Pneumonia Progress Report 2012

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EXECUTIVE SUMMARY

Recent estimates from the United Nations Children's Fund (UNICEF) show that pneumonia continues to be the number one killer of children around the world - causing 18% of all child mortality, an estimated 1.3 million child deaths in 2011 alone.[1] Nearly all pneumonia deaths occur in developing countries, and three-quarters take place in just 15 countries. The majority of pneumonia cases are preventable or treatable.[2]

In 2009, the World Health Organization (WHO) and UNICEF released the Global Action Plan for Prevention and Control of Pneumonia (GAPP), setting out a 90% coverage target by 2015 for three interventions: vaccination, breastfeeding, access to care and antibiotic treatment.[2] If 90% coverage is reached, these interventions could prevent two thirds of all childhood pneumonia deaths. **This Pneumonia Progress Report monitors coverage of the three GAPP interventions in the 15 countries with the highest absolute number of child pneumonia deaths in 2010.**

The report reveals continued progress in some areas, along with setbacks and challenges. Nigeria, India, and the Democratic Republic of Congo continue to suffer from low vaccination coverage and high child mortality.[3] Bangladesh and Tanzania, formerly 12th and 14th, respectively, in childhood pneumonia deaths, are no longer in the top 15 worldwide, having been replaced by Mali and the aggregated Sudan and South Sudan. Tanzania and Bangladesh remain high mortality countries, at 16th and 17th worldwide.

Even in the face of significant progress, pneumonia remains the biggest threat to children's lives, and disproportionately affects the poorest children in the world.

Progress includes an overall reduction in world-wide child pneumonia deaths and introduction of pneumonia vaccines in almost all of the highest mortality countries. Alongside these gains, however, are continued issues with stock-outs and health systems capacity. The status of protection and treatment interventions—breastfeeding, access to health care providers, and antibiotic treatment—remains unclear, due to low availability of data. Expanded and improved data collection efforts are urgently needed to inform decision-making at the country and global levels.

Even in the face of significant progress, pneumonia remains the biggest threat to children's lives, and disproportionately affects the poorest children in the world. While the advances reported in this document are encouraging, it is also clear that more targeted and effective work is needed to scale up life-saving interventions and protect the world's most vulnerable children from the devastating toll of pneumonia.

[1] UNICEF. Committing to Child Survival: A Promise Renewed. Progress Report 2012. 2012.
[2] WHO/UNICEF. Global Action Plan for Prevention and Control of Pneumonia (GAPP). WHO (Geneva); 2009. Available at: http://www.unicef.org/media/files/GAPP3_web.pdf
[3] WHO/UNICEF. WHO/UNICEF estimates of national immunization coverage. July 14, 2012. Available at: http://www.who.int/immunization_monitoring/routine/immunization_coverage/en/index4.html

INTRODUCTION

The 2000-2010 decade brought a significant reduction in overall child mortality, from 9.6 to 7.6 million.[4] Pneumonia remains the number one killer of children, taking the lives of 1.3 million in 2011 alone.[1] More than 99% of all pneumonia deaths occur in developing countries,[5] and three-quarters take place in just 15 countries. The majority of pneumonia cases are preventable and treatable.[6]

The third annual International Vaccine Access Center's (IVAC) Pneumonia Progress Report provides an updated assessment of the degree to which the World Health Organization (WHO) and the United Nations Children's Fund's (UNICEF) Global Action Plan for Prevention & Control of Pneumonia (GAPP) interventions are in use in the countries with the highest pneumonia child mortality burden. GAPP focuses on simple, proven ways to **prevent** pneumonia infections, to **protect** children from conditions that increase the risk of pneumonia and **treat** the infections that occur. GAPP analyses have demonstrated that scaling up a set of proven, effective pneumonia interventions—such as vaccination, breastfeeding, and access to care and antibiotic treatment—can prevent two out of every three child pneumonia deaths.

The Report provides the most recent publicly available data on the key interventions highlighted in the GAPP report for the 15 countries with the highest number of pneumonia deaths in children, along with additional data on pneumonia vaccine introduction. Of the GAPP interventions, only vaccine coverage can be compared yearly.

KEY FINDINGS: GAPP PACKAGE COVERAGE

GAPP intervention scores were developed to compare broad trends between countries and direct program and policy efforts of pneumonia control efforts. Scores are determined by averaging *available* data on coverage rates for each of the seven components in the "package" of the three primary GAPP interventions in the 15 countries with the highest numbers of childhood pneumonia deaths. Those components are measles, pertussis, pneumococcal, and Haemophilus influenzae type b (Hib) vaccinations (reported separately);

## Interpreting GAPP Intervention Scores

Interpretation of GAPP intervention scores is complicated by the fact that yearly data are not available for every intervention and in each country. Vaccine coverage estimates are updated yearly, while breastfeeding and treatment coverage estimates are reported for the most recent year available within a five year period. The 2012 coverage score therefore includes breastfeeding and treatment coverage data collected between 2006 and 2010 and vaccine coverage data from 2011. These scores should be considered an estimate, most useful for comparing broad trends between countries and directing program and policy efforts in pneumonia-stricken regions.

exclusive breastfeeding; access to an appropriate health care provider for children with suspected pneumonia; and access to antibiotics for children with suspected pneumonia. Since each country's score is an average which only includes the interventions for which there are data available, the scores should be interpreted carefully; scores will be most reflective of actual conditions for countries with the greatest data availability.

Combined coverage scores for the three GAPP interventions range from a low of 39% in Ethiopia to a high of 79% in Sudan and South Sudan (analyzed together at the time of data collection) among the 15 highest pneumonia mortality countries profiled. None of these countries have reached the 90% GAPP target for each intervention. India and Nigeria, two large countries with the highest numbers of child deaths worldwide, remain low scorers with an average intervention coverage rate of 55% and 40%, respectively.

Bangladesh and Tanzania, formerly 12th and 14th in childhood pneumonia deaths, are no longer in the top 15 worldwide, and are replaced by Mali and the aggregated Sudan and South Sudan. Tanzania and Bangladesh remain high mortality countries, at 16th and 17th worldwide. With the available data and size of the decrease in pneumonia deaths in these two countries, it is currently not possible to attribute the decline to specific interventions.

GAPP Intervention Scores, 2012 Calculation
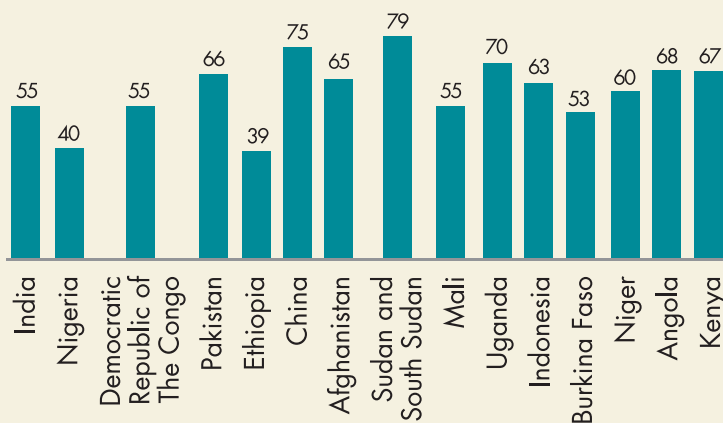
Countries are listed from left to right in order of highest child pneumonia mortality. Because of the cession in July 2011 of the Republic of South Sudan by the Republic of the Sudan, and its subsequent admission to the United Nations on 14 July 2011, disaggregated data for the Sudan and South Sudan as separate States are not yet available for most indicators. Aggregated data presented are for the Sudan pre-cession. Not all countries have data for all seven interventions. For details and sources, see Table 1.

[4] Liu L, et al. Global, regional, and national causes of child mortality: an updated systematic analysis for 2010 with time trends since 2000. Lancet 2012; 379:2151-61.
[5] UNICEF. Pneumonia and Diarrhea: Tackling the deadliest diseases for the world's poorest children. 2012.
[6] WHO/UNICEF. Global Action Plan for Prevention and Control of Pneumonia. 2009. Available at: http://www.unicef.org/media/files/GAPP3_web.pdf

TABLE 1: Current levels of coverage for interventions that prevent (vaccination), protect (exclusive breastfeeding) and treat (access to care and antibiotic treatment) pneumonia in the 15 countries with the most child pneumonia deaths.

Global Mortality Rank in Pneumonia Deaths in Children under 5[1]	Country	Annual Child Pneumonia Deaths (000s) 2010[1]	Vaccine Coverage				% of Children with suspected pneumonia		% Exclusive breast-feeding in first 6 months[4]	GAPP Intervention Score
			Pertussis (DTP3) 2011[2]	Measles 2011[2]	Hib 2011[2] or (Year Introduced)[3]	PCV Introduction Status[3] or 2011 (Year Introduced)[3]	Taken to an appropriate health-care provider[4]	Receiving antibiotics[4]		
1	India	396.7	72	74	Coverage in some states (2012)[5]	Non-GAVI introduction planned	69	13	46	55
2	Nigeria	143.6	47	71	Coverage in some states (2012)[6]	GAVI introduction planned (2013)	45	23	13	40
3	Democratic Republic of the Congo	87.0	70	71	70 (2009)	9 (2011)	40	42	37	55
4	Pakistan	79.8	80	80	80	Introduced (2012)	69	50	37	66
5	Ethiopia	57.8	51	57	51	Introduced (2012)	19	5	49	39
6	China	54.7	99	99	Private market coverage	No decision	-	-	28	75
7	Afghanistan	48.4	66	62	66	Conditional approval by GAVI for assistance	-	-		65
8	Sudan and South Sudan[+]	27.0	93	87	93 South Sudan planning to apply	Sudan: Approved by GAVI for assistance South Sudan: No decision	90	-	34	79
9	Mali[+]	24.5	72	56	72	56 (2011)	38	-	38	55
10	Uganda	24.0	82	75	82	Approved	73	47	60	70
11	Indonesia	21.9	63	89	Approved by GAVI for assistance	Non-GAVI introduction planned	66	-	32	63
12	Burkina Faso	21.8	91	63	91	Plan to apply	39	15	16	53
13	Niger	21.7	75	76	75	Approved by GAVI for assistance	47	-	27	60
14	Angola	20.9	86	88	86	Approved by GAVI for assistance	-	-	11	68
15	Kenya	20.5	88	87	88	85 (2011)	56	50	32	67

[1] Liu L, et al. Global, regional, and national causes of child mortality: an updated systematic analysis for 2010 with time trends since 2000. Lancet 2012; 379:2151-61.
[2] WHO/UNICEF. WHO/UNICEF estimates of national immunization coverage. July 14, 2012. Available at: http://www.who.int/immunization_monitoring/routine/immunization_coverage/en/index4.html.
[3] JHSPH IVAC. Vaccine Information Management System (VIMS). Available at: http://www.jhsph.edu/research/centers-and-institutes/ivac/vims/.
[4] UNICEF. State of the World's Children 2012: Children in An Urban World. 2012. Available at: http://www.unicef.org/sowc/files/SOWC_2012-Main_Report_EN_21Dec2011.pdf.
[5] Kerela and Tamil Nadu introduced in 2011; Jammu and Kashmir, Pondicherry, Goa, Karnataka, Gujarat and Haryana will introduce by the end of 2012
[6] Adamawa, Akwa Ibom, Anambra, Bauchi, Edo, Ekiti, Enugu, Jigawa, Kaduna, Kwara, Lagos, Plateau, Rivers and the Federal Capital Territory will introduce by the end of 2012
* Because of the cession in July 2011 of the Republic of South Sudan by the Republic of the Sudan, and its subsequent admission to the United Nations on 14 July 2011, disaggregated data for the Sudan and South Sudan as separate States are not yet available for indicators. Aggregated data presented are for the Sudan pre-cession.
[+] Not profiled in the 2011 Progress Report; not formerly in the 15 countries with the highest number of child deaths from pneumonia.

Through Vaccination, Progress Protecting India's Children from Pneumonia

India has recognized that while it made great strides in reducing child mortality over the past 20 years, cutting the under-five mortality rate nearly in half, it must accelerate progress to meet Millennium Development Goal 4: reduce under-five mortality by two-thirds between 1990 and 2015. Preventing pneumonia is essential to that goal; pneumonia is the leading cause of child mortality in India, responsible for the deaths of nearly 400,000 Indian children under five in 2010.[4] Similarly, pneumonia causes a great burden of morbidity in India, which results in economic and social pressures on families and the country as a whole. Therefore, pneumonia prevention is not only about saving child lives, but also preventing illness, hospitalization and related economic costs.

One notable area of progress is on coverage of two vaccines that can help prevent pneumonia, Hib vaccine and measles vaccine. While Hib vaccine uptake has been slow in India's public sector, momentum is now shifting following efforts by the Ministry of Health & Family Welfare (MOHFW), states, health experts and advocates to prioritize implementation of the National Technical Advisory Group on Immunization's (NTAGI) recommendation to add Hib to the Universal Immunization Programme (UIP). Two states, Tamil Nadu and Kerala, introduced Hib vaccines (in the form of the pentavalent vaccine) in December 2011, and six more are slated to do so by the end of 2012. At a recent Hib Symposium in the state of Odisha, MOHFW officials stated that at least twice as many additional states have expressed interest in the vaccine.

In another positive signal, India has joined other WHO Member States in introducing a second dose of measles vaccine into the UIP to ensure its children are protected from the virus, which contributes to the burden of pneumonia. Measles was once one of the leading causes of death in children, but global measles deaths have declined dramatically because of widespread coverage with two doses of measles vaccine. India began a phased introduction of the second dose in 2010; by the end of the first year, the second dose of measles vaccine had been added to routine immunization in 21 states and catch-up campaigns were completed in 197 districts in 14 states. Additional introductions and catch-up campaigns are ongoing, and the country expects to introduce the second dose in the entire country by 2014.

India still has much to do to strengthen its comprehensive approach to fighting pneumonia, including introduction of a pneumococcal conjugate vaccine as previously recommended by NTAGI in at least one state. Nonetheless, as illustrated in this report, these two developments are positive signals for Indian children.

KEY FINDINGS: PREVENTION THROUGH VACCINATION

Immunization is a safe, effective, and cost-effective tool for preventing pneumonia. There are vaccines against four diseases that cause pneumonia – measles, pertussis, *Haemophilus influenzae* type b (Hib), and pneumococcus. WHO recommends that all routine childhood immunization programs include vaccines that protect against these diseases.[7] This report reveals that in 2011 there have been both positive and negative changes in coverage of these four vaccines in countries with the highest pneumonia mortality.

While pertussis and measles vaccines have existed for decades, uptake and coverage in developing countries has been lower than in high-income countries, and below the 90% target recommended by GAPP in most countries profiled here. These vaccines are comparatively low-cost; coverage impediments in some situations are likely to be related to the health systems capacity to deliver and create demand for the vaccines, rather than cost alone.[8] In recent years, countries, the GAVI Alliance, and others have made significant efforts and investments to improve health systems in low- and middle-income countries, and there have been notable improvements in coverage over the past decade.

In 2011, gains in pertussis and measles coverage in some countries have stalled or even reversed; according to WHO best estimates, three-dose diphtheria-tetanus-pertussis vaccine (DTP3) coverage fell in Nigeria from 69% in 2010 to 47% in 2011.[3] Currently, only 7 of the 15 countries profiled have DTP3 coverage levels at or above 80%. Countries such as Afghanistan, Kenya, Angola, and Pakistan saw stalled progress or small decreases between 2010 and 2011. India, the country with the most child deaths in the world, had no change in coverage between 2010 and 2011, remaining at 72% and 74% for DTP3 and measles-containing vaccine (MCV), respectively.

There have been success stories in 2011 as well, with the Democratic Republic of Congo, Uganda, and Niger recording slight coverage increases. China's coverage remains high.

In addition to DTP3 and MCV, two other vaccines also provide protection against two of the main causes of life-threatening pneumonia: pneumococcal conjugate vaccine (PCV) protects against pneumococcus (*Streptococcus pneumoniae*) and Hib vaccine protects against *Haemophilus influenzae* type b. Both organisms can also cause life-threatening meningitis and sepsis. Coverage for these two vaccines has increased significantly over the past decade, as low-income countries have been able to introduce the vaccines with assistance from the GAVI Alliance, but gaps remain.

Hib vaccine first became available 20 years ago and was slow to reach developing countries, but has now been introduced in nearly all GAVI-eligible countries. However, in the 15 countries profiled here, coverage is far from universal. Nigeria and India, the two countries with the highest number of child deaths, have Hib coverage in only some states. Nigeria introduced pentavalent vaccine in June 2012 and plans to expand coverage across the country over a three-year period. India introduced pen-

[7] WHO. Recommendations for routine immunization. Available at: http://www.who.int/immunization/policy/immunization_tables/en/
[8] Stokes-Prindle C, et al. Landscape analysis of routine immunization in Nigeria: identifying barriers and prioritizing interventions. Johns Hopkins University, International Vaccine Access Center; 2012. Available at: http://www.jhsph.edu/research/centers-and-institutes/ivac/projects/nigeria/IVAC-Landscape-Analysis-Routine-Immunization-Nigeria-WhitePaper.pdf

tavalent in two states in 2011 with more rollouts expected before the end of 2012 (see sidebar on page 4). In China, coverage is achieved through the private market, which raises concerns about coverage equity for low-income Chinese families.

PCV, the newest of the four vaccines, was first introduced in the US in 2000 and developing countries in 2009, with an even newer generation PCV reaching developing countries just one year following introduction in developed countries – an unprecedented achievement. Just over a decade after initial introductions in high-income countries, 13 of the 15 profiled countries have introduced or have plans to introduce one of the latest generation pneumococcal conjugate vaccine (PCV10 or PCV13). However, the decision to introduce at the country level is only the first step; storage, transport, education efforts, and health care worker training must all be strong enough to successfully manage the increased human resource and infrastructural burdens of new vaccine introduction. Building the required level of system capacity can be a significant hurdle for country immunization systems. Without sufficiently robust health systems, including ongoing monitoring and support, it becomes more difficult to reach children and families with geographic or socioeconomic barriers to service access.[9]

It is important to note that some difference in vaccine coverage may be the result of different methodologies used to estimate coverage. In this report, we have used the most recent available WHO coverage estimates for a given country. These estimates are sometimes revised at later dates, and may therefore differ from estimates in previous or future publications. A portion of the changes in vaccine coverage figures may also be an artifact of imperfect data collection,[10] or attributable to the temporary global shortage of DTP3 vaccine. However, overloaded health systems and insufficient transportation, storage, and medical staff are perhaps the most important contributors to low scores, as they persist even when overall supply is adequate at the country level. In Nigeria, for instance, respondents to a qualitative survey repeatedly cited storage and transport as key barriers, even in situations where there is adequate supply at the national level. These capacity issues may have hindered timely introduction of the Hib-containing pentavalent vaccine.[11]

KEY FINDINGS: PROTECTION AND TREATMENT

While this report focuses primarily on progress in vaccination coverage for pneumonia prevention because these data are more available, protection (via breastfeeding in early childhood) and treatment (with appropriate health care and antibiotics) are equally important tools in the fight against childhood pneumonia. Included estimates are based on the most recent data available during the five-year window of 2006-2010. Therefore, it is not possible to make inferences about changes in coverage within the past year. However, in the absence of indicators to the contrary, it is likely that the 2006-2010 rates provide a rough estimate of current coverage for these interventions.

PROTECTION: EXCLUSIVE BREASTFEEDING

Feeding infants only breast milk in the first six months of life is a key protective intervention highlighted in the GAPP report. Exclusive breast-feeding has multiple positive effects; along with the nutritional benefits, breastfeeding allows the mother to pass on key components of her immune system to her child, bolstering an infant's immunity, and helping to protect babies from pneumonia, diarrhea, and other infections.

Of the countries for which data is available, exclusive breastfeeding is characterized by sub-optimal coverage levels ranging from only 10% to 60% – all of which fall short of the 90% GAPP target.[12] Niger is one of the few countries reporting new data; new estimates put Niger's breastfeeding coverage at 27%, a low number that nonetheless reflects improvement from the previous estimate of 10%. There is a need to investigate *why*

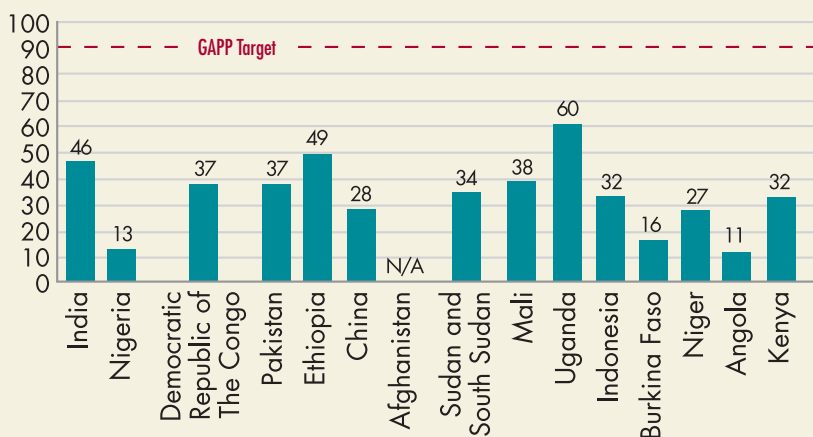## % Exclusive Breastfeeding in First Six Months of Life (2006-2010)

FIGURE 3: Levels of exclusive breastfeeding for infants in the first 6 months of life in the 15 countries with the highest child pneumonia mortality, 2006-2010 (based on most recent data year available). Source: UNICEF's State of the World's Children 2012. Because of the cession in July 2011 of the Republic of South Sudan by the Republic of the Sudan, and its subsequent admission to the United Nations on 14 July 2011, disaggregated data for the Sudan and South Sudan as separate States are not yet available for most indicators. Aggregated data presented are for the Sudan pre-cession.

[9] Hildenwalla H, et al. Local illness concepts—Implications for management of childhood pneumonia in eastern Uganda. Acta Tropica; 2007: 01(3). http://dx.doi.org/10.1016/j.actatropica.2007.02.003; Rutebemberwa E, et al. Determinants of delay in care-seeking for febrile children in eastern Uganda. Tropical Medicine & International Health; 2009: 14(4). 10.1111/j.1365-3156.2009.02237.x.
[10] Bosch-Capblanch X, et al. Accuracy and quality of immunization information systems in forty-one low income countries. Tropical Medicine & International Health; 2009 14(2). doi: 10.1111/j.1365-3156.2008.02181.x.
[11] Stokes-Prindle C, et al. Landscape analysis of routine immunization in Nigeria: identifying barriers and prioritizing interventions. Johns Hopkins University, International Vaccine Access Center; 2012. Available at: http://www.jhsph.edu/research/centers-and-institutes/ivac/projects/nigeria/IVAC-Landscape-Analysis-Routine-Immunization-Nigeria-WhitePaper.pdf.

some mothers are not breastfeeding, and reasons and barriers may vary across populations. Where there are structural impediments, there may be potential to address those issues through targeted programs and policies. Where the barriers are knowledge-based, low-resource populations are likely to bear a disproportionate burden, and appropriate education and outreach will be crucial to address breastfeeding disparities. It is interesting to note that the coverage for this intervention in wealthy nations such as the United States remains very low despite intensive educational campaigns.[13]

TREATMENT: ACCESS TO CARE & ANTIBIOTICS

While prevention and protection will greatly reduce the overall number of pneumonia cases, these interventions will not completely eliminate pneumonia. Children will therefore always need access to safe effective pneumonia treatments. In poor and isolated communities, perceived distance to a health facility, lack of transportation, lack of information about when to seek care, and costs of treatment can all act as barriers preventing access to care and treatment.[14]

Access to an appropriate care provider includes access to health facilities as well as community health workers; the definition of appropriate health care provision can vary between countries.[15] With the exception of the aggregated data for Sudan and South Sudan, current coverage levels of access to an appropriate care provider in the profiled countries range from 19% to 73% – far lower than the GAPP target level of 90%. Sudan and South Sudan report 90% coverage levels for access to care.

Access to antibiotics among children with suspected pneumonia is even lower than access to a care provider, with a low of 5% and a high of 50% coverage in the eight profiled countries with available data. As with access

to care, these numbers are well below the 90% GAPP target level. Expansion of community-based management programs may improve access to care and treatments for seriously ill children.[16]

TREATMENT
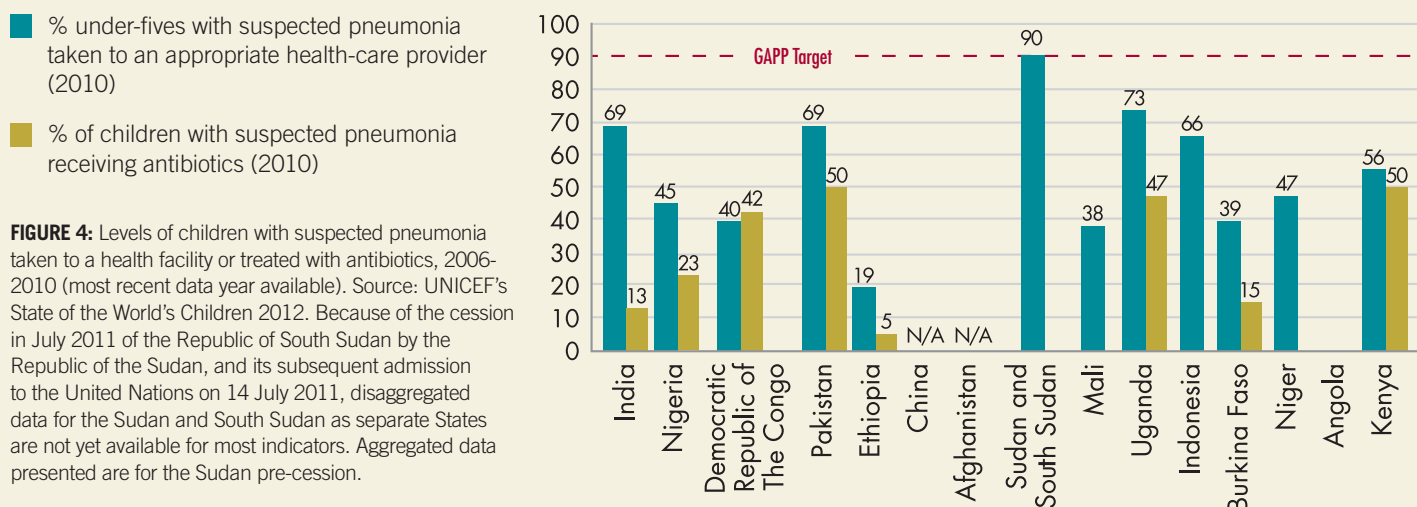## Percent of Children with Pneumonia Who Are Taken to an Appropriate Health Care Provider or Receive Antibiotics

- % under-fives with suspected pneumonia taken to an appropriate health-care provider (2010)

- % of children with suspected pneumonia receiving antibiotics (2010)

FIGURE 4: Levels of children with suspected pneumonia taken to a health facility or treated with antibiotics, 2006-2010 (most recent data year available). Source: UNICEF's State of the World's Children 2012. Because of the cession in July 2011 of the Republic of South Sudan by the Republic of the Sudan, and its subsequent admission to the United Nations on 14 July 2011, disaggregated data for the Sudan and South Sudan as separate States are not yet available for most indicators. Aggregated data presented are for the Sudan pre-cession.

[12] UNICEF. State of the World's Children 2012: Children in An Urban World. 2012. Available at: http://www.unicef.org/sowc/files/SOWC_2012-Main_Report_EN_21Dec2011.pd.
[13] Li R, et al. Breastfeeding rates in the United States by characteristics of the child, mother, or family: the 2002 National Immunization Survey. Pediatrics; 2005:115(1). doi: 10.1542/peds.2004-0481.
[14] Hildenwalla, H., et al., 2007. Local illness concepts—Implications for management of childhood pneumonia in eastern Uganda. Acta Tropica, 01(3). http://dx.doi.org/10.1016/j.actatropica.2007.02.003; Rutebemberwa, E, et al. Determinants of delay in care-seeking for febrile children in eastern Uganda. Tropical Medicine & International Health; 2009: 14(4). 10.1111/j.1365-3156.2009.02237.x.
[15] WHO. Children under five years of age with acute respiratory infection and fever (ARI) taken to facility: Rationale for use. 2006. Available at: http://www.who.int/whosis/whostat2006Under5WithARI.pdf.
[16] Soofi S, et al. Effectiveness of community case management of severe pneumonia with oral amoxicillin in children aged 2–59 months in Matiari district, rural Pakistan: a cluster-randomised controlled trial Lancet; 2012: 379(9817). doi: 10.1016/S0140-6736(11)61714-5; Bari A, et al. Community case management of severe pneumonia with oral amoxicillin in children aged 2—59 months in Haripur district, Pakistan: a cluster randomised trial. Lancet; 2011: 378(9805). doi: 10.1016/S0140-6736(11)61140-9.
[17] JHSPH IVAC Vaccine Information Management System (VIMS). Available at: http://www.jhsph.edu/research/centers-and-institutes/ivac/vims/.