

Between 2014 and 2015, 7 of the 15 countries with the greatest burden of child pneumonia and diarrhea deaths showed improvements in their GAPPD scores. However, gains were minimal in large countries, such as India and Nigeria.

Between 2014 and 2015, the 15 countries with the greatest number of pneumonia and diarrhea child deaths have remained largely unchanged, with two exceptions. Uganda and Kenya dropped from the list in 2015, and were replaced by Somalia and Tanzania. For the remaining countries on the list in both 2014 and 2015, mixed progress was observed. **GAPPD scores improved modestly for some countries (Democratic Republic of the Congo, Angola, Ethiopia, Afghanistan, and Sudan); remained unchanged for Indonesia, Niger, and China; and decreased for others (Pakistan, Chad, and Bangladesh).** Furthermore, India and Nigeria, the two countries that consistently have the greatest number of pneumonia and diarrhea deaths under-five, improved their GAPPD scores by only two percentage points.



Reflecting on the rate of progress over the past few years, it has become increasingly evident that without significant gains in countries with large birth cohorts, such as India, Nigeria, China, and Indonesia, reduction in global pneumonia and diarrhea mortality in children will continue to stall, as has been the case in recent years.

The rate of uptake and scale-up of evidence-based interventions that protect against, prevent, and treat pneumonia and diarrhea have not kept up with the pace required for countries to meet the MDG4 target of reducing under-five mortality by two-thirds by 2015. In fact, more than half of the countries evaluated in this report have missed the target.¹ Although Ethiopia, Indonesia, Niger, China, Bangladesh, and Tanzania successfully achieved at least a two-thirds reduction in their

child mortality relative to its 1990 rate and thus met the MDG4 target, they still bear a significant burden of pneumonia and diarrhea child deaths worldwide. Particularly in large countries or countries that once had extremely high child mortality rates, the absolute number of child deaths (all-cause or pneumonia and diarrhea only) in 2015 can still be high relative to those of other countries, despite a large relative reduction in their mortality rates over time.

Low GAPPD scores in this report may be due to a number of factors, including but not limited to a lack of implementation of GAPPD interventions (e.g., no introduction of the vaccines that can impact pneumonia and diarrhea mortality), slow rollout of vaccines that have been introduced (which is often the case for phased introductions in large countries), and challenges in changing health behaviors, specifically with regard to adopting protective and treatment measures.

Introduction



Pneumonia and Diarrhea – Major Threats to Child Health and Survival

Over the past 25 years, the rate of mortality in children under the age of five years has been cut by more than half worldwide (from 91 deaths per 1,000 live births in 1990 to 43 deaths per 1,000 live births in 2015).¹ Still, reaching a fifth birthday is a life milestone that many children will never reach, especially in the poorest areas of the world. In 2015, the number of childhood deaths is expected to reach 5.9 million. Despite significant gains in overall child health achieved across the globe, the world has still fallen short of reaching its goal of reducing 1990 under-five mortality by two-thirds by 2015. Pneumonia and diarrhea's contribution to under-five child deaths, in particular, have remained stubbornly high.^{1,2} **In 2015, these two diseases together were responsible for one in four deaths that occurred in children under five years of age.**⁴ The majority of the total burden of pneumonia and diarrhea child deaths globally (1.5 million) is also disproportionately borne by 15 countries. Of the children who lost their lives to pneumonia and diarrhea before the age of five, 72% are from these 15 high-burden countries,⁴ even

though these countries only account for 55% of the world's under-five population.⁵ Of these 15 countries with the greatest number of pneumonia and diarrhea child deaths, 6 (Angola, Chad, Somalia, Nigeria, Democratic Republic of Congo (DRC), and Niger) are also among the 10 countries with the highest under-five mortality rates and 9 (India, Nigeria, Pakistan, DRC, Angola, Chad, Afghanistan, Sudan, and Somalia) have missed the MDG4 target for the reduction of child mortality.¹ The remainder (Ethiopia, Indonesia, Niger, China, Bangladesh, and Tanzania) have achieved their MDG4 targets, but remain in the top 15 countries due to the high absolute burden of pneumonia and diarrhea, and therefore should continue to focus on further reductions of pneumonia and diarrhea mortality, particularly amongst their most vulnerable populations.

Measuring and Evaluating Country Progress

This report evaluates the progress of the 15 countries with the greatest number of deaths from pneumonia and diarrhea in children under the age of five years, using the most up-to-date information on countries' use of high-impact

pneumonia and diarrhea interventions as recommended by the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) in the Global Action Plan for the Prevention and Control of Pneumonia and Diarrhea (GAPPD). Additionally, actual coverage levels for each intervention are compared to coverage targets set forth in GAPPD to assess how close or far countries are from meeting global standards for pneumonia and diarrhea prevention and treatment.

**Protect.
Prevent.
Treat.**

GAPPD provides an integrated strategy for ending preventable pneumonia and diarrhea deaths through the use of proven measures that **protect** child health, **prevent** children from becoming ill with pneumonia and diarrhea, and **treat** affected children.

GAPPD sets forth the following coverage targets for its recommended interventions, which countries should strive to achieve:

90%



coverage for each of the following vaccines: pertussis, measles, Haemophilus influenzae type b (Hib), pneumococcal conjugate, and rotavirus vaccines

90%



treatment coverage for children with suspected pneumonia, including care by an appropriate health care provider and antibiotics

90%



treatment coverage for children with diarrhea, including treatment with oral rehydration salts (ORS) and zinc supplements

50%



rate of exclusive breastfeeding for the child's first six months of life

GAPPD Intervention Scoring

GAPPD scores are composite scores that are calculated from countries' most recent coverage, expressed as a proportion, for key GAPPD interventions, for which data are available. There are ten indicators that factor into the GAPPD score, which represents a summary of coverage and is calculated as the average coverage across interventions based on available data. These intervention measures include coverage rates for the third dose of pertussis (as measured by DTP3), first

dose of measles-containing vaccine (MCV1), third dose of Hib vaccine (Hib3), third dose of pneumococcal conjugate vaccine (PCV3), and the last dose of rotavirus vaccine (RV); exclusive breastfeeding for the first six months of a child's life; care by an appropriate health care provider and antibiotic treatment for children with suspected pneumonia; and treatment with ORS and zinc for children with diarrhea. The overall GAPPD scores provide an overview of the progress made in

countries in terms of providing children coverage of high-impact interventions that protect against, prevent, and treat pneumonia and diarrhea, integrating strategies that impact either pneumonia or diarrhea, as well as those that impact both. For a closer look at countries' progress with respect to pneumonia and diarrhea interventions separately, GAPPD-Pneumonia and GAPPD-Diarrhea scores, which respectively take into account only pneumonia-specific and diarrhea-specific interventions, are also reported.

The coverage indicators that are included in each score are outlined below:

Score	DTP3	MCV1	Hib3	PCV3	RV (last dose)	Pneumonia Treatments		Diarrhea Treatments		Exclusive breastfeeding in first 6 months
						Care by an appropriate health care provider	Antibiotics	ORS	Zinc supplements	
Overall GAPPD score	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
GAPPD-Pneumonia score	✓	✓	✓	✓		✓	✓			✓
GAPPD-Diarrhea score		✓			✓			✓	✓	✓

GAPPD scores reflect countries' progress on ten key GAPPD interventions for which coverage data are publicly available; they are not intended to represent the full portfolio of interventions that are effective in reducing pneumonia and diarrhea morbidity and mortality in children. Therefore, non-inclusion of interventions in the GAPPD score calculations does not imply their lack of importance in the prevention and treatment of childhood pneumonia and diarrhea.

Considerations for Interpreting GAPPD Scores: Recent data (within the last 10 years) are not available for certain GAPPD indicators and are thus excluded from the calculation of GAPPD scores. As a result, countries with several missing values may have scores that either overestimate or underestimate the true progress being made in the country. Additionally, progress may appear stalled in countries where coverage estimates for GAPPD indicators are not updated annually, even if the country has made improvements in recent years. This underscores the importance of ongoing monitoring and availability of high quality data on key GAPPD interventions, which will not only enhance the quality of programs delivering these interventions, but also allow an accurate and up-to-date assessment of countries' progress.

In addition, immunization coverage rates calculated in the GAPPD scores are from the WHO/UNICEF Estimates of National Immunization Coverage (WUENIC), which are updated on an annual basis for the most recent year, as well as for all previous years, taking into account any new survey data that were made available since the last WUENIC data were released. Any changes in estimated coverage rates of previous years do not imply increases or decreases in actual coverage in that given year; rather, they reflect an adjustment of coverage estimates based on the latest available survey data. Therefore, changes between the 2013 vaccine coverage rates reported in the 2014 Pneumonia & Diarrhea Progress Report and the 2014 rates reported in this year's Progress Report can be due to WHO/UNICEF's adjustments of 2013 coverage rates in its latest (2015) release or a true increase or decrease in coverage levels from 2013 to 2014. In this 2015 Progress Report, when assessing trends across years, coverage rates from the latest WUENIC data are used, not the 2013 WUENIC coverage rates issued in 2014 and reported in the 2014 Progress Report.

Key Findings

GAPPD Package Coverage

Overall GAPPD scores in 2015 varied widely from a low of 20% (Somalia) to a high of 72% (Tanzania), with all 15 focus countries falling below the 86% target for the overall GAPPD score. Large countries, such as India, Nigeria, Indonesia, and China had little to no improvement in their GAPPD scores since last year.

These large countries with low coverage of lifesaving interventions that protect against, prevent, and treat pneumonia and diarrhea represent critical opportunities to bend the curve on child mortality.



In 2015, the 15 countries that contributed most to the global burden of child pneumonia and diarrhea deaths were largely the same as those in 2014, with two exceptions. Between 2014 and 2015, Uganda and Kenya dropped from the list of the 15 countries with the greatest number of under-five deaths from pneumonia and diarrhea, and were replaced by Somalia and Tanzania. These 15 highest burden countries now consist of (1) India, (2) Nigeria, (3) Pakistan, (4) DRC, (5) Angola, (6) Ethiopia, (7) Indonesia, (8) Chad, (9) Afghanistan,

(10) Niger, (11) China, (12) Sudan, (13) Bangladesh, (14) Somalia, and (15) United Republic of Tanzania (listed in decreasing order of pneumonia and diarrhea child deaths).⁶ This shuffling of countries on and off the list of the top 15 highest burden countries is due to several factors, including reductions in the total number of child pneumonia and diarrhea deaths and an adjustment of 2013 pneumonia and diarrhea burden estimates in the latest update of the global burden of disease estimates released in 2015.⁴ In all 4 cases

(Uganda, Kenya, Somalia, and Tanzania), the combined burden of child mortality from pneumonia and diarrhea did decrease between 2013 and 2015.⁴

This year, overall GAPPD scores varied widely from a low of 20% (Somalia) to a high of 72% (Tanzania), the highest GAPPD score reached by any of the 15 highest-burden countries since we began evaluating pneumonia and diarrhea interventions together in 2013 (See Fig. 1 and 2 and Table 1). The median score among the 15 countries was 46%. This represents a slight improvement from 2014 scores, which ranged from 23% (Chad) to 63% (Sudan), and with a median score of 44%.⁶ However, only 4 of the 15 countries had overall GAPPD scores of at least 50% in 2015 (Angola, Sudan, Bangladesh, and Tanzania), and all 15 fell short of the 86% target for the overall GAPPD score, which would be achieved if a country met the minimum coverage targets for each of the ten GAPPD interventions evaluated in this report.

Figure 1: Overall GAPPD scores for the 15 countries with the greatest absolute number of pneumonia and diarrhea deaths in children under 5 years of age, 2015

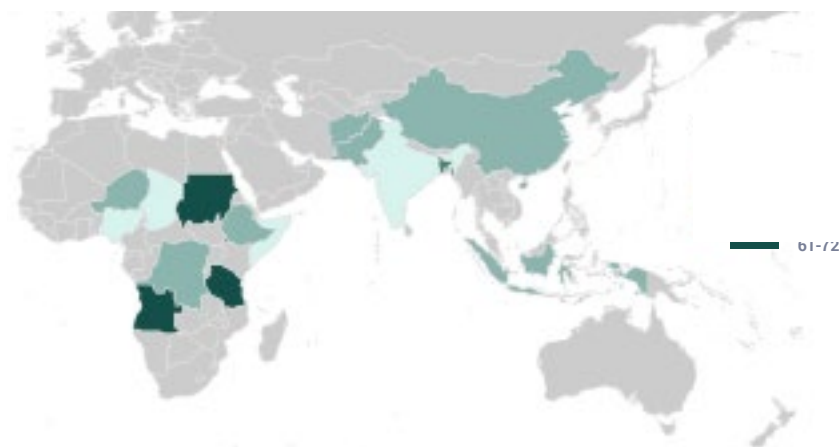


Table 1: Current levels of coverage for pneumonia and diarrhea interventions in the 15 countries with the most absolute child pneumonia and diarrhea deaths

Global rank order of total pneumonia and diarrhea deaths in children under 5	Country	Pneumonia & Diarrhea Deaths in Children Under 5 Years 2015 ¹	Vaccine Coverage (%)					% of Children Under 5 with Suspected Pneumonia		% of Children Under 5 with Diarrhea		% Exclusive Breastfeeding in first 6 months ⁷ (2005-2014)	2015 Overall GAPPD Intervention Score	2015 GAPPD Pneumonia Intervention Score	2015 GAPPD Diarrhea Intervention Score
			Pertussis (DTP3) 2014 ²	Measles 2014 ²	Hib3 2014 ² & Vaccine Use Status	PCV3 2014 ² & Vaccine Use Status	Rota 2014 ² & Vaccine Use Status	Taken to an appropriate health care provider ³ (2005-2014)	Receiving Antibiotics ³ (2005-2014)	Receiving ORS ⁴ (2005-2014)	Receiving zinc supplements ^{5,6} (2005-2014)				
1	India	297,114	83	83	20	0 No decision	0 Non-Gavi planning intro	69	12.5	26	0.3	46	34	45	31
2	Nigeria	210,557	66	51	66	0 (Dec 2014)	0 Gavi plan to apply	34.5	34.9	34	2.3	17	31	39	21
3	Pakistan	103,760	73	63	73	68	0 Gavi plan to apply	64.4	41.5	38	1.5	38	46	60	28
4	Democratic Republic of the Congo	78,422	80	77	80	61	0 No decision	41.6	39.6	39	2.4	48	47	61	33
5	Angola	54,548	80	85	80	61	18	-	-	-	-	-	65	77	52
6	Ethiopia	46,888	77	70	77	76	63	27	6.8	26	0.0	52	48	55	42
7	Indonesia	33,737	78	77	21	0 Non-Gavi planning intro	0 Non-Gavi planning intro	75.3	38.9	39	1.1	42	37	47	32
8	Chad	30,641	46	54	46	0 No decision	0 No decision	26.1	31.4	13	0.2	3	22	30	14
9	Afghanistan	30,419	75	66	75	40	0 Gavi plan to apply	60.5	63.9	53	5.3	-	49	63	31
10	Niger	28,164	68	72	68	13	19	53.1	10.7	44	10.3	23	38	44	34
11	China	27,114	99	99	Private Market Coverage	0 No decision	0 No decision	-	-	-	-	28	45	56	42
12	Sudan	24,903	94	86	94	97	86	48.3	59	22	-	41	70	74	59
13	Bangladesh	24,571	95	89	95	0 Introduced Mar 2015	0 Gavi plan to apply	42	34.2	77	11.8	60	50	59	48
14	Somalia*	23,426	42	46	42	0 No decision	0 No decision	13	32	13	0.9	9	20	26	14
15	Tanzania, United Republic of*	22,394	97	99	97	93	97	70.6	-	44	4.7	50	72	84	59

*Not profiled in the 2014 Pneumonia & Diarrhea Progress Report; was not among the top 15 countries with the highest number of child pneumonia and diarrhea deaths in the previous year.

Sources:

- ¹ Liu, L., Oza, S., Hogan, D., Chu, Y., Perin, J., Zhu, J., Lawn, J., Cousens, S., Mathers, C., Black, R. E. (2015). National, regional and global causes of child mortality in 2000-2015 – reflecting on the MDG 4 and embarking on the SDG 3.2. Under preparation.
- ² WHO/UNICEF. WHO/UNICEF National Immunization Coverage Estimates. Data as of 10 Jul 2015. Retrieved from http://www.who.int/immunization/monitoring_surveillance/data/en/
- ³ UNICEF. Global databases 2015 based on MICS, DHS and other national household surveys. Retrieved from <http://data.unicef.org/child-health/pneumonia.html>
- ⁴ UNICEF. Global databases 2015 based on MICS, DHS and other national household surveys. Retrieved from <http://data.unicef.org/child-health/diarrhoeal-disease.html>
- ⁵ The DHS Program. (n.d.). Demographic and Health Surveys (DHS) Final Reports. Retrieved from <http://dhsprogram.com/publications/publication-search.cfm?type=5>
- ⁶ UNICEF. (2014). Multiple Indicator Cluster Surveys / MICS5. Retrieved from http://www.childinfo.org/mics5_surveys.html
- ⁷ UNICEF. Global databases, 2014, DHS, MICS, other national household surveys and UNICEF. Retrieved from <http://data.unicef.org/nutrition/iyfc.html>.



Without significant and accelerated progress in these large countries, reduction of preventable pneumonia and diarrhea deaths in young children globally will continue to stall.

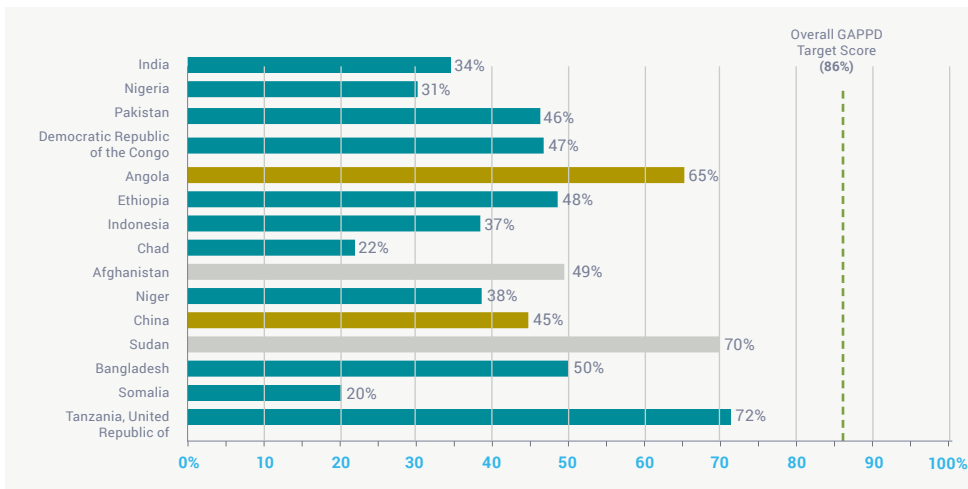
Compared to 2014 scores, 7 of the 15 countries had improvements in their 2015 scores (Fig. 3), with the largest increases seen in Angola (+15%), Ethiopia (+10%), and DRC (+8%). Afghanistan and Sudan, respectively, also saw increases in their overall GAPPD scores (+5 and +7, respectively) and India and Nigeria raised their score slightly (+2%). It is quite notable that India has the lowest GAPPD score among the Asian countries evaluated in this report, despite its resources. Indonesia, Niger, and China had no improvements in their overall score. Overall GAPPD scores decreased in three countries: Pakistan and Chad decreased only slightly (-1%), but Bangladesh's score declined by 8%. Bangladesh's lower GAPPD score was largely attributable to its decreasing rate of antibiotic treatment for children with suspected pneumonia (from 71% to 34%) and zinc coverage in children with diarrhea (from 41% to 12%). Of the 15 countries profiled in this report, the 3 countries with the highest GAPPD scores (Tanzania, Sudan, and Angola) are using all 5 vaccines protective against pneumonia and diarrhea (pertussis, measles, Hib,

PCV, and rotavirus vaccines) and are achieving relatively high coverage with each. By contrast, in countries with large populations of children under the age of five years, such as India, Nigeria, China and Indonesia, PCV and rotavirus vaccine have not yet been introduced into the national immunization schedule, which contributes to stagnation of their overall GAPPD scores.

Moving the needle in large countries where a large portion of the world's under-five population lives has proven difficult and slow. As evident in Figure 4, India and Nigeria, which bear the greatest burden of child deaths from pneumonia and diarrhea, have overall GAPPD scores that remain well below 50%, revealing the substantial opportunities for reduction of this burden of mortality. This pattern is true for other countries with large under-five populations as well, including China, Indonesia, and Pakistan, who also have scores less than 50%.

This progress will need to not only include introduction of the vaccines, but equitable rollout to ensure maximum impact. In large countries, the phased approach for introduction of vaccines, often because of weaker systems can inadvertently result in lower than desired progress, as subnational areas that tend to introduce last are also areas where disease burden is highest. A deliberate effort to introduce interventions in highest burden areas in parallel with system strengthening is needed to achieve the greatest impact.

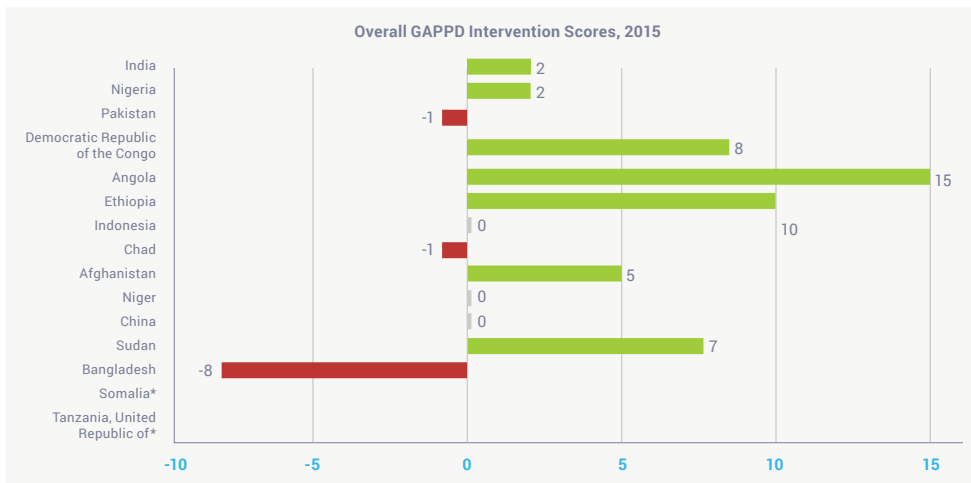
Figure 2: 2015 Overall GAPPD intervention scores for countries shown from top to bottom in decreasing order of absolute child pneumonia and diarrhea deaths



Source: World Health Organization (WHO). (2015). WHO vaccine-preventable diseases: monitoring system. 2015 global summary. Last updated 8 Sep 2015. Retrieved from http://apps.who.int/immunization_monitoring/globalsummary/indicators

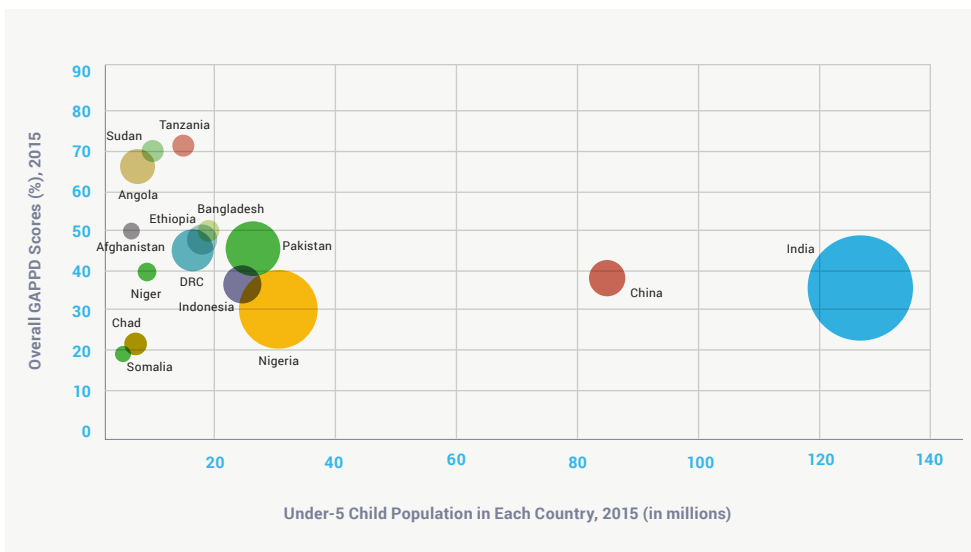
Countries consistently scored higher on their GAPPD-Pneumonia scores than their GAPPD-Diarrhea scores. Tanzania was the only country of the 15 highest burden countries to meet the GAPPD-Pneumonia target score of 84%, while no country achieved the target 82% GAPPD-Diarrhea score.

Figure 3: Change in overall GAPPD scores between 2014 and 2015 shown from top to bottom in decreasing order of absolute child pneumonia and diarrhea mortality



*Not profiled in the 2014 Pneumonia & Diarrhea Progress Report; was not among the top 15 countries with the highest number of child pneumonia and diarrhea deaths in the previous year.

Figure 4: Absolute number of pneumonia and diarrhea deaths in under-five children and overall GAPPD scores in the 15 highest burden countries, relative to their under-five population size

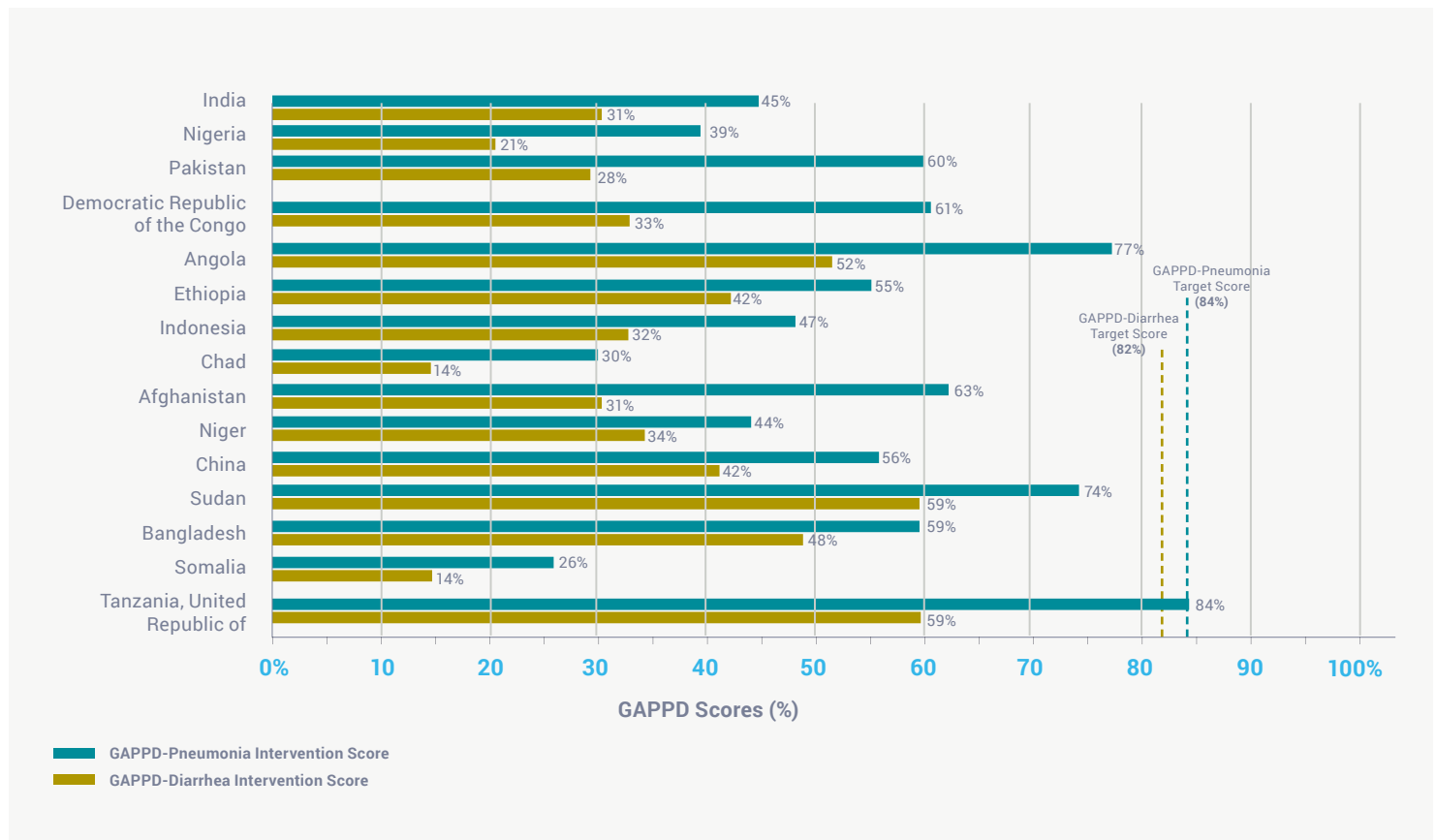


Note: The size of each bubble represents the absolute number of under-five child deaths from pneumonia and diarrhea in each country.

When evaluating pneumonia and diarrhea interventions separately, GAPPD-Pneumonia scores were consistently higher than GAPPD-Diarrhea scores across all 15 countries, ranging from 26-84% and 14-59%, respectively (Fig. 5). India, DRC, Ethiopia, Angola, and Sudan made improvements to both their GAPPD-Pneumonia and GAPPD-Diarrhea scores. In other countries, there was mixed progress, with some countries making gains on pneumonia interventions, while losing ground on diarrhea interventions, and vice versa. For example, Nigeria increased its GAPPD-Pneumonia score by two percentage points, but lost the equivalent in its GAPPD-Diarrhea score. Similarly, Afghanistan’s GAPPD-Pneumonia score improved by six percentage points, while its GAPPD-Diarrhea score dropped by two percentage points. Niger, on the other hand, gained five percentage points in its GAPPD-Diarrhea score and lost four in its GAPPD-Pneumonia score. Two countries (Bangladesh and Chad) had decreases in both their GAPPD-Pneumonia and -Diarrhea scores.

This shows that progress on the child pneumonia and diarrhea fronts could differ by country and that barriers to each should be addressed on the individual country level. Some countries could have strong champions or funding for pneumonia interventions, but lack them for diarrhea (or vice versa), and therefore perform better in certain areas than others. Even within countries, improvements in pneumonia compared to diarrhea and the degree to which each were improved could vary across states and districts, especially in large, heterogeneous countries with a decentralized government and health system. To devise a more tailored solution, it is important to recognize these potential differences across geographic areas and between the various interventions.

Figure 5: 2015 GAPPD-Pneumonia and GAPPD-Diarrhea intervention scores for countries shown from top to bottom in decreasing order of total child pneumonia and diarrhea deaths



Although none of the 15 countries met the 86% target for their overall GAPPD score, Tanzania did meet all the minimum targets for the pneumonia-specific GAPPD interventions, thereby achieving the 84% target for its GAPPD-Pneumonia score. However, no country was even close to reaching the 82% target for its GAPPD-Diarrhea score (the

minimum score achieved if a country were to meet the minimum standards for all the diarrhea-specific GAPPD interventions). The sluggish pace of progress with diarrhea interventions highlights the urgent need to accelerate the rate of implementation and scale up of diarrhea and treatment measures so that these interventions can reach

children who need them most. **Only 5 of the 15 countries met one or more GAPPD coverage targets**, with Tanzania hitting targets for the most (6) indicators, followed by Sudan, who met 4 coverage targets. **In total, 10 of the 15 countries failed to reach even one of the 10 GAPPD coverage targets.**

A close-up photograph of a hand holding a syringe, administering a vaccine to a child's arm. The image is overlaid with a dark blue filter. The text is positioned on the left side of the image.

Key Findings: **Prevention through Vaccination**

Both accelerated vaccine introductions and scale ups are needed to promptly raise coverage levels and prevent child deaths from pneumonia and diarrhea. In countries with phased vaccine introductions, slow rollout of the vaccine to all areas of the country has contributed to persistently low coverage.

Vaccines have long been recognized as a cornerstone to child health and survival. However, the introduction of new vaccines in developing countries has generally lagged behind use in developed countries, even though poorer countries bear a disproportionate burden of disease.

For pneumonia and diarrhea, there are several vaccines that are safe and effective in preventing these diseases, such as pertussis, measles, Hib, pneumococcal, and rotavirus vaccines.

DTP3 Coverage

According to the latest WHO/UNICEF Estimates of National Immunization Coverage (WUENIC) released in 2015, DTP3 rates rose in 7 of the 15 countries, decreased in 3 of the countries, and were unchanged in the remaining 5 countries between 2013 and 2014. **In some countries, such as Chad and Somalia, DTP3 coverage levels are unacceptably low (less than 50%),** indicating serious issues with delivering routine immunizations in those countries. For many countries with remarkably low DTP3 coverage, including Somalia, political conflict has played a major role in disrupting basic immunization services. In these areas affected by conflict, enhanced efforts to strengthen immunization systems are especially critical, as more and more children become displaced and even harder to reach for preventive services.⁹

Measles Coverage

For measles vaccine, coverage rates increased in 3 countries, decreased in 6, and were unchanged for the other 6 countries.⁸ Ten of the 15 countries had measles vaccine coverage at or above 70%, with 2 (China and Tanzania) reaching nearly universal coverage (99%). Nevertheless, the fact that measles vaccine coverage is not where it should be for 13 of the 15 countries, and that only 3 countries are on an upward trajectory, should be a cause for

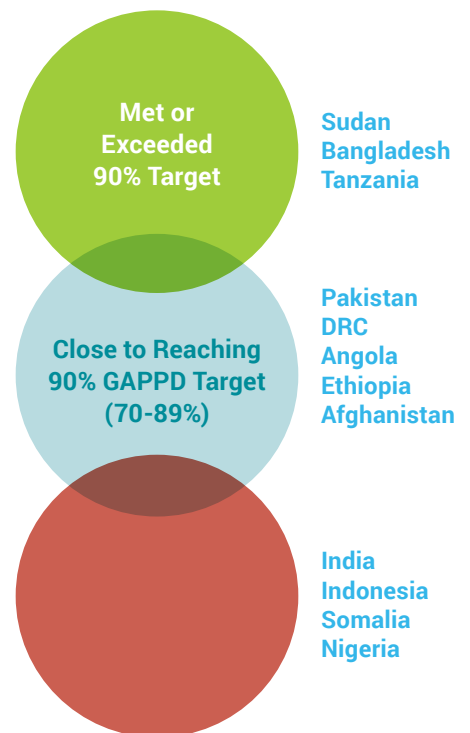
concern. As we see with recent measles outbreaks in the U.S., a country that had previously eliminated measles over a decade ago,¹⁰ it is important for countries to recognize that their population will remain vulnerable to outbreaks if coverage levels are not high and do not stay high. For measles particularly, declining coverage levels pose a real and substantial threat to the sustainability of previous successes achieved in measles prevention.

Hib Vaccine Coverage

Hib vaccine, another vital vaccine for the prevention of pneumonia, is widely used across the globe in every country, except for China and Thailand. Children in China have access to Hib vaccine in the private market, but its coverage levels in the private sector are not well documented.⁷ Currently, **3 of the 15 countries (Sudan, Bangladesh, and Tanzania) have met or exceeded the 90% GAPPD coverage target for Hib vaccination and several countries are relatively close to reaching the target, including Pakistan (73%), DRC (80%), Angola (80%), Ethiopia (77%), and Afghanistan (75%).** Still, many countries continue to have extremely low coverage, such as India (20%), Indonesia (21%), Somalia (42%), and Chad (46%). For India and Indonesia, low coverage of Hib vaccine is a result of incomplete introduction of the vaccine throughout all states and districts in the country. India and Indonesia's DTP3 coverage rates are much higher though,

which is indicative of what their Hib coverage rates will likely be once they complete the transition from DTP to Hib-containing pentavalent vaccine in all states. Somalia and Chad, on the other hand, have similarly low coverage rates for both DTP and Hib (42% for Somalia and 46% for Chad), which suggests that they still have very weak immunization systems and thus require strengthening of their routine immunization programs.

Hib Vaccination Coverage Target



PCV Coverage

Although the lag in use of PCV and rotavirus vaccines in developing countries compared with developed countries has been significantly less than that of Hib vaccine,⁷ the pace of introduction of these vaccines in the highest burden countries has been remarkably slow, especially in large countries that have the potential to make great impact. **Fifteen years after PCV's first introduction in 2000, five of the highest pneumonia burden countries (India, Indonesia, Chad, China, and Somalia) are still not using the vaccine in their routine immunization programs.**¹¹ India, Chad, China, and Somalia have not made official decisions to introduce the vaccine, and Indonesia is expected to introduce PCV no earlier than 2017, and only in a limited area.¹¹ Among the 8 countries that have introduced PCV, coverage varied widely from a low of 13% (in Niger) to a high of 97% (in Sudan). In all cases, the goal of vaccine introduction should be to scale up access to include all children, with policy makers prioritizing accelerated rollouts to the highest burden populations that are most vulnerable and most in need.

Rotavirus Vaccine Coverage

Compared to PCV, rollout of rotavirus vaccine in these 15 countries has been even more limited. Nine years into rotavirus vaccine's introduction in the global market, only 5 of the 15 highest mortality burden countries (Angola, Ethiopia, Niger, Sudan, and Tanzania)

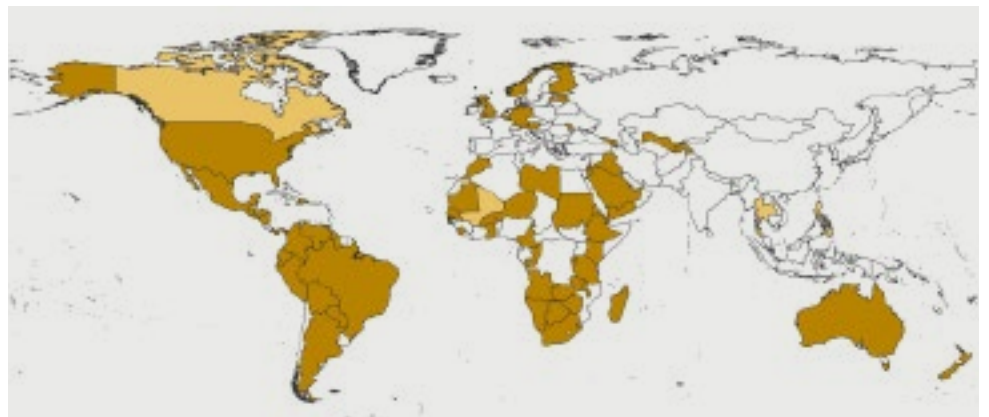
are using the vaccine. **On the global scale, uptake of rotavirus vaccine is especially delayed in South Asia and Southeast Asia, falling substantially behind the pace of introductions in Africa.** Compared to the 29 (55%) countries in Africa using rotavirus vaccine in national immunization programs, Asia pales in comparison, with only 11 countries (24%) routinely using the vaccine.¹¹ Furthermore, the Asian countries that have not introduced rotavirus vaccine are also countries with large birth cohorts, such as India, Indonesia, and China.

Although rotavirus vaccine is not included in China's national immunization schedule, there is a licensed monovalent rotavirus vaccine (LLR) available on the private market in the country.¹² However, based on a 2013 study of rotavirus vaccine coverage in Guangzhou, one of the largest cities in China, only about 1 in 4 children between the ages of 2 and 59 months received 1 dose of LLR, and even fewer (0.5%) received 2 or more doses. Given the vague and broad schedule

recommendation of LLR (for children 2-35 months of age) and its high price (costing roughly 10% of the average Chinese monthly salary for 2 doses), private market coverage of rotavirus vaccine in Guangzhou was expectedly low.¹³ For the 5 countries profiled in this report that are using rotavirus vaccine, coverage ranged from 18% (in Angola) to 97% (in Tanzania). India, Nigeria, Pakistan, Indonesia, Afghanistan, and Bangladesh are planning to introduce rotavirus vaccine, but not until 2016 or 2017.¹¹ In India, the country with the highest absolute number of diarrheal deaths, the vaccine is planned for introduction into 4 states, initially. DRC, Chad, China, and Somalia have not yet made decisions regarding rotavirus vaccine introduction.¹¹

Despite an overall decline in diarrhea and pneumonia mortality over time, countries must resist becoming complacent as long as preventable disease and mortality in children still remain, especially in hard-to-reach areas where disease burden is high and access to care is low.

Global rotavirus vaccine introductions



■ Introduced – Universal (76 countries) ■ Introduced – Subnational (4 countries)

Striving to Achieve and Maintain High, Equitable Vaccine Coverage

Beyond the political will needed to introduce these vaccines, achieving high levels of coverage among children remains a major challenge for many of these countries. Of the 15 countries evaluated in this report, only 2 (Sudan and Tanzania) met the 90% GAPPD coverage target for PCV and only 1 (Tanzania) met the same target for rotavirus vaccine coverage. While some countries improved vaccination coverage for all vaccines already introduced (of the five included in this report), such as DRC, Ethiopia, Afghanistan, Sudan, and Tanzania; Chad's vaccination rates dropped for all the vaccines evaluated in this report. In Angola's case, coverage rates declined for DTP, measles, and Hib vaccine, but increased for PCV and rotavirus vaccine. India showed improvements in its DTP and measles vaccine coverage; however, in 2014, three years after Hib vaccine's first rollout in Indian states, only 20% of children in the country are receiving the vaccine.¹¹ Likewise, Indonesia, opting to wait for an indigenously produced vaccine, was slow to adopt Hib vaccine and only introduced the vaccine thirteen years after Gavi support became available and over 10 years after a vaccine probe study demonstrated the high burden of Hib disease. Additionally, Indonesia's decentralized system has contributed to a slow rollout of Hib vaccine, reaching only 21% coverage, well below DTP3 coverage rates after more than two years since its phased introduction

began in August 2013.¹¹ This again underscores the importance of strengthening immunization programs at the national, state, and district levels; building awareness and political will for introduction; and assuring that systems at all levels have the capacity to roll out new vaccines at an accelerated pace, especially in high-burden states where delivery might be particularly difficult.

It is often the case that when countries have multiple new vaccine introductions planned, they stagger the introductions so as not to overburden the system. Even though it is wise to make sure that immunization programs and systems are well prepared to accommodate the new vaccines, delaying introduction means that children continue to be at risk of infection and death each day that the vaccines are not being given. Meanwhile, other countries have decided not to wait, opting for dual introductions.

This was the case for Tanzania, the country with the highest overall GAPPD intervention score and also one of the few countries among the 15 highest burden countries that is using both PCV and rotavirus vaccine. Tanzania experienced success with their dual PCV and rotavirus vaccine introduction for a number of reasons. First, they conducted cold chain assessments to proactively identify and address any capacity or storage issues months in advance of the introduction. Second, because they were preparing two vaccine introductions at once, they were able to consolidate working groups and health worker trainings,

which translated to time savings for health workers and increased overall efficiency of planning efforts.¹⁴ Concurrent vaccine introductions also allowed for combined advocacy and communications efforts, including development of key messages and materials.¹⁴ These lessons, gleaned from Tanzania's concurrent launch of PCV and rotavirus vaccine, provide valuable insights into what is essential for a successful dual launch. They also bring to the forefront the benefits of dual, as opposed to separate and staggered, vaccine introductions. These lessons can also be taken up by other countries contemplating the introduction of multiple vaccines that target children within the same age group.

A golden-hour photograph of a person splashing in water in front of a mosque. The scene is bathed in warm, yellow light, with the sun low on the horizon. The person's silhouette is dark against the shimmering water. In the background, a large mosque with multiple domes and minarets is visible, its architecture reflected in the water. The overall mood is serene and cultural.

Country Highlights: **India**

India

Global rank in number of pneumonia & diarrhea child deaths: 1

2015 GAPPD score: 34

PROGRESS:

- Strong political commitment to immunize all children in the next five years
- Increased efforts to monitor data and progress at the district levels
- Launch of Mission Indradhanush, aiming to expand immunization coverage in high-priority districts with large populations of unvaccinated and undervaccinated children

CHALLENGES:

- Slow rollout of pentavalent vaccine in high burden states and low Hib vaccine coverage nationally
- Lagged decision making on PCV introduction
- Low levels of access to appropriate pneumonia and diarrhea treatments

In their addresses to the Global Call to Action Summit in New Delhi in August 2015, Prime Minister Narendra Modi and Union Health Minister JP Nadda renewed the government's commitment to ending preventable maternal and child deaths in India and highlighted the strides made to date. Heralding achievements in neonatal health, including India's successful elimination of maternal and neonatal tetanus, Prime Minister Modi also called for accelerated immunization of all children in India, pledging to reach full immunization in the next five years to ensure that no child in India dies of a vaccine-preventable disease. With one in every five global child deaths from diarrhea or pneumonia occurring in India, the need for an equitable, comprehensive approach to preventing and treating these diseases is critical, including expanding exclusive breastfeeding and access to antibiotics, along with increases in vaccine introduction and use.

District Level Task Forces in India monitor data regarding progress on a variety of indicators, including those on pneumonia and diarrhea. The District Magistrates have shown detailed knowledge of various basic indicators of program strength, including stock levels of commodities, such as vaccines, ORS,

zinc, antibiotics; human resources and vacancies; where the activists are; and more. This in-depth monitoring has contributed to some of the progress that India is making in implementing an integrated approach to fight pneumonia and diarrhea.

In 2014, the Government of India announced the introduction of four new vaccines, including rotavirus vaccines, into the Universal Immunization Programme (UIP) and as of November 2015, 20 states and Union Territories have rolled out pentavalent vaccine, which includes DTP and Hib vaccines.

Working to ensure that the currently available vaccines are reached by the children who need them most, the Ministry of Health and Family Welfare launched Mission Indradhanush ("Rainbow" Mission). Launched in December 2014, the aim of Mission Indradhanush was to expand immunization coverage in 201 high-focus districts comprising 50% of unvaccinated or partially vaccinated children in phase I, and add nearly 300 more districts to the program in phase II. The efforts to strengthen political commitment and mobilize communities to scale up efforts that target the hardest-to-reach communities signal

the renewed commitment of India's leadership to improve child survival. While the introduction and rollout of rotavirus and pentavalent vaccines are in motion in India, further supported by the licensure of an indigenous rotavirus vaccine, PCV is not yet used in the UIP. In support of India's push toward full immunization and prevention of diarrhea and pneumonia among children, a symposium ("Pneumococcal Conjugate Vaccines in India: A Roadmap for Introduction") will be hosted in New Delhi in November 2015. The symposium will bring together experts and partners from across India and the world to discuss the experience of PCV introduction in other countries and potential steps for introduction and rollout of PCV in India. A country-led committee will discuss evidence-based policy options for state selection and develop a proposed PCV rollout strategy for the Ministry's consideration.

The government of India's continued commitment to child health is inspiring. Each great stride helps save more lives and prevent illness. It's important to continue to demand the same level of momentum for the fight against vaccine-preventable diseases.



Country
Highlights:
Indonesia

Indonesia

Global rank in number of pneumonia & diarrhea child deaths: 7

2015 GAPPD score: 37

PROGRESS:

- The Ministry of Health has called for a phased introduction of PCV in 2017 and 2018 in Central Lombok.
- A limited introduction of rotavirus vaccine is also planned within a similar timeframe.
- A new law which sets forth minimum healthcare standards will help strengthen the healthcare delivery system and improve accountability.

CHALLENGES:

- Indonesia's decentralized health system makes access to prevention and treatment services for pneumonia and diarrhea difficult, especially for hard to reach populations.
- Local preference for a Halal vaccine may complicate decision making if an indigenous trypsin free vaccine does not become available soon.
- To achieve universal vaccine coverage, plans for expanded rollout of PCV and rotavirus vaccine in all regions of Indonesia are needed.

Indonesia has made impressive progress in reducing childhood mortality and reaching MDG4 goals. Despite this progress, the country ranks seventh in absolute number of pneumonia and diarrhea child deaths. The decentralized health system covering over 17,000 islands makes access to care a challenge and often leaves hard-to-reach populations without adequate pneumonia and diarrhea prevention and care. The country is taking steps to address the burden of pneumonia and diarrhea, however.

Indonesia plans to introduce both pneumococcal conjugate and rotavirus vaccine in the next several years. The Ministry of Health has called for introduction of pneumococcal conjugate vaccine in 2017 in Central Lombok, following a recommendation by The Komite Pensihat Ahli Imunisasi Nasional or Indonesia Technical Advisory Group on Immunization (ITAGI) and the vaccine's inclusion in the multi-year plan. This phased introduction will continue in additional provinces and if the indigenous whole-cell pneumococcal vaccine (now in clinical trials) is licensed, a switch will likely be made. A limited

introduction of rotavirus vaccine is planned in a similar timeframe as well, with an indigenous porcine-free rotavirus vaccine. On the treatment side, a new law in Indonesia calling for minimum standards in healthcare may facilitate the strengthening of the healthcare system and improve accountability.

This news, while a positive signal for children in the country, is still complicated by several factors. With Indonesia graduating from Gavi support, it will be increasingly important to advocate for dedicated funding to ensure that PCV rolls out in a timely and equitable manner. Given its decentralized system, buy-in from both districts and provinces will be especially crucial; they will need to understand the value of the vaccine and prioritize strengthening of systems to enable smooth and impactful vaccine delivery. Declining DTP3 coverage rates (currently at 78% for 2014), even though the Indonesian government has strengthened immunization activities during the last five years, also strike a note of concern about the certainty of achieving the goal of universal

rollout, particularly on islands where the immunization system is not strong. Thus, raising awareness and advocating for vaccines must be a priority at both national and local levels to ensure the needed changes are implemented. Additionally, plans for timely and widespread rollout of pneumococcal and rotavirus vaccines introduction will need to be expanded to additional provinces in order to achieve universal access and coverage.

Beyond the logistical issues, there may be other unique challenges that could hinder the introduction of vaccines as planned at the national level. For example, demand for a Halal vaccine and perceptions about whether current vaccines are haram (prohibited) complicate decision making, should an indigenous porcine trypsin-free vaccine not be available within a reasonable time period. This challenge could be reasonably managed with strengthened advocacy, engagement of Muslim community leaders, and contingency planning efforts for other acceptable alternatives to help ensure sustained progress against diarrhea as well as pneumonia is made.

Indonesia has made significant investments in the immunization program over the past five years, but faces many challenges to ensure both equity and sustainability of their program as they transition out of Gavi support.



Country
Highlights:
Nigeria

Nigeria

Global rank in number of pneumonia & diarrhea child deaths: 2

2015 GAPPD score: 31

PROGRESS:

- Delisting from polio-endemic countries by WHO
- Successful roll out of pentavalent vaccine across the nation
- Phased introduction of PCV
- Plans to apply for Rotavirus in 2016 and introduce by 2018

CHALLENGES:

- Funding gaps for immunization and other GAPDD interventions
- Weak central coordination across GAPPD strategies and interventions
- No central point of accountability for the rollout of comprehensive GAPPD interventions and continuing progress
- Inadequate access to effective prevention and treatment of pneumonia and diarrheal cases

Despite missing the MDG 4 target, Nigeria has reason for cautious optimism; under-five mortality dropped 49% between 1990 and 2015. But 750,000 Nigerian children still die every year from largely preventable causes. Thus the country is still far from fulfilling the “Promise Renewed” of ending preventable child deaths.

Pneumonia and diarrhea are top killers of children in Nigeria. Unfortunately, progress on pneumonia control is slow. From the year 2000 to 2013, the number of under-five deaths from pneumonia remains unchanged. In contrast, deaths from malaria and measles declined by 34% and 97% respectively. The country’s low GAPPD intervention score of 31% reflects the poor coverage of key interventions and explains the lack of progress.

The Nigerian government has taken concrete steps to address the high child mortality. In 2012, the then President, Goodluck Jonathan, launched the flagship Saving One Million Lives Initiative (SOML). This Initiative aimed to rapidly increase access to proven interventions across six maternal newborn and child health program areas. The SOML focuses on health outcomes rather than outputs or inputs. The core

strategy is to employ performance management to drive accountability and action to achieve targets on coverage of interventions and number of lives saved. In 2015, the World Bank boosted the program with 500 million USD to “pay” state governments for results on targets. While the SOML program is an opportunity to increase access to the multi-pronged GAPPD interventions that “protect, prevent, and treat”, national coordination along the GAPDD strategies remains weak and implementation of the interventions variable.

Under “**protect**”, there has been no high-visibility effort to promote breastfeeding since the Baby Friendly Initiative (BFI) of the 1990s. It is not surprising therefore that only 17% of Nigerian children are exclusively breastfed for the first six months of life, as against the GAPPD target of 50%. To move the breastfeeding agenda forward, a partnership for nutrition advocacy has begun working to raise awareness, including the Future Assured Initiative of the Wife of the President of Nigeria, Mrs. Aisha Buhari.

Programs to “**prevent**” pneumonia and diarrhea include vaccination; prevention of vertical transmission of HIV; and improving water, sanitation, and

environmental conditions. Nigeria has made good progress on immunization with three new vaccines (pentavalent, pneumococcal conjugate vaccine, and IPV) in four years, being delisted from WHO’s polio-endemic countries, and making modest increases in immunization coverage. However, the rising vaccine program costs and looming transition out of Gavi support are real challenges.

The “**treat**” strategy also has gaps. There is limited access to diagnostic technologies, (X-ray machines and pulse-oximeters) and to oxygen for treatment. Even low-tech strategies such as integrated community case management and referrals have not been optimized. As a result, only 35% of children with symptoms of acute respiratory infections receive antibiotics for their illness. Nigeria has begun local production of dispersible amoxicillin tablets and the distribution of ORS and zinc supplementation, while enhancing integrated community case management to improve treatment access. Ending preventable child deaths by 2030 will require financing, advocacy, and strong systems to scale up GAPPD interventions.

Nigeria’s success with polio eradication is a demonstration of her strong commitment to the health of her children. The same commitment should inspire the scale up of GAPPD interventions, to battle and defeat two of the biggest killers of Nigerian children.



Key Findings: **Protection**

One important but inexpensive strategy for protecting children from pneumonia and diarrhea is breastfeeding, particularly exclusive breastfeeding for a child's first six months of life. Exclusive breastfeeding not only enhances children's immune systems to protect them from infectious diseases, such as pneumonia and diarrhea, and lowers their risk of subsequent chronic diseases, but it also improves their nutritional status, which plays a critical role in child health and survival.¹ In fact, almost 50% of all deaths in children under the age of five years can be linked to undernutrition, as children who are undernourished face a higher risk of disease, increased duration of illness, and greater chance of death from disease.¹ Despite the indisputable evidence on the benefits of breastfeeding, only 40% of children worldwide are exclusively breastfed during their first six months.¹

Rates of exclusive breastfeeding during a child’s first six months of life continue to remain low. Currently, 12 of the 15 countries with the most child pneumonia and diarrhea deaths have exclusive breastfeeding rates that still fall short of the 50% GAPPD target for this protective intervention.

GAPPD set forth a 50% coverage target for exclusive breastfeeding for the first six months of an infant’s life.³ Yet, in many countries with a large burden of disease from childhood pneumonia and diarrhea, coverage levels for exclusive breastfeeding for the first six months still fall short of the GAPPD target.

are unknown for two countries (Angola and Afghanistan) because they have not reported such data within the past 10 years.

Currently, estimating changes in rates of exclusive breastfeeding from year to year is difficult because countries are not collecting and updating these figures on an annual basis. This lack of real-time monitoring and reporting prevents an essential feedback

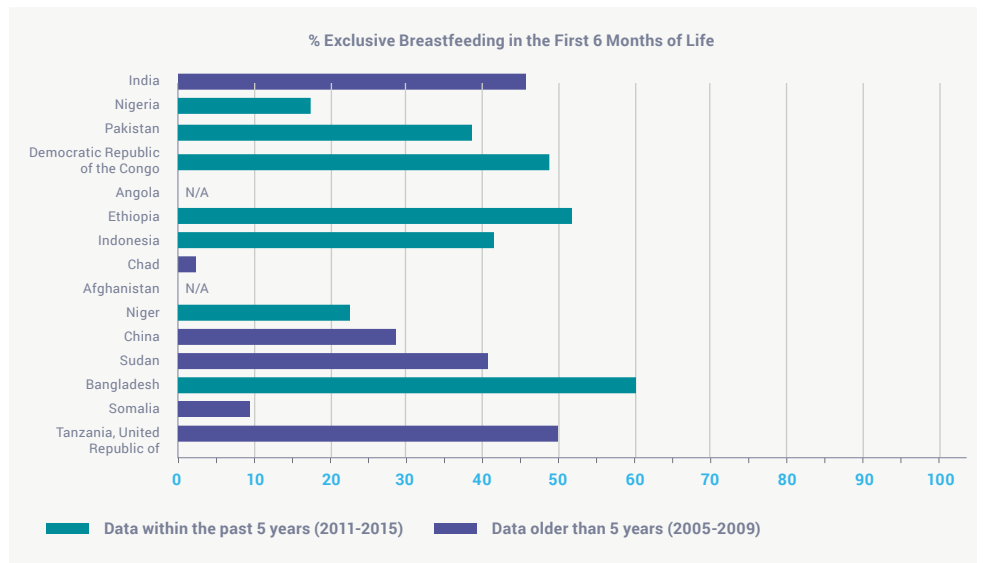
mechanism that enables policy and programmatic changes that would address issues as they arise and are identified. In some countries, data on exclusive breastfeeding are absent altogether, which makes it impossible to identify problem areas and allocate resources accordingly to mitigate those issues.

Exclusive Breastfeeding

To fully evaluate the extent of progress on exclusive breastfeeding, improved reporting efforts are needed.

Based on the latest country-level data for exclusive breastfeeding during the first six months (Fig. 6), which varied by country (from 2005 to 2014), rates among the 15 highest burden countries in terms of child pneumonia and diarrhea deaths were as low as 3% (in Chad) and as high as 60% (in Bangladesh). Three countries (Ethiopia, Bangladesh, and Tanzania) have coverage rates at or above the 50% GAPPD target and four countries (India, DRC, Indonesia, and Sudan) are relatively close to reaching the target, whereas Nigeria, Pakistan, Chad, Niger, China, and Somalia still have quite a way to go to reach the 50% coverage mark. Recent rates of exclusive breastfeeding

Figure 6: Levels of exclusive breastfeeding of infants in their first 6 months of life in the 15 countries with the greatest burden of child pneumonia and diarrhea deaths, 2005-2014 (for the most recent year of available data).



Source: UNICEF. Infant and Young Child Feeding (IYCF) [Data file]. Last updated March 2015. Retrieved from <http://data.unicef.org/nutrition/iycf.html>



Key Findings: **Treatment**

As important as protection and prevention are for tackling pneumonia and diarrhea mortality in children, access to appropriate treatment for children who do become sick is crucial in reducing mortality. Of the ten GAPPD interventions evaluated in this report, pneumonia and diarrhea treatment tend to have the lowest coverage rates; some countries are not reporting any data at all, creating blind spots on progress and program performance. Angola and China do not have national data publicly available for any of the four pneumonia and diarrhea treatments included in the GAPPD scores. Sudan is missing data on zinc coverage for children with diarrhea, and Tanzania has not produced updated figures for antibiotic use in children with suspected pneumonia in the past ten years.

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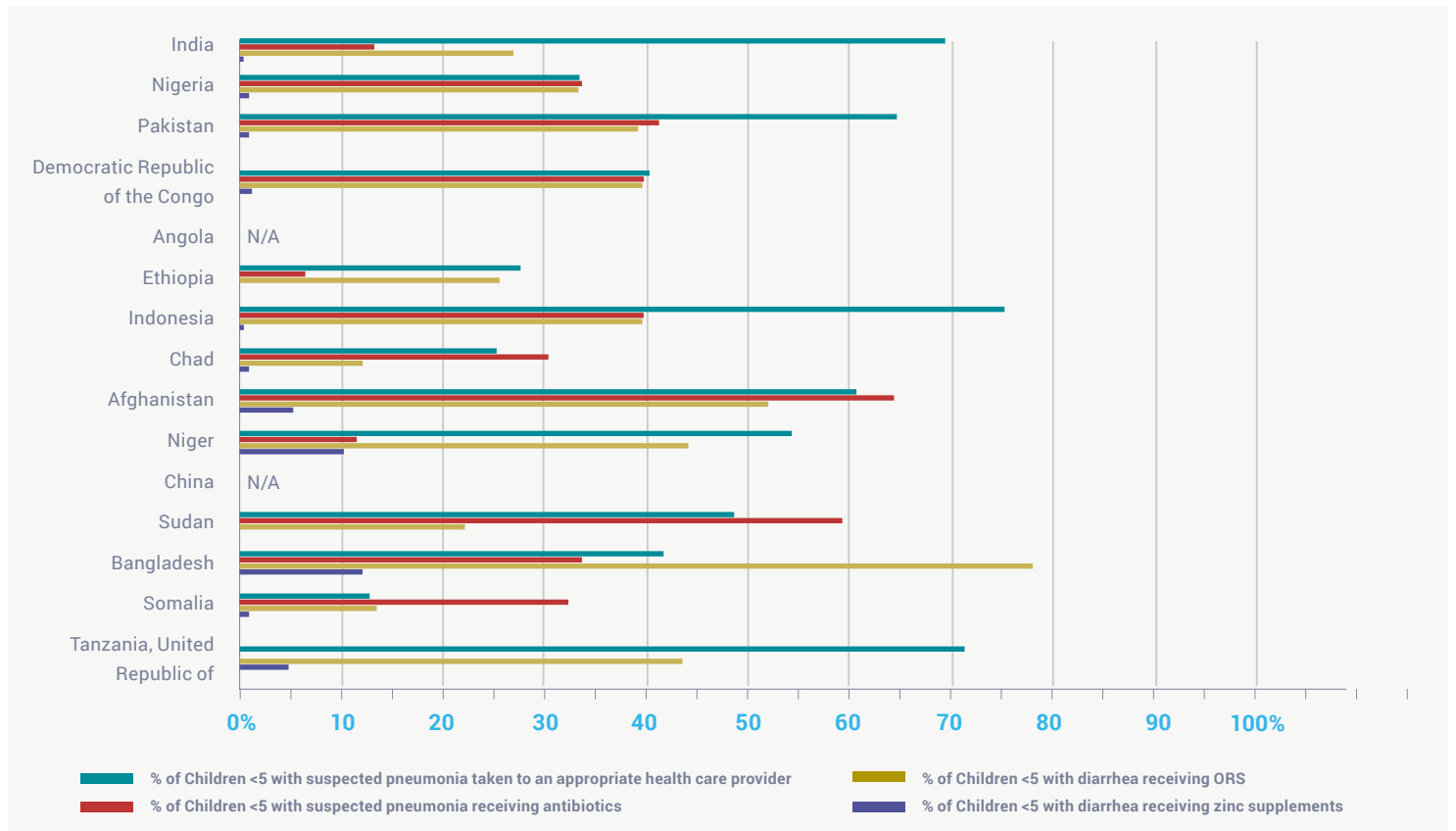
updated figures for antibiotic use in children with suspected pneumonia in the past ten years.

Pneumonia Treatment: Care by Appropriate Health Care Provider and Antibiotics

Proper care for children with suspected pneumonia includes two indicators – treatment by an appropriate health care provider and antibiotic treatment. Based on the most recently available data (between 2005 and 2014), rates of treatment by an appropriate health care

provider for children with suspected pneumonia did not exceed 75% for any of the 15 highest burden countries and were as low as 13% (in Somalia’s case). Antibiotic treatment rates were even lower, ranging from 7% (in Ethiopia) to 64% (in Afghanistan). **For both of the pneumonia treatment indicators, the 90% GAPPD coverage target was missed in all 15 countries** (Fig. 7). In India, Pakistan, Chad, Ethiopia, Indonesia, Niger, and Bangladesh, rates of treatment by a healthcare provider were notably higher than were rates of antibiotic treatment for children who were suspected of having pneumonia. For other countries, including Chad, Afghanistan, and Sudan, and Somalia,

Figure 7: Proportion of children under 5 with suspected pneumonia and diarrhea who receive appropriate treatment, 2005-2014



rates of antibiotic use instead were slightly higher than care-seeking with an appropriate healthcare provider.

Even though effective treatments against pneumonia are available, diagnosis of pneumonia is not specific for the condition, and identification of its specific cause (bacterial vs. viral) is nearly impossible, especially in low-resource settings. In the absence of adequate health infrastructures or technologies that enable proper assessments of the child's condition, health workers in developing countries must rely on clinical assessments to diagnose likely pneumonia, which may miss some cases and over diagnose in others. Insufficient training of health workers on pneumonia diagnosis and treatment can further exacerbate misdiagnoses, presenting another barrier to timely pneumonia treatment.

Apart from the health care provider, it is also vital that caregivers of children sick with pneumonia recognize the signs and symptoms of a possible pneumonia infection and are informed about the proper course of action (e.g., seek care by an appropriate health care provider). In addition to educational barriers, there are other factors that could play a role in care-seeking behavior when a child is suspected to have pneumonia. In DRC, Ethiopia, and Nigeria, children under 2 years of age were more likely than children 2-5 years of age to receive care from a health care provider. This may reflect a higher responsiveness of parents when children get sick at a younger age. In Tanzania, Nigeria, and Ethiopia, children from the wealthiest families were 6 to 9.5 times more likely to be brought to a health care provider than their counterparts in the poorest families,¹⁶ which indicates large disparities in treatment access across wealth groups within a country. These disparities may be linked to different levels of education among parents of

different socioeconomic positions and/or differential access to resources (physical and financial) that enable their sick children to receive needed care.

Diarrhea Treatment: Oral Rehydration Salts (ORS) and Zinc

For children with diarrhea, the standard treatment includes the use of ORS and zinc supplements. In this report, coverage rates for diarrhea treatment are measured by the percentage of under-five children with diarrhea who are given ORS and the percentage of under-five children with diarrhea who are given zinc supplements. The year of most recently available data reported for these two indicators range from 2005 to 2014.

Coverage data for ORS treatment were available for 13 of the 15 countries; Angola and China have no reported data on ORS use in children with diarrhea. **Of the reporting countries, all failed to reach the 90% GAPPD coverage target for diarrhea treatment**, as was the case with pneumonia treatments. Besides Bangladesh, who had a 77% ORS coverage rate, all the other countries are far from reaching the 90% target. As for zinc coverage, which was reported in 12 of the 15 countries, it is apparent that very few children with diarrhea are actually treated with zinc as they should be. Coverage rates for zinc among children with diarrhea were no greater than 12% for any of countries evaluated in this report, with majority of countries having single-digit coverage figures.

In a 2013 study, comparisons between countries that achieved "sustained success" in ORS coverage (defined as above 50% coverage sustained for at least five years and current coverage levels greater than 66%) and countries that did not, revealed three

ORS and zinc treatment rates for children with diarrhea in the highest child pneumonia and diarrhea burden countries are still far from meeting the 90% GAPPD target. Improvements in pneumonia and diarrhea treatment coverage, particularly zinc supplements, present a huge opportunity to further move the needle in achieving national and global goals on the reduction of childhood pneumonia and diarrhea.

distinguishing factors that contributed to countries' successful scale up and maintenance of ORS coverage. These included broad based support and engagement with stakeholders across various sectors (including government, non-government, and private entities); coordinated efforts to stimulate demand consistently across public and private sectors; and other conditions that enable ORS scale up, such as dedicated funding and political stability.¹⁷ Bangladesh was considered a country with sustained success at the time of this study and has continued to sustain its coverage levels into 2014 due to its strong stakeholder buy-in within country.¹⁷ Bangladesh was also strategic in its engagement of family members to promote ORS education and use.¹⁷ In this way, it was able to sustain the outcomes of marketing campaigns without the need for repeated campaigns.

While Bangladesh's scale up of ORS treatment offers valuable lessons that other countries can draw from, specific barriers to ORS treatment may vary by country. It is incumbent on countries to take ownership in identifying the major barriers to (or determinants of) high ORS coverage in their country. Notwithstanding Bangladesh's success with ORS, it still struggles with achieving high zinc coverage, a clearly universal challenge for countries with a high burden of pneumonia and diarrhea child mortality.

Sustainable Progress in the Post-2015 Era

The image shows a medical professional in a white coat and gloves holding a small vial. In the background, a patient is lying down. The scene is overlaid with a blue and orange gradient. The text 'Sustainable Progress in the Post-2015 Era' is written in yellow on the left side of the image. In the bottom left corner, there is a box labeled 'SYRINGE 0.8 x 25mm'. In the bottom right corner, there is a pair of glasses on a table.

Sustainable Progress in the Post-2015 Era

In order to meet the SDG 3.2 target of ending preventable deaths of neonates and under-five children by the year 2030, achieving high coverage of GAPPD interventions in places where the most children are dying of preventable causes is undoubtedly a necessary condition.

As the Millennium Development Goals draw to an end in 2015 and the global community shifts to the new Sustainable Development Goals officially adopted by the United Nations,¹⁸ the work that remains to be done between now and 2030 is both clear and colossal. To meet the SDG target 3.2 of ending preventable deaths of neonates and under-five children by the year 2030, achieving high coverage of GAPPD interventions in places where the most children are dying of preventable causes is undoubtedly a necessary condition. Moreover, SDG target 3.2 also prompts all countries to

bring down under-five child mortality rates to 25 deaths per 1,000 live births or less, a target that is a far reach for many countries.

As it currently stands, the rate of under-five deaths from pneumonia and diarrhea alone far exceeds 25 deaths per 1,000 live births in 7 of the 15 highest burden countries (Nigeria, Angola, Chad, Afghanistan, Niger, and Somalia). (See Table 2.)

Table 2: Pneumonia and diarrhea deaths in children under 5 years of age in the 15 highest burden* countries

Country	Pneumonia & diarrhea deaths in children under 5 years (2015)	Pneumonia & diarrhea deaths per 1,000 live births (2015)
India	297,114	12
Nigeria	210,557	30
Pakistan	103,760	19
Democratic Republic of the Congo	78,422	25
Angola	54,548	50
Ethiopia	46,888	15
Indonesia	33,737	6
Chad	30,641	51
Afghanistan	30,419	30
Niger	28,164	30
China	27,114	2
Sudan	24,903	19
Bangladesh	24,571	8
Somalia	23,426	53
Tanzania, United Republic of	22,394	11

* Source: Liu, L., Oza, S., Hogan, D., Chu, Y., Perin, J., Zhu, J., Lawn, J., Cousens, S., Mathers, C., Black, R. E. (2015). National, regional and global causes of child mortality in 2000-2015 – reflecting on the MDG 4 and embarking on the SDG 3.2. Under preparation.

*Based on 2015 estimates of pneumonia and diarrhea child deaths

Thus, moving the needle on child mortality requires improved prevention, control, and treatment of pneumonia and diarrhea globally, especially in large and high-burden countries.

Considering that several of the countries with the highest burden of pneumonia and diarrhea mortality in children under five years of age are also among the most populated countries in the world (rank order of countries by total under-five population: China-1, India-2, Indonesia-4, Pakistan-6, Nigeria-7, Bangladesh-8, Ethiopia-13, DRC-19, and Tanzania-26), targeted efforts to produce even modest improvements in select high-burden countries can translate to significant global impact.⁵ At the same time, progress in these countries may face disruption as they begin to “graduate” from Gavi support and transition to fully self-financing vaccines. **Over the next 5 years, 5 of the 15 highest burden countries (India, Nigeria, Pakistan, Angola, and Indonesia) are projected to enter or complete their Gavi graduation process**, during which they will assume increasing responsibility for the financing of vaccines that were previously supported by Gavi and procured through UNICEF tenders.¹⁹ Without strong immunization systems and financing mechanisms in place to sustain new vaccine programs and their financing, graduating countries may be at risk of losing ground in areas of previous positive gains.

To assess this risk, we examined various vaccine financing and immunization system indicators across the 15 countries evaluated in this report.

These indicators included:

- Whether the country had line items in their national budget for vaccines

- Percentage of immunization expenditure financed using government funds

- Stock-out of DTP, measles, Hib, PCV, and rotavirus vaccines at the national level

- Number of individual effective vaccine management (EVM) scores meeting the global standard

- NITAG establishment

- Number of basic WHO criteria met by NITAGs (of the 6 total)

Vaccine Financing

Of the five graduating and soon-to-be graduating countries among the 15 focus countries, Nigeria, Pakistan, and Indonesia will have large funding gaps to fill as Gavi support begins to taper off over the next several years.

Based on the latest available data (between 2013 and 2014), all 15 countries with the greatest burden of child pneumonia and diarrhea deaths, except for Somalia, had line items in their national budget for vaccines.²⁰ However, in approximately half of them, the governments are financing less than 30% of the total immunization expenditures (Fig. 8). Countries that are

financing most of their immunization costs include India (80%), Angola (88%), and China (100%). The governments of Indonesia, Chad, Niger, and Bangladesh also take on a fair amount (>50%) of the responsibility for their immunization program expenses. Countries with extremely low percent contributions currently are DRC (5%), Afghanistan (4%), Sudan (12%), Somalia (0%), and Tanzania (21%). Of the five graduating and soon-to-be graduating countries among the 15 focus countries, Nigeria, Pakistan, and Indonesia will have large funding gaps to fill as Gavi support begins to taper off over the next several years.

Impact of Changing Levels of Gavi Support

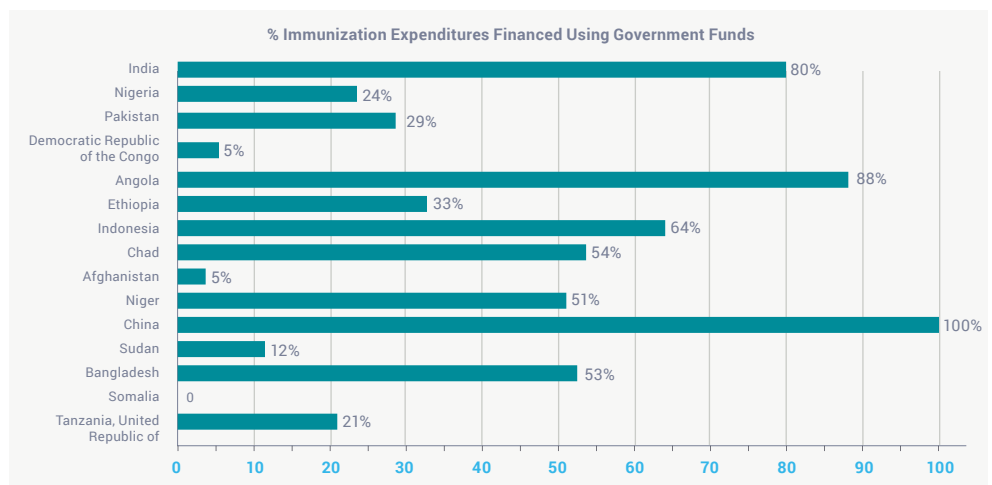
Countries transitioning out of Gavi support that are ill-prepared to take on the increased responsibility of vaccine financing are at risk of defaulting on their co-payments to Gavi and may face disruptions in their immunization.

According to Gavi’s new eligibility and transition policy that took effect in July 2015, Gavi eligibility status will now be based on a three-year average of a country’s gross national income (GNI) per capita. One of the key reasons for this policy update was to avoid sudden and unexpected eligibility changes, which leave countries insufficient time to prepare to take on full financing of vaccines introduced through Gavi, and therefore threaten the sustainability of such programs.²¹ As countries’ GNI improve over time and they begin to transition out of Gavi support, their required co-financing contributions to Gavi-supported vaccines will increase each year until they are fully self-financing. For the first five years after the end of Gavi financing, graduated countries can still procure vaccines at Gavi/UNICEF prices, but after this phase of their transition, they will be expected to self-finance vaccines at non-UNICEF prices.²¹ With the increasing bill for immunizations that graduating countries will soon face, countries must be well prepared for that financial responsibility post-graduation in order to maintain their current immunization programs, sustain adequate coverage levels, and still have enough room to pursue other vaccines that they were not able to introduce through Gavi. This will require not only advance planning to ensure these costs are accounted for in the budget, but increased advocacy for both funds and implementation.

Between 2008 and 2013, a number of the high-burden countries already encountered challenges in meeting their co-financing obligations for Gavi-supported vaccines. Sudan has defaulted on its co-payment in the past, and Afghanistan, DRC, Niger, Pakistan, and Angola actually defaulted on multiple occasions since Gavi’s co-financing policy was first put into place in 2008. A recent survey among Gavi countries that have defaulted revealed some of the main reasons behind the defaults; among them were procedural issues (internally and externally with Gavi and UNICEF) that prevented timely payments, competing priorities in the national budget which depressed the priority of funding for immunization, and political instability in the country.²² Having a line item for vaccines in the budget, while important for planning purposes, is not

sufficient to actually secure the funds for immunization financing; more needs to be done to ensure continued prioritization of immunization among other health and budgetary priorities.²² The political will to sustain funding for vaccine programs could be influenced by public support for vaccines. Generating popular support for vaccines is a multi-faceted endeavor, but may rest with local stakeholders and their ability to use evidence from impact evaluations and other studies to effectively communicate about the ongoing success of vaccine programs. On the other hand, public confidence in vaccines could be undermined by failures to address concerns about vaccines, including fear of adverse events. As more of the program burden falls on countries, strong local leadership, innovations in financing, and a clear focus on sustainability planning will be required to tackle the fiscal challenges ahead.

Figure 8: Percent of routine immunization expenditures financed using government funds in the 15 highest burden* countries, 2011-2014.



* Based on 2015 estimates of pneumonia and diarrhea child deaths

Source: World Health Organization (WHO). (2015). WHO vaccine-preventable diseases: monitoring system. 2015 global summary. Last updated 8 Sep 2015. Retrieved from http://apps.who.int/immunization_monitoring/globalsummary/indicators

Immunization Systems, Supply Chains, and Decision Making Capacity



Many of the high-burden countries failed to meet global standards for effective vaccine management across a variety of evaluation areas. Improving vaccine delivery and supply chain management should therefore be a priority for immunization systems strengthening.

With the exception of DRC, which experienced measles vaccine stock-out for six consecutive years since 2009, DTP, measles, Hib, PCV, and rotavirus vaccine stock-outs at the national level were generally not an issue for these 15 countries.²⁰ Despite not experiencing national stock outs, the countries struggled with various aspects of vaccine management and delivery. EVM (Effective Vaccine Management) scores were designed to provide a global standard by which countries' supply chain performance at various levels can be evaluated, including (1) vaccine arrival; (2) storage temperature; (3) storage capacity; (4) buildings, equipment, and transport; (5) maintenance; (6) stock management; (7) distribution; (8) vaccine management; and (9) information systems and supportive functions.²³ For each of the nine EVM criteria, the target score is at least 80%. In this regard, Sudan and Indonesia scored positively on their supply chain performance, with eight and seven EVM criteria meeting target, respectively. (See Table 3.) **A stark contrast was seen in Chad, India, and Nigeria's scores, where they failed to meet even one EVM target.** Pakistan,

DRC, and Niger's supply chains also fared poorly on the EVM evaluations, with each country meeting targets for just one of the nine criteria. Of the nine EVM criteria, the area in which countries performed most poorly in was distribution. Bangladesh was the only country of the 15 to score at least 80% on the distribution criteria.

With new vaccine introductions, there is increasing pressure on vaccine supply chains to adequately accommodate the larger vaccine supply and to be able to identify and correct potential inefficiencies in the system. EVM scores are one way to measure compliance with specific standard operating procedures within a supply chain, but they do not fully reflect the vulnerabilities and strengths of the system. Meanwhile, other evaluation tools are being developed to assess more complex supply chain performance issues, such as the Highly Extensible Resource for Modeling Event-Driven Supply Chains (HERMES) tool.

In pushing for accelerated progress towards SDG 3.2, it is also essential for countries to establish independent and functional national immunization technical advisory groups (NITAGs) that can make evidence-based recommendations to support vaccine-related decision making in the country. Most of the current highest burden countries (India, Nigeria, Pakistan, Indonesia, Afghanistan, Niger, China, Sudan, and Bangladesh) have already established NITAGs, and among these nine countries, six of them (India, Pakistan, Indonesia, Afghanistan, Sudan, and Bangladesh) have NITAGs that met all six WHO criteria for a functional NITAG.²⁴ Nigeria's NITAG was only recently established in 2015 and efforts to support and strengthen the NITAG are still underway. Niger and China's NITAG met some, but not all of the WHO criteria.²⁴



Table 3: EVM scores across nine EVM criteria for the 15 highest pneumonia and diarrhea burden* countries, 2011-2015.

Country	Vaccine Arrival (%)	Storage Temperature (%)	Storage Capacity (%)	Buildings, Equipment, Transport (%)	Maintenance (%)	Stock Management (%)	Distribution (%)	Vaccine Management (%)	Information Systems, Supportive Functions (%)	# EVM Criteria Meeting Target ≥80%
India	43	54	63	69	57	51	45	46	56	0
Nigeria	63	41	10	67	40	45	70	70	61	0
Pakistan	86	65	71	71	51	48	38	72	49	1
Democratic Republic of the Congo	90	58	72	73	59	74	58	72	55	1
Angola	-	-	-	-	-	-	-	-	-	-
Ethiopia	97	87	67	82	91	41	63	-	-	4
Indonesia	89	88	94	95	100	72	58	89	87	7
Chad	66	44	56	52	70	47	3	23	47	0
Afghanistan	98	76	87	79	62	67	79	88	58	3
Niger	58	59	83	55	39	69	49	62	70	1
China	-	-	-	-	-	-	-	-	-	-
Sudan	98	88	96	86	88	88	59	100	88	8
Bangladesh	77	50	67	97	72	77	89	65	66	2
Somalia	73	40	84	98	100	85	71	-	88	5
Tanzania, United Republic of	83	50	61	92	85	82	34	77	96	5

* Based on 2015 estimates of pneumonia and diarrhea child deaths

Source: World Health Organization (WHO). (2015). Immunization Repository. Data as of Sep 2015. Retrieved from https://extranet.who.int/immunization_repository

Note: Various process and performance indicators are evaluated across the nine EVM criteria at each level and then combined into a criterion score, expressed as a percentage.

Capacity to Scale Up Interventions and Sustain Progress

Gavi graduating countries that have been slow to adopt new vaccines will soon lose the opportunity to introduce with Gavi's support. Those countries with local vaccine manufacturing capability have viable alternatives for introducing affordable vaccine products; they are well positioned to sustain their immunization programs over the long term, while also contributing to a more competitive global market.

As 14 of the 15 highest pneumonia and diarrhea burden countries are currently Gavi countries, five of which are graduating or projected to start graduation between now and 2020, one of the major concerns is long-term sustainability of gains made in those countries after Gavi support ends. Among the five graduating and will-be graduating countries, Nigeria is the country that has taken up the greatest number of new vaccine support (NVS) grants from Gavi (for seven vaccines), while Indonesia has only taken advantage of Gavi's support for one vaccine introduction thus far (Hib-containing pentavalent vaccine). See Fig. 9 for more details.

In countries with relatively low adoption rates of Gavi-supported vaccines, such as India, Indonesia, and China (it is important to note that China was not eligible for Gavi support after 2006 at the end of Gavi's phase I),¹¹ interestingly, there are a number of local vaccine manufacturers in those countries. Because of the potential for locally sourced vaccines, which are usually priced lower than vaccines produced by global/multinational companies, countries often prefer the indigenous product and wait for it to become

available before introducing at all. This can delay vaccine introductions unnecessarily and prevent children from accessing lifesaving vaccines during the development and trial periods of the indigenous vaccines.

Countries that do have local vaccine manufacturing capacity might be well positioned to continue procuring vaccines for their immunization programs in a sustainable manner, even without external donor support. As more developing country vaccine manufacturers emerge, the addition of vaccine suppliers to the market, whether national or global, will not only alleviate vaccine supply constraints, but also drive competitive pricing of vaccines globally. Of the 15 countries, India, Indonesia, and China all have local manufacturers for DTP and measles vaccine that are on the market. India and China also have indigenous Hib vaccines on the market. For PCV, India has a few products in the development pipeline and Indonesia has a whole cell pneumococcal vaccine in the pipeline. As for rotavirus vaccine, China and India each have a local product on the market, and India has two more in the pipeline. Indonesia has a rotavirus vaccine in the pipeline as well. Bangladesh and

Pakistan currently do not have local manufacturers of DTP, measles, Hib, PCV, or rotavirus vaccines, but they do have manufacturers producing other vaccine products.

As we have seen with pentavalent vaccine, which was priced at a weighted average price (WAP) of \$3.60 per dose and had only one supplier in 2007, significant reductions in price were achieved over the course of eight years with seven more vaccine manufacturers entering the pentavalent market, bringing down the vaccine's WAP to less than \$2 per dose for Gavi countries in 2014.²⁵ The increased competition among suppliers also translated to savings for middle-income countries procuring vaccines through UNICEF, as their pentavalent vaccine's 2014 WAP dropped to nearly \$2 per dose.²⁵ In 2014 alone, UNICEF achieved a combined savings of more than \$200 million from pneumococcal (\$9.4 million), rotavirus (\$160.4 million), and pentavalent (\$30.7 million) vaccines, due to increased suppliers (and thus more competitive pricing), the pneumococcal Advance Market Commitment (AMC), unique contracting agreements, and improved demand forecasting.²⁵

Figure 9: Uptake of new vaccine support (NVS) from Gavi among the 15 highest pneumonia and diarrhea burden countries

Country (Graduation Transition Period)	Gavi New Vaccine Support (NVS) Uptake Status								Total # of Vaccines	%*** of Gavi Vaccines Adopted by Countries
	HPV	IPV	JE	M/ MR	MenA	Penta	PCV	RV		
India* (2016-2020)		✓				✓			2	25%
Nigeria* (2015-2019)		✓			✓ (campaign)	✓	✓	✓	5	63%
Pakistan* (2020-2024)		✓		✓		✓	✓	✓	5	63%
Democratic Republic of the Congo		✓		✓		✓	✓		5	63%
Angola* (2011-2017)		✓				✓	✓	✓	4	50%
Ethiopia	✓	✓		✓	✓ (campaign)	✓	✓	✓	7	88%
Indonesia* (2011-2016)						✓			1	13%
Chad		✓				✓			2	25%
Afghanistan		✓		✓		✓	✓	✓	5	63%
Niger		✓		✓		✓	✓	✓	5	63%
China **						✓			1	13%
Sudan		✓			✓	✓			3	38%
Bangladesh	✓	✓		✓		✓	✓	✓	6	75%
Somalia		✓				✓			2	25%
Tanzania, United Republic of	✓	✓		✓		✓	✓	✓	6	75%

*Countries that are currently graduating or are projected to enter graduation within the next five years

**Introduced Hepatitis B vaccine with Gavi support (during Gavi phase I), not pentavalent vaccine

*** Of the eight vaccines presented in this table.

Note: Cholera and Japanese encephalitis (JE) vaccines are also supported by Gavi. However, they are excluded here because cholera is recommended for epidemic control, not routine use, so not all Gavi countries should introduce cholera vaccine. JE vaccine is also not expected to be used in all countries because the disease is only regionally relevant.

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While the MDGs ushered in an era of substantial political commitment to child health as well as considerable progress, the SDGs will require further accelerated progress and strategic planning over the long term so that countries are able to not only sustain but extend the gains they've made in reducing preventable child deaths as they transition into greater financial independence.

The increase in emerging country vaccine manufacturers is especially encouraging for large, high-burden countries that will soon require large volumes of vaccines to meet their needs as they begin rolling out more vaccines and taking on an increasing share of vaccine financing. Having a diverse supplier base and in-house manufacturing capability will lessen the risks when countries complete their transition from Gavi funding and eventually lose access to Gavi vaccine prices. That said, until an indigenous product is licensed and produced in the country, countries should use existing vaccines and consider switching to locally produced products when they become available. For every day that goes by and a child does not receive a recommended vaccine, another opportunity to save a child's life is lost.

To achieve this reality, countries need to not only improve data collection and quality (to enable ongoing and real-time assessments of programmatic gaps), but also to develop a framework through which available data can actively inform policy and program decisions. This will often require broader engagement of key decision makers beyond Ministers of Health and NITAGs, including Ministers of Finance and other influencers on national and subnational budget decisions. This engagement is essential for achievement of proper resource allocation in areas most in need of improvement, based on the gaps identified in pneumonia and diarrhea prevention and treatment. In the post-2015 era, sustainability and acceleration of progress in reducing the burden of child pneumonia and diarrhea will demand increased commitments and efforts at all levels, including continued investments of resources by global donors paired with increasing country ownership of prevention and treatment program funding, improved implementation and equitable scale ups of interventions throughout the country, and demand of access to these lifesaving measures as a basic human right from individuals and communities.



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