

IMMUNISATION FOR **ALL**

No child left behind

NO CHILD
BORN TO DIE



Save the Children

IMMUNISATION FOR **ALL**

No child left behind

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FOREWORD

Routine immunisation is the most significant, affordable and cost-effective child survival intervention. Every child has the right to complete basic immunisation irrespective of economic status, political affiliation, geographical location, gender, caste, colour or religion. The amazing progress in child survival that we have observed in the last decade is primarily a result of ever-increasing immunisation coverage.

It is a matter of joy that we have reached four-fifths of the world's children with routine immunisation services. Thanks to the millions of field workers for their hard work in making this possible. Thanks to the many programme administrators, donors and governments for their able leadership in this big achievement. We must now prepare ourselves to cover the final fifth of children who are still left out of this important service. These children are in the remotest places, are the poorest children, or are affected by family displacement, natural disaster, war or conflict. They are also the most vulnerable to vaccine preventable diseases. We cannot afford to miss them.

Immunisation for All: No child left behind is a timely publication to inspire those working on immunisation to reach the remaining 20% of

children. This report is an excellent endorsement of the many wonderful initiatives and programme examples, and of government leadership, which have all contributed significantly to reaching more children with immunisation. This report gives a strong message to national governments to develop customised strategies to reach the hard-to-reach children, recognising that problems might not be identical in all places. Similar messages are given to the GAVI Alliance, the international donor community, UN organisations, the private sector and civil society – to revitalise their commitments and revisit their strategies to deliver the best and to reach the hard-to-reach children with immunisation services.

We understand our success in immunisation programmes reflects our good team work. What is now most important is to finish the rest of the job to achieve 100% coverage. For this we must overcome inequalities. This report will be an important tool and source of inspiration toward achieving this goal.

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ABBREVIATIONS

AFRO	Regional Office for Africa (WHO)	IP	Intellectual property
AMC	Advance Market Commitment	ITN	Insecticide-treated net
ANC	Antenatal care	IVAC	International Vaccine Access Centre
ARISE	Africa Routine Immunization System Essentials (project)	JHSPH	Johns Hopkins Bloomberg School of Public Health
CBO	Community-based organisation	LIC	Low-income country
CHW	Community health worker	LiST	Lives Saved Tool
CSO	Civil society organisation	LMIC	Lower-middle-income country
CTC	Controlled temperature chain	MDG	Millennium Development Goal
DCVMN	Developing Country Vaccine Manufacturers' Network	MIC	Middle-income country
DHS	Demographic and Health Survey	MICS	Multiple Indicator Cluster Survey
DTP	Diphtheria-tetanus-pertussis (vaccine)	MNCH	Maternal, newborn and child health
EMRO	Regional Office for the Eastern Mediterranean (WHO)	NID	National Immunisation Day
EPI	Expanded Programme on Immunisation	ORS	Oral rehydration salts
FBO	Faith-based organisation	PAHO	Pan American Health Organization
GAVI	Global Alliance for Vaccines and Immunisation	PINCI	Pakistan, India, Nigeria, China and Indonesia
GIS	Geographical information system	PRRINN-MNCH	Partnership for Reviving Routine Immunization in Northern Nigeria, Maternal Newborn and Child Health (initiative)
GIVS	Global Immunisation Vision and Strategy	R&D	Research and development
GNI	Gross national income	REC	Reaching Every Community
GPP	Gulf Cooperation Council Purchasing Programme	RED	Reaching Every District
GSK	GlaxoSmithKline	RMNCH	Reproductive, maternal, newborn and child health
GVAP	Global Vaccine Action Plan	TRIPS	Trade-Related Aspects of Intellectual Property Rights
HEW	Health Extension Worker	UN	United Nations
HRC	High-risk community	UNICEF	United Nations Children's Fund
HRH	Human Resources for Health	WHO	World Health Organization
IMCI	Integrated management of childhood illness	WTO	World Trade Organization
IMR	Infant mortality rate		

EXECUTIVE SUMMARY

Impressive progress has been made in reducing child mortality across the world. Deaths of children before the age of five have dropped by over 40%, from nearly 12 million in 1990 to fewer than 7 million in 2011.¹ Last year we saw the biggest drop in history – 700,000 in one year. The sharp increase in immunisation has helped drive this impressive progress, and has accelerated progress towards meeting the fourth Millennium Development Goal (MDG) – reducing child mortality rates by two-thirds by 2015.

Global immunisation coverage has increased from 74% in 2000 to 83% currently.² In 2011, there were 10 million fewer unimmunised children, compared with a decade ago.³ Political commitment at national and global levels, matched with critical investments in immunisation, have expanded coverage to historically high rates, and now immunisation coverage is typically higher than coverage for other essential child health services. This shows how investment in proven strategies and interventions can make strides towards giving each child a better chance of survival beyond their fifth birthday.

The benefits of vaccines relate not only to the individual vaccinated. Achieving high overall immunisation coverage can bring wider benefits to society⁴ by reducing transmission and even eliminating certain diseases.⁵ We are therefore at a tipping point where, as we reach the groups who remain unimmunised,⁶ the benefits of vaccination could become even more pronounced. To do so will require significant effort in reaching the hardest-to-reach children.

Reaching the hard-to-reach children will also maximise the value-for-money of vaccines. It is the poor and marginalised who often miss out on life-saving vaccination; however, these are the children who need and would benefit from it the most.⁷

So the opportunity is clear, but so too is the challenge. Today, one in every five children is still

not receiving even the most basic vaccines.⁸ In some countries, coverage rates are much worse: for instance, in Nigeria only 47% of children have access to basic vaccines, and in Ethiopia only 51%.⁹ Over half of all unimmunised children are located in just three countries – India, Nigeria and the Democratic Republic of Congo (DRC).¹⁰ Within countries, there are some children who are much less likely than others to have access to immunisation: for instance, in countries where inequalities are most acute, the poorest children are three times less likely than the richest children to receive three doses of DTP.¹¹ Children from the poorest regions and the most disadvantaged groups are those who tend to be unimmunised. They are therefore also those who are at greatest risk from deadly – yet preventable – diseases.

IMMUNISATION FOR ALL

This report identifies country-level strategies to reach the unreached. As no blueprint exists, efforts to address inequalities must start with a bottleneck analysis to identify the barriers to progress, and to inform the development of a contextually specific strategy.

We identify key considerations for **strengthening routine immunisation**. These include: effective and integrated use of outreach; investments in frontline health workers, including addressing issues of motivation and performance; innovations to strengthen supply chains and service delivery; specific initiatives such as Reaching Every District; and engaging and empowering communities to demand immunisation, and to shape delivery mechanisms to increase uptake and improve the quality and supply of immunisation services.

A child's immunisation status, however, is not based on chance. Children from the poorest and most remote areas, or from migrant communities, particular castes, or other disadvantaged groups, tend to be left out. There is no reason why countries cannot get

close to universal immunisation coverage, but to do so will require political commitment and sufficient financial investment to reach the poorest and most marginalised children.

The report also finds that while campaign approaches have been very successful, particularly in disease elimination strategies, more comprehensive systems are required if we are to **achieve and sustain high and equitable immunisation coverage**.

In addition to the steps needed to reach the poorest, this report reflects on the potential of the immunisation system to bring otherwise excluded children into the reach of other essential health services. Where immunisation coverage is both higher and more equitable than that of other health services, **using vaccination services to deliver a broader package of interventions** – for instance, through outreach – will help to narrow inequalities for a wider set of health services. Furthermore, **embedding immunisation services within an integrated primary healthcare system** can be a more efficient use of resources and will provide sustainable access to essential health services.

No child should be denied their right to immunisation, but millions still are. Within countries, much can be done to overcome these inequalities. Strong routine immunisation is crucial to achieving this and, through immunisation, more equitable access to other essential health interventions can be extended for the children and their families who most need these services.

ESTABLISHING AN ENABLING ENVIRONMENT FOR UNIVERSAL IMMUNISATION

Ensuring that every child has access to immunisation will not only require resolute action within countries. In addition to the strategies identified above, various factors at the global level will help to create a more conducive environment for countries to achieve universal immunisation coverage.

Research and development agendas should respond to the major causes of mortality and morbidity for the poor and vulnerable, and technologies and packaging should be developed or adapted to better suit the contexts within which these populations live – for instance, where health systems and cold chains

are weak. Countries also need sustainable access to vaccines at affordable prices. For this, the international community can help increase competition in the market of vaccine development and supply to ensure that developing countries have access to affordable vaccines, one of the targets in MDG 8 (Develop a Global Partnership for Development). This can be done by facilitating competition, or by supporting technology transfer to build the capacities of emerging market producers.

Furthermore, with the changing face of global poverty, more of the unreached are living in lower-middle-income countries (LMICs), which may no longer be eligible for support from the Global Alliance for Vaccines and Immunisation (GAVI). Affordable access to vaccines to ensure sustainability of vaccine programmes in these contexts is more urgent than ever. Strategies need to be explored to respond to the needs of these countries, such as tiered pricing and pooled procurement for LMICs.

CONCLUSION AND RECOMMENDATIONS

The fact that one in five children remains without basic vaccination is wrong. The world is faced with a unique opportunity to give every child a chance to survive beyond their fifth birthday. We know what needs to be done and we must seize the opportunity to achieve and sustain universal access to the full benefits of immunisation.

This is a call to action for this Decade of Vaccines to ensure that inequalities in immunisation are addressed so that no child dies from preventable or treatable causes. This report calls on governments, development partners, the private sector and civil society to implement the following recommendations:

FOR GOVERNMENTS:

- Develop strategies to address inequalities in immunisation that are integrated into national health plans and that strengthen health systems. They should be costed, funded and implemented.
- Empower communities and engage them meaningfully as strategies are developed, implemented and monitored.
- Where appropriate, resolve to build and invest in national R&D capacities and strengthen government regulatory capacity.

FOR GAVI:

- Make equity a top priority in the next GAVI Business Plan and revise the eligibility policy to include equity criteria.
- Urgently realise commitment to allocate 15–25% of budget to cash-based support, promoting synergies across the continuum of care.
- Use market-shaping with pharmaceutical manufacturers to encourage price transparency and reductions, and collaborate with partners, encouraging LMIC tiered pricing and pooled procurement for graduating countries.

FOR BILATERAL DONORS:

- Champion the opportunity of immunisation to promote equity across primary healthcare, and ensure sufficient funding for countries to strengthen health systems, including immunisation as part of the essential basic package of services.
- Continue investment in and commitment to vaccine R&D, including building R&D and regulatory capacities in emerging markets.

FOR WHO AND UNICEF:

- Champion equity as the priority agenda within the Decade of Vaccines and the opportunity of immunisation to promote equity across primary healthcare, encouraging sufficient investment from country governments and donors alike.
- Ensure meaningful civil society representation in the monitoring and accountability framework for the GVAP.

FOR THE PRIVATE SECTOR:

- Prioritise R&D that responds to the burden of disease and the contexts in which the poor and marginalised live.
- Increase transparency about vaccine prices and pricing mechanisms and be open to opportunities for pooled purchasing and tiered pricing by income level, particularly for LMICs.
- Support capacity building of emerging market suppliers through untied technology transfers, strengthening regulatory capacity, training, etc.

FOR CIVIL SOCIETY:

- Empower local civil society to actively participate in immunisation and health systems.
- Engage in the GVAP monitoring and accountability framework with all key stakeholders at local, country, regional and global levels.

INTRODUCTION

GLOBAL PROGRESS

Impressive progress has been made in reducing child mortality across the world. Deaths of children before the age of five have dropped by over 40%, from nearly 12 million in 1990 to fewer than 7 million in 2011.¹ Last year saw the biggest drop in history – 700,000 in one year. The sharp increase in immunisation has helped drive this impressive progress and accelerate progress towards meeting the fourth Millennium Development Goal (MDG) – reducing child mortality rates by two-thirds by 2015.

Global immunisation coverage has increased from 74% in 2000 to 83% currently.² In 2011, there were 10 million fewer unimmunised children, compared with a decade ago.³ Political commitment at national and global levels, matched by critical investments in immunisation, have expanded coverage to historically high levels, and now immunisation coverage is typically higher than that of other essential child health services. This shows how investment in proven strategies and interventions can make strides towards giving each child a better chance of survival beyond their fifth birthday.

YET MANY CHILDREN ARE LEFT BEHIND

Global progress masks significant inequalities in coverage both between and within countries. Today, one in every five children is still not receiving even the most basic vaccines.⁴ In some countries, coverage rates are much worse: for instance, in Nigeria only 47% of children have access to basic vaccines, and in Ethiopia only 51%.⁵ Over half of all unimmunised⁶ children are located in just three countries – India, Nigeria and the Democratic Republic of Congo (DRC).⁷ Within countries, there are some children who are much less likely than others to have access to immunisation: for instance, in countries where inequalities are most acute, the poorest children are three times less likely than the richest children

to receive three doses of DTP.⁸ Children from the poorest regions and the most remote areas, or from migrant communities or other disadvantaged groups, are those who tend to be unimmunised. They are therefore also those who are at greatest risk from deadly – yet preventable – diseases.

DRIVERS OF INEQUALITIES IN IMMUNISATION

A child's immunisation status is not based on chance. It corresponds to systemic inequalities both across and within countries, as shown in our recent report, *Finding the Final Fifth*.⁹ In order to ensure that all children benefit from immunisation, it is important to understand why certain children are not being reached and what drives inequalities.

Household wealth, mother's education and rural/urban location are identified as some of the main determinants of immunisation coverage.¹⁰ These social determinants¹¹ are consistent with those that deny children and their families access to healthcare more broadly.

However, inequalities are determined by broader socio-economic circumstances, politics and policies, including the health system.¹² Disparities in access to immunisation and good-quality healthcare are often a result of political decisions and unequal allocation of resources, which shape conditions at national, regional and local levels.¹³

These inequalities are unfair and avoidable, and undermine the realisation of every person's right to immunisation as part of their right to the highest attainable standard of health. There is no reason why countries cannot get close to universal coverage of immunisation if they put their minds to it, but to do so will require political commitment and sufficient financial investment to reach the poorest and most marginalised children.

Finding the Final Fifth explored some of the more direct reasons why children are unimmunised.¹⁴

It found that limited supply of and access to good-quality health services – due, for instance, to the inequitable distribution of health facilities and a critical shortage of health workers – was the most frequently cited reason. This was followed by family characteristics, such as education and socio-economic status, parental knowledge and attitudes, and communications. Such characteristics are multifaceted and often interconnected. For example, poor families in rural areas might refrain from accessing health services for which they have to travel a long distance and thereby incur direct and opportunity costs. In this case, the weak health system, distance and poverty all intersect.

THE IMPORTANCE OF IMMUNISATION FOR ALL

Immunisation is an essential, cost-effective and proven intervention that all children should have access to, on the basis of their right to health. The fact that a fifth of children remain without essential vaccination is wrong. Making equitable progress towards universal immunisation coverage is right from both an ethical and an economic perspective.

A child who has not been immunised is also unlikely to have had access to other essential child health services. Where possible, immunisation should be used as a platform to drive progress across other interventions – increasing average coverage *and* reducing inequalities in coverage.

Reaching the hard-to-reach will maximise the value-for-money of vaccines, and achieving a high level of overall coverage can bring wider benefits to society.¹⁵ To achieve this level will require significant effort in reaching the hardest-to-reach children.

GLOBAL MOMENTUM

Recently, there has been growing attention to addressing inequalities in immunisation coverage, with the declaration of the Decade of Vaccines¹⁶ and the endorsement in 2012 of the Global Vaccine Action Plan (GVAP) at the World Health Assembly. The goal of the GVAP is for *all* people to have access to the full benefits of immunisation – a goal that requires inequalities to be tackled. The GVAP provides an opportunity and can be catalytic in reorienting attention to addressing inequalities and to seizing opportunities to strengthen routine immunisation in a more integrated way.

THE SCOPE OF THIS REPORT

This publication is our second report exploring the importance of improving equity in immunisation. *Finding the Final Fifth: Inequalities in Immunisation* mapped where the 20% of children who are unimmunised are and what evidence we have for why they are not being reached. This report goes further to make the case for reaching the unimmunised – from a human rights and economic perspective – and identifies considerations and strategies for how to do this at both country and global levels.

The report looks at key considerations for strengthening routine immunisation at national level, exploring potential strategies to reach the unreached. It examines the use of outreach; investments in frontline health workers, including addressing issues of motivation and performance; innovations to strengthen supply chains and service delivery; specific initiatives such as Reaching Every District; and actions to engage and empower communities to demand immunisation and to shape delivery mechanisms to increase uptake and improve the quality and supply of immunisation services. It also highlights the importance of political will and sufficient financial investment to reach the poorest and most marginalised.

The report explores the opportunity that immunisation provides to reach communities with other essential health services. It looks at the potential of packaging other interventions with immunisation, and at the importance of embedding immunisation services within an integrated primary healthcare system in order to expand access to essential health services.

The final section of the report considers global factors that can help ensure an enabling environment for countries to achieve and sustain equitable immunisation, moving towards universal coverage. It addresses such issues as research and development and the importance of vaccines that respond to the contexts in which they are needed the most, as well as affordability issues affecting countries' ability to achieve and sustain high levels of coverage. Finally, it considers the changing context of the global poor and looks at what implications this has for countries, the Global Alliance on Vaccines and Immunisation (GAVI Alliance) and other stakeholders.

The report concludes with a set of recommendations for various stakeholders, including for governments, development partners (bilateral donors, WHO and UNICEF), GAVI, the private sector and civil society.

1 WHY SHOULD WE FOCUS ON ADDRESSING INEQUALITIES IN IMMUNISATION AND HEALTH?

THE INVESTMENT CASE FOR REACHING THE FINAL FIFTH

Reaching the hard-to-reach children will maximise the value-for-money of vaccines. Research undertaken by UNICEF finds that although in the short term it may cost more to reach those children who are hard to reach, taking an equity-focused approach¹ is more cost-effective, accelerates progress in reducing child mortality and brings more sustainable gains.²

This is particularly the case for new vaccines against rotavirus and pneumococcal diseases, which disproportionately affect the poor and marginalised. They are the children who are most vulnerable to disease, owing to their living conditions, inadequate diet, and lack of access to preventive healthcare, including immunisation. They are also least likely to receive effective and timely treatment, which means that millions of children die from preventable and curable diseases. It is these children who need – and would benefit from – vaccines the most, but they are the children who remain missed.³

Moreover, as a global public good, the benefits of vaccines relate not only to the individual vaccinated. Achieving high overall immunisation coverage can bring wider benefits to society⁴ by reducing transmission and even eliminating certain diseases.⁵ We are therefore at a tipping point; as we reach the groups who remain unimmunised,⁶ the benefits of vaccination could become even more pronounced.

A strong and equitable health system can help to break the cycle of poverty in households, and consequently support the long-term prosperity of the wider community. Expanding coverage of good-quality health interventions, and protecting the poor from financial hardship, can result in increased productivity and incomes.⁷

However, most importantly, every child has the right to the highest attainable standard of health, including

immunisation, as part of an essential package of health services. This right to health is enshrined in the Universal Declaration of Human Rights of 1948,⁸ and in Article 24 of the United Nations Convention on the Rights of the Child 1989.⁹ Every country has ratified at least one treaty that acknowledges this right. As a proven, cost-effective health intervention, access to immunisation is part of the right to health.¹⁰ Therefore, every child deserves and has the right to access the full benefits of immunisation, and the state bears the responsibility to provide for this.

Ensuring that vaccination and healthcare are accessible to all requires financial as well as technical and social investment. It is not only a cost-effective and worthwhile investment, which promotes human development and economic growth more broadly; it is the right thing to do. The children who need it the most must no longer be left behind.

HEALTH AND IMMUNISATION SYSTEMS AS EQUALISERS

In this report we look at some of the possible strategies to address both the direct and underlying causes of why children are missing out on immunisation. We do this within a broader framework of strengthening routine immunisation systems, recognising the importance of strong systems to ensure that all children have regular and sustained access to services.

Overcoming the underlying causes of both immunisation and health inequalities will require broad socio-economic and political change, but health and immunisation systems themselves can help mitigate inequalities. Even though the health system itself may be subject to these same underlying determinants, a well-designed and managed system can have an ‘equaliser’ effect, having the potential to reduce many health inequalities by addressing

the needs of the poor and vulnerable.¹¹ The health system therefore plays an integral role in addressing inequalities, providing equitable access to good-quality care, improving health outcomes and protecting people from the financial burden of ill health.¹²

This report considers how immunisation programmes, too, as part of a strong health system, can be an 'equaliser'. Immunisation programmes can reduce the gap between the rich and the poor, reaching the unreached in ways that are sustainable, and can

promote equity in coverage of interventions for children and their families across the continuum of care.

The report, however, does not consider the comparative cost-effectiveness of investing in measures to address the broader social determinants of health versus investing in measures to strengthen the health system and routine immunisation; this is an issue that warrants further research.

2 IMMUNISATION FOR ALL: WHAT IS NEEDED AT COUNTRY LEVEL?

In many countries, the priority given to expanding immunisation to universal coverage, and ensuring that there is equitable progress towards this, has necessitated strategies and approaches capable of reaching those whose access to services is limited, or even non-existent.

Since the particular nature of inequalities will be context-specific, strategies to address them should be locally derived, informed by coverage patterns and based on a systematic analysis of the bottlenecks that might explain why certain children are not being reached. Strategies may be innovative or may simply require the identification and scaling-up of existing good practices.

A recent review of efforts to improve equity through addressing bottlenecks identified three broad types of strategies to improve delivery:¹

- Improve the existing delivery channel – for instance, improving health worker incentives and salaries. This is the most common approach.
- Shift within the existing delivery channel – such as task-shifting so that less-skilled health workers are able to perform certain interventions.
- Shift to another delivery channel altogether – for example, outreach to remote communities, which shift the delivery of interventions from a facility to the community.

The reality is that countries generally use a mix of delivery approaches. This chapter identifies strategies to improve equity in immunisation, within a framework of strengthening routine immunisation systems. The first section looks at the importance of strengthening routine immunisation to achieve and sustain high and equitable coverage. In this section, we also recognise the achievements that campaign

approaches have had in disease elimination strategies, highlighting though the importance of ensuring that they are integrated in, and strengthen, routine systems.

In the subsequent sections of this chapter, we look at the crucial step of identifying bottlenecks to equitable progress, which should be the basis for any strategy to reach the unreached. We then identify country-level considerations and initiatives to reach the unreached, with various case studies to demonstrate countries' experiences. We highlight the need for political will and financial investment to ensure that countries make important strides towards universal coverage of immunisation. Finally, we explore the potential of the immunisation system to accelerate improvements in other areas of health.

SUSTAINABLE PROGRESS THROUGH ROUTINE IMMUNISATION

Routine immunisation may include services through fixed sites, at a health facility;² outreach, whereby health facility staff leave the facility to deliver immunisation;³ and mobile services, in which mobile teams typically spend several days visiting a circuit of remote areas.^{4,5} These are at times supplemented by 'campaign-style' activities⁶ to intensify and accelerate improvements in routine coverage by temporarily increasing services, rather than being the primary means of providing them.⁷

In areas with weak infrastructure, security problems, or significant geographical and resource difficulties, countries often use outreach strategies (or occasionally mobile services) to reach the hard-to-reach with routine immunisation.⁸ This can be an effective strategy for reaching the most marginalised, and can yield quick returns, given that it will take time

and resources to extend routine systems to these communities through health facilities. However, it should not be seen alone as the solution to reaching hard-to-reach children. Rather, the ultimate goal should be to move beyond outreach strategies so that immunisation is available through health centres, and that health services are available to all children and communities according to need, rather than on the basis of schedules. This will not only lead to sustainable access and results in the long term, but also has the potential to increase access to other primary care services. Reaching Every District (RED) is an example of integrating outreach into broader efforts to strengthen systems (Box 9).

Strengthening routine immunisation in a way that is integrated into broader primary healthcare offers the greatest opportunity for ensuring that all children have access to vaccination as part of integrated health promotion and disease control strategies. Investing in this can also have a synergistic effect, promoting the equitable coverage of other essential interventions across the continuum of care.⁹

Strategies to strengthen routine immunisation are varied and context-specific, and successful progress is often the product of multiple factors, as has been the case in Bangladesh (Box 1) and Mandi district, India (Box 2), for example. This may be through direct drivers (eg, a cadre of community health workers), or broader enabling factors (eg, political commitment and leadership).¹⁰ Factors are often interconnected and operate at different levels of the country and health systems. For instance, a national commitment to health, including immunisation, which is reflected in increased resource allocation, may be associated with improved routine immunisation.

Other strategies identified to strengthen routine immunisation include bringing services closer to the community; driving demand for vaccination through information dissemination (eg, increasing awareness, promoting participation); changing practices in fixed sites (eg, providing immunisation when patients are seen for illness or other reasons); and using innovative management practices (eg, working with other partners, peer learning, better use of data and community information).¹¹

BOX 1: STEADY PROGRESS ON REDUCING INEQUALITIES IN IMMUNISATION IN BANGLADESH

By employing a multi-strategy approach to vaccinating its hard-to-reach populations, Bangladesh has achieved national immunisation coverage of close to 96% (as indicated by DPT3), while also making steady progress on coverage equity and on reducing drop-outs.¹²

Inequalities across the socio-economic spectrum undoubtedly exist, but dedicated programme managers, and outreach services involving community leaders, have contributed to closing this gap. Innovations that entail more thorough tracking of the details of eligible children and the use of reminder systems, coupled with stronger education and awareness-raising on the importance of complete vaccination, have been important. Other simple changes such as extending clinic hours have also resulted in more people having access to services.¹³ In urban slum communities,

and other resource-poor settings, mothers and others outside the formal health sector have been effective champions of immunisation, helping disseminate information on behalf of health workers at little or no cost.¹⁴

One of the champions of progress in Bangladesh, Dr Asm Amjad Hossain, a former district immunisation and surveillance medical officer, won the first Gates Vaccine Innovation Award in 2012.¹⁵ Dr Hossain used innovative strategies to reach more children in two low-performing districts by implementing a register system to track and locate pregnant mothers, and by introducing simple yet effective improvements such as adding the phone numbers of vaccinators at the top of immunisation cards. His methods increased immunisation coverage by 15 percentage points in a single year.

BOX 2: REACHING THE HARD-TO-REACH IN MANDI DISTRICT, HIMACHAL PRADESH

Good organisation, planning, leadership and commitment have contributed to high immunisation coverage in Mandi District. This has meant a good understanding of realities on the ground, and adequate time allocated by all health workers for reporting, data collection, analysis and understanding of gaps. In addition to immunisation at sub-centres, outreach ensures that services reach hard-to-reach areas (eg, hilly terrain). Tracking and

targeting beneficiaries through EMRI (emergency ambulance services) and health worker visits, in addition to incentives, help ensure that all children are reached and have follow-up. Mobile populations in particular are given numbered reporting cards to enable use across the state. Yearly and monthly advanced planning based on demand (plus additions to account for wastage) ensure adequate supply of vaccines.

Source: PHFI India, 2012

THE ROLE OF CAMPAIGN APPROACHES

A mass campaign approach is a common strategy to reach a large number of children (sometimes nationwide) with a particular vaccine. These approaches have made huge strides in disease elimination efforts, such as for polio and measles¹⁶ and in getting immunisation against specific diseases to the most remote children. Campaigns have also been used as an opportunity to get other interventions out to these remote communities. For example, the Measles and Rubella Initiative has supported the distribution of insecticide-treated nets, deworming medicine and vitamin A, and the administration of polio vaccination, during measles vaccination campaigns,¹⁷ while vitamin A is distributed in many countries during polio campaigns.¹⁸

However, if not properly integrated, campaign approaches can potentially have a negative effect on routine immunisation by diverting funds and other resources. For example, in Tanzania and Nepal, National Immunisation Days (NIDs)¹⁹ have been found to divert public focus, donor attention and resources from routine immunisation programmes.²⁰ In Chad and Uganda, polio eradication campaigns have been reported to overload the healthcare system and undermine routine vaccination services.²¹ Similarly, measles vaccine campaigns have been shown to negatively affect routine immunisation in South Africa.²²

While a campaign approach has the potential to reach communities with the greatest need with certain vaccines, if not done in an integrated way it can also leave these communities without access to other health services, thus widening inequalities in coverage between immunisation and other essential health interventions. Moreover, the intermittent nature of campaigns means that these communities do not have regular, sustained access to services.

Sustaining immunisation coverage for elimination and eradication goals will typically require a strong routine immunisation system. For example, countries where polio and measles persist tend to be those where routine immunisation is weak.²³ As stated by Dr Seth Berkley, CEO of the GAVI Alliance, “Measles is the ‘canary in the coal mine’ because outbreaks can signal that routine immunisation coverage is faltering.”²⁴ On the other hand, where routine systems are strong, the need for campaign approaches may be less, as was found in the Ubundu Health Zone, in the Democratic Republic of Congo.²⁵

Experience has shown that unless campaigns are designed to complement and enhance routine immunisation services, progress on coverage and the success of eradication efforts are unlikely to be sustained,²⁶ in particular among the most vulnerable and hard-to-reach communities. Therefore, synergies should be explored. Disease eradication initiatives recognise this and highlight the need to prioritise and strengthen routine immunisation.²⁷

Thus, when designing and planning campaigns, potential risks should be considered and efforts should be made to ensure better integration and complementarity with routine immunisation. Cambodia provides a good example of how supplementary immunisation activities (SIA) for measles have been used as an entry point to identify communities being missed by routine immunisation (Box 3). The experience of Bihar, India, shows the potential synergistic role that polio eradication activities can have in supporting routine immunisation (Box 4).

IDENTIFYING BOTTLENECKS TO EQUITABLE PROGRESS

A systematic analysis of the bottlenecks that might explain why certain children are not being reached with immunisation, and broader healthcare, is a crucial phase of strategy development. This analysis should consider the broader drivers of inequality and demand-side barriers, as well as those within the health system, such as resource allocation, policy frameworks and their implementation across the components of the health system.

BOX 3: USING VACCINATION CAMPAIGNS TO SUPPORT ROUTINE IMMUNISATION IN CAMBODIA

As part of its Reaching Every Community (REC) strategy, Cambodia has used the opportunity of measles vaccination activities to identify and target children missing out on routine immunisation. It first identified the socio-economic characteristics of the unimmunised (remote, mobile, ethnic and urban poor) on a national scale through an Expanded Programme on Immunisation (EPI) review in 2010. Measles supplementary immunisation activities were then used to identify *where* these high-risk

communities (HRCs) were in each district. Children's immunisation cards were checked village by village, for both measles and routine immunisation status, and their access to community health services was measured – including fixed-site or outreach and frequency of utilisation. A socio-economic and health access profile was determined for HRCs, allowing for the development of more targeted strategies to reach these hard-to-reach communities with routine immunisation.

Source: Duncan, 2012²⁸

BOX 4: SYNERGISING ROUTINE IMMUNISATION AND POLIO ERADICATION IN BIHAR, INDIA

Bihar has some of the lowest routine immunisation rates in India. In an effort to improve routine coverage, the state government launched the Muskan ('smile') initiative in 2006. The initiative has resulted in a rapid revival of the health system, including filling vacant health workers' posts across the state, renovating and re-invigorating primary health centres, and improving accountability of the government health staff for delivery of services. Polio eradication activities have played a synergistic role in these efforts. Polio eradication infrastructure in the state has supported routine immunisation, including strengthening the cold

chain; existing polio micro-plans have been used to update routine immunisation micro-plans, helping to identify high-risk areas without access to services and to track mobile communities; and supplementary immunisation activities (SIAs) have been used to register newborns and generate awareness about routine immunisation, including when and where sessions are held. Not only has this led to a reduction in polio incidence in Bihar,²⁹ but at the same time the proportion of children fully immunised against common childhood diseases more than trebled.³⁰

Source: WHO – Polio Eradication Initiative

Bottlenecks might be particular to the immunisation programme, or cut across the health system more broadly. They can occur at household or community, outreach service, facility, district or national levels.³¹ Bottlenecks may also stem from policies or from operational challenges.³² It is often the combination of multiple hurdles that results in a child not getting vaccinated. For example, a sub-national analysis carried out in three Indian states revealed that various factors contribute to good and poor immunisation coverage (Box 5). A Landscape Analysis of Routine Immunization carried out by the International Vaccine

Access Centre (IVAC) at Johns Hopkins Bloomberg School of Public Health identified key barriers to better immunisation coverage rates in Nigeria (Table 1). Similar analyses have been carried out to identify health system barriers to better vaccination coverage in DRC, Chad, Nigeria and Uganda.³³ The Africa Routine Immunization System Essentials (ARISE) project,³⁴ on the other hand, has carried out analyses to identify factors that lead to strong routine immunisation systems, looking at experiences in Cameroon, Ethiopia and Ghana.³⁵

BOX 5: MULTIPLE CHALLENGES IN INDIAN STATES

Inequalities are a result of multiple factors. Evidence from Uttar Pradesh, Himachal Pradesh, and Rajasthan show that better immunisation coverage is a reflection of **better-functioning health systems**. Uneven distribution of health centres across the country, many lacking basic facilities, is associated with poor immunisation outcomes. In some places the situation is worsened by a shortage of **skilled frontline health workers**, coupled with long distances they must travel to reach children. In states and districts with better immunisation performance, there is better availability, distribution and skill level of health workers. Poor incentive structures and politically influenced assignments – whereby workers may not live in villages they serve – may also affect performance and outcomes.

Communication and awareness also affect performance, with gaps in poorly performing states. Some people are unaware of the benefits of immunisation or where sessions are held, while others have reservations about immunisation. At times, vaccination is given without explanation; at other times there may be simple messages that vaccines prevent disease, but no community engagement to promote demand for services. In better-performing districts, instead, a high degree of community acceptance of immunisation services was observed.

Estimates and monitoring of beneficiaries (including tracking ‘left-outs’ and ‘drop-outs’), as well as of required vaccine supply, is associated with immunisation performance, with targets set by districts, states and at the national level, not

always matching realities on the ground. Required **vaccine doses and appropriate packaging** (eg, the number of doses in a vial) do not always meet programme needs, leading to wastage in some villages and subsequent shortages in others. For example, one district immunisation officer stated: “If there are only three children in each village, we still have to send one vial to that village, even though that vial may be adequate to vaccinate 20 children. Hence there is wastage, but we cannot leave any children out.” **Shortages of associated supplies** (eg, vaccine carriers, blank immunisation cards) also emerged as problems. Better-performing states, on the other hand, reported adequate and more consistent availability.

Planning for immunisation programmes, especially micro-planning for service delivery, has significantly improved over the past few years, but supervision and monitoring from district and sub-divisional authorities is lacking. **Financial constraints** and lack of clear **guidelines** for budgeting creates issues for villages and districts – eg, planned outlays do not always match actual budgets, and for some costs, provisions are missing or utilisation is not properly planned for. **Cold chain** problems are no longer a big concern for most states, with generally good availability of sufficient numbers of ice-lined refrigerators and deep freezers. But frequent and extended power failures, coupled with maintenance and operational costs for generators, are key concerns, in particular in light of financial constraints and the absence of earmarked budgets for such activities.

Source: PHFI India

TABLE 1: BARRIERS TO BETTER VACCINATION COVERAGE IN NIGERIA

Type	Details
Logistical	Inadequate supply (vaccine stock-outs) and transportation of vaccines (in particular at peripheral points), weak cold chain, inconsistent power supply, equipment-related problems (poor maintenance, unintended use). These become more relevant as service points become more remote.
Financial	Delays in the release of designated funds, inadequate level of funding, inefficient use of resources, appropriation of resources, unsustainable financing of donor projects. Barriers affect the entire process from procurement to delivery and at all levels from national to health facility. Financial barriers become more salient as service points become more remote.
Human resources	Inadequate supply/staff shortages, capacity gaps, poor performance management, inefficient staff allocation or allocation of staff time, culture of monetisation of tasks, poor attitude, work ethic and motivation. These occur both at managerial and health worker levels.
Service delivery	Poor integration of routine immunisation services with broader primary health services, inadequate quantity of health facilities, low or non-existent community engagement, poor access to hard-to-reach communities, poor conditions at health facilities.
Health information systems	Unreliable or invalid administrative data, unclear protocols and inadequate training of staff for data collection and utilisation, data not used for decision-making, lack of basic data collection tools for primary health centres, poor forecasting, lack of feedback to the community (reduced accountability).
Governance	Dependence on individual interests to prioritise routine immunisation at state level, decentralising leading to low accountability, reluctance by elected officials to invest in routine immunisation (as opposed to more visible projects).

Source: IVAC 2012³⁶

These kinds of comprehensive analyses can help policy-makers and programme managers develop contextually relevant strategies that are more responsive to the needs of the population they serve, and therefore more effective in unblocking specific obstacles to reaching the unreached.

It is important to recognise, however, that inequalities in immunisation often do not occur in isolation. A weak health system will affect most disease- or population-specific programmes, and reduce their capacity to achieve and sustain high or equitable coverage of essential interventions. Bottlenecks to more equitable immunisation coverage will therefore often be common to multiple health interventions, so opportunities for synergies should be pursued.

Depending on the bottlenecks identified, some strategies may be narrower in focus and may address inequalities in immunisation specifically. Alternatively, a broader approach may be taken to address inequalities in the wider health system, which will probably have positive effects across primary healthcare. Some strategies may be more short-term in outlook – say,

through outreach – while others may be longer-term, aimed at strengthening systems. In practice, a mix of approaches may be most appropriate in order to still achieve results in the short term, while moving towards longer-term outcomes.

STRATEGIES TO REACH THE HARD-TO-REACH

No blueprint exists for how to reach the hard-to-reach, and efforts to address inequalities must be context-specific and tailored to the needs of the country and/or the specific state or district where inequalities persist. However, there are broad considerations that should be addressed and specific existing initiatives can be drawn on to strengthen routine immunisation so that it reaches the hard-to-reach. These include investments in frontline health workers; innovations to strengthen supply chains and service delivery; specific initiatives such as Reaching Every District; and empowering communities to demand services and hold providers accountable.

INVESTING IN FRONTLINE HEALTH WORKERS

Across the health system, a major driver for promoting equity is having sufficient numbers of motivated health workers who are appropriately trained, supported, reimbursed, incentivised, equipped and distributed in reach of all children. Health worker density is strongly associated with immunisation coverage rates,³⁷ with health worker shortages most evident where numbers of unimmunised children are highest.³⁸ This is particularly an issue in more rural and remote areas where health worker shortages are more salient and deployment and retention present a challenge.

A cadre of paid community health workers (CHWs), who are integrated into the health system, may be instrumental in expanding coverage to these areas. For instance, Ethiopia has invested in building a community-based health workforce that is able to extend coverage to certain essential interventions, including immunisation (Box 6).

Evidence suggests that CHWs have a positive impact on immunisation coverage and uptake,⁴⁰ in promoting demand for vaccination, bringing services closer to communities,⁴¹ and identifying children who are missing out on immunisation.

In addition to maximising the potential of CHWs, countries and donors must invest in strengthening the health workforces across all essential cadres. They must implement strategies to ensure sufficient

numbers of health workers, so that all children and their families have access to the health worker they need. Management, support and accountability of health workers must also be strengthened to address issues associated with poor performance and motivation.

INNOVATIONS TO IMPROVE COLD CHAINS⁴² AND SERVICE DELIVERY

Strong supply and cold chains are vital to improve routine immunisation and the delivery of other health services. This is necessary to ensure adequate supply and functioning equipment for health workers to administer vaccinations,⁴³ as well as other interventions. As the number of vaccines introduced into a national schedule increases, so does the burden on vaccine storage, transportation, refrigeration and tracking systems.⁴⁴ PATH and WHO, through the project Optimize,⁴⁵ for instance, are currently working to define the characteristics of an ideal supply chain and developing a roadmap to implement innovations around countries. The USAID | DELIVER project is another example of an initiative being carried out to strengthen in-country supply chains.⁴⁶

Improved supply chains will help overcome challenges to delivery in low-resource settings – eg, where there are long distances between health facilities and unstable power supplies. For example, in Jigawa, Nigeria, solar power is being used to improve vaccine

BOX 6: CADRE OF PAID COMMUNITY-CENTRED HEALTH WORKERS TO REACH THE HARD-TO-REACH IN ETHIOPIA

The Health Extension Programme (HEP) was introduced in Ethiopia in 2003 with the aim of improving access to health services in rural areas. This entailed expanding infrastructure (health centres and health posts) and introducing a cadre of government-paid, community-based and -focused Health Extension Workers (HEWs). HEWs deliver immunisation services at newly constructed health posts, as well as through outreach and house-to-house visits. They also organise sessions to raise awareness about vaccination in communities.

The programme has led to increasing geographic and social access to health services and has created

a favourable context for progress on immunisation coverage. HEWs have also become focal points in their communities for health in general and have built trust and rapport with communities to encourage the use of immunisation and other primary health services. The focus on strengthening community structures (eg, networks of community volunteers and supporting their links to health service activities) has also meant that local governments and local volunteers are increasingly involved in health and development activities, including immunisation.

Source: LaFond and Sequeira, 2012³⁹

storage in remote areas (Box 7). These kinds of initiatives are helping to ensure vaccines reach the children who need them the most – in particular in hard-to-reach rural and remote communities.⁴⁷ Such efforts should ensure that strengthened supply chains are able to serve primary healthcare more broadly.

Modifying equipment and utilising technologies can also improve service delivery, as has been identified in Bihar, India, through the Vaccine Delivery Innovation Initiative⁴⁹ (Box 8).

SPECIFIC APPROACHES

Reaching Every District

Reaching Every District (RED) is a multidimensional strategy that packages the best practices of successful immunisation systems – namely planning, outreach and

management tools – to improve vaccination coverage in low-performing districts (Box 9). Although intended for immunisation systems, the RED strategy represents an adaptable platform for the delivery of other essential primary health services and a stronger health system.

Reviews of RED implementation in nine African countries⁵³ in 2005 and 2007 revealed positive immunisation impacts as well as for other maternal and child health services.⁵⁴ For instance, reviews showed increases in immunisation coverage and the number of outreach sessions, and improvements in connections with the community through an expanded volunteer cadre. Subsequently, the WHO Regional Office for Africa (AFRO) recommended increased funding for districts implementing RED,

BOX 7: EXPANDING ACCESS TO VACCINES IN REMOTE AREAS OF JIGAWA STATE, NIGERIA, THROUGH SOLAR POWER

In addition to raising awareness about using routine immunisation and antenatal care services, officials in Jigawa state are working to strengthen the supply of services to support increasing coverage. One of the challenges has been the effective storage of vaccines and drugs in more remote areas. In response, the state – in collaboration with local governments and The Partnership for Reviving Routine Immunization in Northern Nigeria, Maternal, Newborn and Child Health Initiative (PRINN-MNCH) – is procuring, installing and maintaining solar-powered

refrigerators and freezers in health facilities across Jigawa. The solar-powered refrigerators are energy efficient and do not require a conventional electricity supply, electrical compressor, kerosene or gas to run. As Nasir Bala, a local engagement consultant for Jahun Gunduma Health System Council, said, “The provision of solar refrigerators in health facilities enables them to ensure a timely supply and distribution of vaccines and other necessary drugs to hard-to-reach areas.”

Source: PRINN-MNCH⁴⁸

BOX 8: INNOVATIONS FOR SERVICE DELIVERY IN BIHAR, INDIA

Redesigning the vaccine carrier box to incorporate multiple functions such as storage of routine immunisation paraphernalia, easy transportation and a collapsible work surface; with the opportunity to expand this to a “Vaccine-Plus” kit, adding equipment to support other maternal and child health interventions.

Interactive Voice Response System for Registration and Assistance to store information collected from the existing resources in a central database.

A social map, identifying landmarks and where key members of the community (for example, local midwives, priests, barbers, teachers) live, is sent to the health worker’s mobile device, along with a list of potential recipients, helping the health worker identify pregnant women, newborns, and migrating populations. The health worker can also provide minimal data to register recipients by calling into an Interactive Voice Response Service using their mobile devices.

Source: CKS Consulting Pvt Ltd, 2009/2010⁵⁰

particularly for ongoing training and outreach. The need to address stock-outs was also raised, as all but one country implementing the strategy experienced stock-outs that resulted in vaccination sessions being cancelled or children being turned away.⁵⁵

Reaching the ‘last mile’

Several countries and districts – in particular where health systems are weak – face considerable obstacles to providing good-quality services in rural and remote areas so that all children are reached with immunisation and other health services. The ability to ensure that vaccines and supplies make it to the ‘last mile’ depends on the strength of information systems, monitoring and supervision, the supply chain network design, and of course the resources available.⁵⁶ In such contexts, poor infrastructure and information make it

difficult to estimate demand for vaccination at remote health posts, and capacity to provide services is often weak. As a result, the schedule for vaccine deliveries and quantities may be ad hoc or inadequate, and health workers may be required to travel to district warehouses to collect supplies, using time which should be spent providing services.⁵⁷

To avoid the loss of health workers’ time and to improve the quality of services, innovations in distribution systems to reach the last mile are needed. One such innovation, piloted by an organisation called Village Reach,⁵⁸ creates a system of dedicated trucks and personnel who visit the most remote villages at least once a month. In addition to transporting supplies and vaccines, the personnel collect information on the demand for and capacity to administer vaccines at these health posts, with

BOX 9: THE RED STRATEGY

Launched in 2002 by the World Health Organization (WHO) and partners, the RED strategy aims towards the goal of the Global Immunisation Vision and Strategy (GIVS) – achieving at least 80% immunisation coverage in every district.

The five operational components of RED are:

- 1) re-establishing outreach services (regular outreach – of immunisation and other interventions – for populations with no access to health centres)
- 2) supportive supervision
- 3) linking services with communities (involving communities in planning and delivery)
- 4) monitoring and use of data for action
- 5) planning and management of resources (micro-plan based on local situation, but national and district responsibility to ensure financial and human resources are available to deliver services).

RED encourages extensive investment in identifying unreached populations through district-level planning, and tailoring solutions to the difficulties in reaching them. RED guidelines prioritise low-performing districts with the largest numbers of unvaccinated children, and establish a mix of approaches tailored to reach the unreached and to

address causes of un/under-immunisation – whether due to problems of access (the ‘left-outs’) or of uptake (the ‘drop-outs’).

Once populations are identified, specific delivery strategies need to be carefully considered and budgeted, whether for fixed, outreach or a mobile strategy. In peri-urban Zambia, for example, geographical information system (GIS) data was used to support mapping of outreach services in order to overcome barriers of distance that can disproportionately affect the poor.⁵¹

Establishing appropriate and frequent outreach strategies to reliably reach remote and underserved populations within the district remains an important component of the RED strategy to address inequalities. Successful implementation of RED also shows the importance of linking services with the community. This can be achieved, for example, through targeted outreach and collaboration with community leaders and other non-health workers to increase demand. A cornerstone of the RED strategy is ongoing training and supportive supervision of health workers to ensure quality services. Sustainability is a crucial feature of RED, requiring ongoing investment.⁵²

the aim of reducing stock-outs and wastage. They can also repair machinery, and provide supportive supervision and training to the health workers serving the rural communities. Such initiatives help to avoid missed opportunities and enhance the quality of care at service delivery points.⁵⁹ This approach was found to be successful in Mozambique where the strategy was piloted (Box 10). Despite the resources required, it was also found to be cost-effective, especially when linkages with the private sector were explored.⁶⁰ The sustainability of such strategies depends on an appropriate level of decentralisation and political buy-in from sub-national health officials.⁶¹ This approach has the advantage that it can also serve other primary healthcare needs, as a delivery mechanism for other essential supplies and drugs for frontline health workers.⁶²

COMMUNITY EMPOWERMENT FOR DEMAND AND ACCOUNTABILITY

Partnership with communities is a crucial element of any strategy to reach the hard-to-reach. Where communities know their rights, are aware of the benefits of health services, and know where, when and how to access them, vaccination coverage is higher.⁶⁵

Health service communication with communities must be appropriate in content, language and mode of transmission, based on an understanding of how

communities access and share information.⁶⁶ For example, mass media may reach wealthier and urban households but may be less effective in reaching poor and rural households.⁶⁷ Instead, ensuring that information is shared where communities normally gather and that messages are relevant for different population groups is likely to be more effective.⁶⁸

Information is essential but insufficient to empower communities.⁶⁹ Communities must also be empowered to demand the services to which they are entitled. Enabling communities – including marginalised or underserved members, respected community and religious leaders, and community-based organisations – to participate in the design and implementation of immunisation strategies can be an effective way to foster ownership and promote accountability.⁷⁰ This can also help to reduce cultural and social resistance to immunisation, as well as misunderstandings due to inadequate or incorrect information.⁷¹ Evidence shows that community participation in immunisation programmes also leads to higher coverage.⁷²

Community-based workers and volunteers play a key role in empowering, educating and communicating with communities, changing attitudes and behaviour, building trust in the health system and generating demand for good-quality services.⁷³ The power of communities to demand access to immunisation was recently revealed in Bamyán,

BOX 10: VILLAGE REACH IN MOZAMBIQUE

Village Reach piloted a last mile strategy in an extremely remote district in northern Mozambique, where over 80% of health posts lacked electricity, and vaccine coverage and per capita income were the lowest in the country. Health workers in the district were spending up to 18% of their time travelling to and from district warehouses for vaccines and supplies.⁶³

Despite difficult terrain, delivery trucks remain the most reliable method for vaccine delivery and information collection. As part of the strategy, a dedicated field team delivers vaccines monthly, collects information on wastage and usage, and provides training to health workers.

As a result, vaccination coverage increased to 92% and stock-outs fell to less than 1%. Drop-out rates

also decreased, with 91% of families interviewed having visited the clinic in the last month, despite 47% living more than two hours away. Previously, the most common reason for vaccination failure was “place of immunisation too far”, suggesting that the reliability and quality of services has helped to overcome barriers caused by distance.

Village Reach also paired up with a local gas company to deliver propane tanks in trucks carrying the supplies. These tanks supported vaccine refrigerators at clinics, and were sold to the community to offset some of the delivery costs.

Following this successful pilot, Village Reach has extended its strategy, in collaboration with the government of Mozambique, to more districts around the country.

Source: Kane, 2008⁶⁴

Afghanistan (Box 11). Tools, such as child health cards, can also help to empower communities – as was found in Penjikent District, Tajikistan (Box 12).

Community participation in local, national, regional and global accountability structures and processes is imperative – as identified by the Commission on Information and Accountability for Women and Children’s Health.⁷⁴ Mechanisms and processes should be established to ensure that communities are able to hold their health service providers and the health system accountable for providing the services to which they are entitled. Civil society organisations have a role to play in supporting communities to be able

to do this. Various tools exist to help with this, such as community scorecards⁷⁵ to monitor the quantity and quality of health services provided.⁷⁶ Other mechanisms may include, for example, local health committees and groups, and patients’ rights charters.⁷⁷

At global level, meaningful civil society participation must be included in the monitoring and accountability framework for the Global Vaccine Action Plan (GVAP), which is currently being developed by WHO. Efforts to integrate this into the existing structures of the Global Strategy for Women and Children’s Health must also be made.

BOX 11: THE POWER OF COMMUNITIES TO DEMAND SERVICES IN BAMYAN, AFGHANISTAN

Community demand can affect immunisation strategies and improve coverage for unreached populations. Through awareness work of Save the Children in Yakawlang District, in the province of Bamyan, Afghanistan, communities now understand about illnesses that could be prevented by vaccination, and have used this knowledge to make demands for services. A community health *shura* (tribal or village council) in the district saw that the children of their community did not have access to a number of health services, including immunisation. The nearest health facility is a four-hour walk

away, and most families are unable to afford the transport costs to access healthcare. The *shura* identified representatives to travel to the district hospital to demand outreach vaccination services to the community. As a result, 800 families are now included in the vaccination outreach schedule. Save the Children has also worked with the communities to approach the Provincial Health Director and request that health services be brought closer to the community, via community-based health workers and facilities.

Source: Save the Children

BOX 12: EMPOWERING COMMUNITIES WITH CHILD HEALTH CARDS IN TAJIKISTAN

As part of a project to strengthen routine immunisation in Penjikent District, Save the Children – in partnership with the District Department of Health – introduced child health cards and trained health workers on how to use them.

Armed with knowledge about how to protect their child’s health, a schedule of immunisation services, and the child health card, parents were empowered to demand health services. This created a shift in the power dynamic between health workers and parents. The responsibility for immunisation previously rested exclusively with the health worker,

whereas caregivers now play an important role in promoting the health of their children.

Following the success of the Penjikent pilot, UNICEF worked with the government and Save the Children to advocate for the nationwide introduction of child health cards. Now part of national policy, health cards are given to all mothers after delivery. Families are required to show the child health cards to prove complete immunisation when a child starts school, and before admission to hospitals and clinics.

Source: Save the Children

POLITICAL WILL AND INVESTMENT

Across all strategies to reach the hard-to-reach, political and social will to address inequalities in immunisation coverage and access to healthcare is a major driver of progress.⁷⁸ Commitment to equity at all levels of the country's government can help focus efforts. For instance, in Ethiopia the Minister of Health called on areas with large numbers of unimmunised children to improve performance, while in Cameroon the Minister of Health sent congratulatory letters to health personnel and communities to recognise good performance.⁷⁹ It is crucial, however, that political commitments are translated into supported and concerted action at all levels.

Implementing and sustaining strategies to reach the unreached with immunisation will also require significant investment. The importance of strengthening and extending routine immunisation to the poorest and most marginalised is imperative to achieve goals of universal access to immunisation as part of a basic package of essential health services. This will require political commitment to secure sufficient and sustained resource allocation to immunisation and primary healthcare programmes,⁸⁰ and to the cross-cutting components of the health system. Many of the recurrent costs of strategies such as RED fall on government budgets at the district level.⁸¹ Where substantial mobile outreach has been necessary, such as in Haiti, immunisation costs can more than double, rising from \$7–20 to \$30–40 per child.⁸²

Policy-makers and programme managers face difficult decisions in planning their health budgets, assessing the trade-offs between different interventions and delivery strategies,⁸³ and in some cases the different areas of the country, some being more politically salient than others. There are up-front costs with reaching the hard-to-reach, but in the long run it is expected that there will be returns on investment in health and economic outcomes.

In all low- and middle-income countries, achieving and sustaining universal access to the full benefits of immunisation will require better use of existing resources as well as additional investment in the health sector, particularly with the rising costs of immunisation programmes. This is particularly true in light of the growing number of vaccines recommended for inclusion in national schedules, many of which are more expensive new vaccines. System and infrastructure costs of vaccination

programmes are also rising, and will rise even more as efforts are made to reach the unreached, who often lack access to the health system altogether.⁸⁴

The major source of funding for immunisation programmes is country public health budgets. Increasing and sustaining public resource allocation to routine immunisation and health is a critical sustainability strategy. Domestic revenues must be raised through progressive taxation,⁸⁵ and services made available to all people free at the point of use,⁸⁶ so that access and coverage are based on need, not ability to pay. This is not just the case for immunisation; there is now a consensus, based on significant research and experience, that user fees should be removed for all essential health interventions,⁸⁷ as the benefits of universal access far outweigh the economic costs. To promote transparency and accountability, governments should have budget lines linked to immunisation programmes⁸⁸ within their health budget. Having specific budget lines has been associated with heightened priority to immunisation, reflected through increased investment.⁸⁹

In 2001, African governments committed to allocate at least 15% of their budgets to health, yet over a decade later, few countries have fulfilled this pledge.⁹⁰ Moreover, for most developing countries, 15% of the public budget will still fall short of the estimated minimum per person spend on health – about \$60 by 2015 – required to provide the very basic life-saving health services.⁹¹ In such contexts, reliable and appropriate development assistance must fill this funding gap. In parallel, development partners must support countries to build their tax bases and must explore alternative progressive taxation in order to increase the public budget towards self-sufficiency.

IMMUNISATION AS A DRIVER FOR BROADER HEALTH EQUITY

The immunisation system has the potential to accelerate improvements in other areas of health. A fully vaccinated child will access the health system (either through outreach services or health facilities) five times in their first year of life.⁹² Immunisation can therefore help to bring otherwise excluded children into the reach of other essential health services. Where immunisation coverage is both higher and more equitable than other health services, using vaccination platforms to deliver a broader package of interventions – for instance, through outreach or mobile teams – will help to narrow inequality gaps in coverage for a wider

set of health services. Furthermore, moving away from 'vertical' approaches to embed immunisation services within an integrated primary healthcare system can be a more efficient use of resources, and will provide sustainable access to essential healthcare.

Immunisation plans and strategies at country and sub-national levels should be integrated into broader health plans and must include the twin objectives of increasing overall coverage and reducing inequalities.

For a health system to promote equity, certain broad characteristics must be present. As already noted, inequalities often stem from political decisions and uneven distribution of resources, and therefore there must be political will to rectify this and address inequalities. This must be translated into appropriate policy frameworks and decentralised strategies, and be backed up by adequate resources allocated for implementation. To improve equity across primary healthcare and produce more sustainable results, cross-cutting bottlenecks must also be addressed.⁹³ A comprehensive primary healthcare approach should be embraced, with the involvement and empowerment of target population groups and civil society.

Currently there is great momentum behind immunisation. This opportunity should be seized to drive more equitable coverage across a broader package of health services.

VACCINATION PLATFORMS TO DELIVER A BROADER PACKAGE OF INTERVENTIONS

Immunisation coverage tends to fare better than many other essential reproductive, maternal, newborn and child health interventions in terms of absolute coverage levels and equity of coverage.⁹⁴

Vaccination can therefore be an optimal platform and an entry point to increase the coverage of other interventions.⁹⁵ Of course, this should only be pursued with suitable interventions,⁹⁶ without overburdening health workers,⁹⁷ and where packaging can add value to existing models of service provision.⁹⁸

Immunisation programmes also often have better access to hard-to-reach communities through outreach or mobile teams; for some children and their families this may be their only access to a health worker or the health system. In such circumstances, it is important to seize the opportunity to expand access to other interventions. As with all outreach services, this should not undermine the importance of strengthening the health system to ensure that all communities have regular and needs-based access to health services.

There is no single approach for determining which interventions should be packaged and how it should be done. Strategies can vary according to the level of integration of the packaged interventions (ie, partial integration of a few interventions or full integration of all available interventions), the delivery strategy (ie, facility-based, outreach or campaign), and the complexity of interventions (eg, single versus multiple episodes of care).⁹⁹ For example, Child Health Days/Weeks are an example of a strategy to increase access to a package of services for children who may have limited access to a health facility (Box 13).

Deciding what strategy to use will depend on the specific context, the cost-effectiveness and feasibility of combining different interventions and delivery channels, the acceptability of interventions to the

BOX 13: MATERNAL AND CHILD HEALTH WEEKS IN SIERRA LEONE

In the past decade, Sierra Leone has had some of the worst health indicators worldwide. However, the focus of the Ministry of Health and Sanitation to improve maternal and child health and the subsequent introduction of various strategies to accelerate progress towards Millennium Development Goals (MDGs) 4 and 5 offers hope. One key strategy has been the implementation of Maternal and Child Health Weeks twice a year to increase coverage of a package of

high-impact reproductive, maternal, newborn and child health (RMNCH) interventions. This is in addition to routine primary healthcare services that are provided across the country. Efforts to strengthen health service delivery and expand access to essential healthcare, including the launch of the Free Healthcare Initiative, combined with improvements in the quality and uptake of routine immunisation services, have led to vaccination coverage reaching 84%.¹⁰⁰

Source: Save the Children

TABLE 2: CONSIDERATIONS WHEN PACKAGING INTERVENTIONS WITH IMMUNISATION

Intervention-specific	Health system-related
<ul style="list-style-type: none"> • Compatibility of interventions • Harmonisation of activities • Target group • Timing/frequency of intervention • Funding available • Logistical requirements • Level of acceptance of, and support for, interventions (by patients, communities, community leaders, health workers, government) • Health worker skill requirements (skill set/level) • Coordination between partners • Supply chain requirements • Managerial capacity and availability of necessary human resources 	<ul style="list-style-type: none"> • Political will to promote integration and coordination • National policies to support each intervention • Financial support and logistics for each intervention • Primary healthcare structures to deliver each intervention (within the broader health system) • Decentralised health structures to ensure access of remote or hard-to-reach populations • Responsibility for monitoring each intervention clearly defined • Health workers in place to cover a range of essential services (ie, not designated or funded for a single intervention) • Combining the interventions does not interrupt, or create a burden for, service delivery

Source: Adapted from USAID, 2007¹⁰²

community, and the capacity and resources to deliver them.¹⁰¹ Table 2 identifies important considerations related to both the interventions and the health system when developing a packaging strategy.

Interventions to be packaged with immunisation can be preventive and curative services, health promotion, or the distribution of commodities. On the basis of various reviews, identified interventions include:¹⁰³ distribution of vitamin A or deworming tablets, oral re-hydration salts, distribution of insecticide-treated bed nets (ITNs), growth monitoring, nutrition education, health education, hygiene, breastfeeding promotion, administration of anti-malarial medication, integrated management of childhood illness (IMCI), nutrition care, other curative care, family planning services, antenatal care (ANC), and newborn care. Given the importance of intervention compatibility (eg, with regard to delivery strategies and frequency of delivery), preventive and promotive services may be easier to package, whereas curative care will be needs-based and may be harder to standardise. Similarly, interventions that have the same target group as immunisation may work best.

Where routine immunisation and health systems are strong, packaging can produce high and equitable coverage for the linked interventions.¹⁰⁴ Where the health system is weak, packaging can be effective in outreach and campaign approaches to improve equity in coverage of other interventions.¹⁰⁵ As with routine immunisation, strategies for successful packaging of interventions can be most effective where the health

system is decentralised, increasing the opportunity for context-specific tailored approaches to reach the unreached.¹⁰⁶

If appropriately designed and implemented, packaging interventions can be cost-effective and efficient, with pooled resources and logistics that realise the synergies of a more integrated approach.¹⁰⁷ It can also be more convenient for users and communities, increasing confidence and satisfaction.¹⁰⁸ Seizing the opportunity to increase coverage of other essential interventions by packaging their delivery with immunisation could also reduce mortality rates. For example, if other essential interventions – such as vitamin A supplementation and provision of ITNs,¹⁰⁹ as well as education on breastfeeding promotion, appropriate complementary feeding and hand-washing with soap – were packaged with and achieved coverage levels as high as immunisation,¹¹⁰ nearly seven million additional under-five deaths could be averted in Countdown 2015 countries.¹¹¹ If the global immunisation target of 90% national coverage is achieved by the same group of countries by 2020,¹¹² over nine million deaths could be averted if these other interventions were packaged with immunisation.¹¹³ However, as already mentioned, what, when, and how to package interventions will be context-specific and should only be pursued where systems are robust enough to support the additional interventions. Also, for this to operate at scale will require a significant investment in the number and quality of healthcare workers.

EMBEDDING IMMUNISATION WITHIN INTEGRATED PRIMARY HEALTHCARE

As noted earlier, there is currently great momentum behind immunisation. It is incumbent on governments to try to seize this opportunity and use it to move towards strengthening comprehensive health systems. Targeted 'vertical' approaches can divert funding or create parallel sub-systems that can crowd out other activities, leading to duplication and overburdening health workers or taking them away from their daily tasks. Therefore, when designing and planning immunisation programmes, care should be taken to ensure better integration and complementarity with the primary healthcare system, so that efforts lead toward a common goal of ensuring that every child has sustainable, needs-based access to care and receives a basic package of health services.

Immunisation services should not only be embedded within comprehensive systems, but used to strengthen rather than weaken those systems. With immunisation there are strong arguments for making use of the current drive to achieve universal coverage of immunisation as a step towards Universal Health Coverage. This is for the benefit of immunisation itself as well as other services.

Integration in primary healthcare is not a new approach – it was a key part of the Alma Ata Declaration in 1978.¹¹⁴ In recent years, it has gained momentum as efforts to achieve the health MDGs has accelerated. Despite achievements of vertical disease- or intervention-specific programmes, the limitations of such approaches and the importance of a robust health system for sustained outcomes have become increasingly apparent.¹¹⁵ Integration is also recognised in current global immunisation guidance – identified in both the 2006–2015 Global Immunisation and Vision Strategy (GIVS)¹¹⁶ and the recently endorsed Global Vaccine Action Plan (GVAP).¹¹⁷ The evolution of GAVI's cash-based support from a focus on immunisation to health system strengthening demonstrates the importance of integration.¹¹⁸

Experience in countries has demonstrated the potential benefits of this approach. Integrating immunisation into primary healthcare in Nigeria, for example, has been effective at strengthening the overall system while also raising immunisation coverage levels (Box 14). In Zambia, efforts are being made to address the problem of diarrhoea through a holistic approach (Box 15).

BOX 14: INTEGRATING IMMUNISATION IN PRIMARY HEALTHCARE IN NIGERIA

The Programme for Reviving Routine Immunization in Northern Nigeria (PRRINN) began in late 2006 with a focus on increasing immunisation coverage. Recognising that routine immunisation is often an entry point into primary healthcare, and acknowledging the need for a strong system to effectively improve maternal, newborn and child health (MNCH) outcomes, the programme was expanded in 2008 to become 'PRRINN-MNCH'. This programme is managed by a consortium of Health Partners International, Save the Children, and GRID Consulting Nigeria, with funding provided by UK Aid and the State Department of the Norwegian Government.

Working closely with the government at federal, state and local levels, as well as with communities, PRRINN-MNCH is managed as an integrated programme to improve access to and the quality of essential health services through advocating to

influence policy, strengthening primary healthcare, and generating demand, voice and accountability.

This programme has contributed to a fall in the infant mortality rate (IMR).¹¹⁹ Contributing to this fall, there have been notable increases in coverage and utilisation of MNCH services, including immunisation. For example, the percentage of one-year-olds that are fully immunised has increased nearly 12-fold.¹²⁰ Improvements have also been observed in MNCH knowledge, attitudes and practices, and governance and accountability are improving with the introduction of monitoring and evaluation frameworks to track the implementation of the state health plan, and sectoral performance reviews. Efforts have also been made to strengthen the health workforce, through the introduction of Human Resources for Health (HRH) policies and plans, and better training.¹²¹

Source: PRRINN-MNCH, 2012¹²²

BOX 15: A COMPREHENSIVE APPROACH TO DIARRHOEA IN ZAMBIA

Diarrhoea is one of the top three killers of children in Zambia, claiming 40 children's lives every day, and accounting for 840,000 clinic visits and 63,000 hospital referrals a year.

Working through the Ministry of Health and in partnership with the Centre for Infectious Disease Research in Zambia (CIDRZ), ARK (Absolute Return for Kids)¹²³ is implementing a programme¹²⁴ that aims to halve diarrhoeal deaths and reduce child mortality by 15% by 2015, through a combination of vaccination, health worker training and community-led behaviour change.

Through the programme, support to the health system and strengthening of the cold chain helped to secure GAVI approval for the national roll-out of rotavirus one year ahead of schedule, which will result in 750,000 children being vaccinated over the next three years. This ensures a robust health system is in place to support the roll-out of new vaccines, and to sustain routine immunisation and

promote equity. In addition, 560 new health workers will be trained in the integrated management of childhood illness, with a focus on diarrhoeal disease, at a newly built training and clinical facility in Lusaka. In parallel, theatre, puppetry and other such initiatives are raising awareness of the importance of vaccination, hand-washing, exclusive breastfeeding and the use oral rehydration salts (ORS) and zinc at first symptoms of diarrhoea. Community education is equipping more than a quarter of a million parents with the knowledge and skills to keep their children healthy.

Critical to the success of these interventions is the support of multiple stakeholders, through public-private partnerships, and in particular the local community. This support will strengthen the supply and demand for vaccination, and other interventions that can prevent, and speed up recovery from, severe diarrhoea.

Source: <http://www.arkonline.org/Zambia>

3 AN ENABLING ENVIRONMENT FOR UNIVERSAL IMMUNISATION: WHAT IS NEEDED AT GLOBAL LEVEL?

Ensuring that every child has access to immunisation will not only require resolute action within countries. In addition to the strategies identified above, various factors at the global level can help to create a more conducive environment for countries to move towards universal immunisation coverage. As a global public good and part of the human right to health, ensuring that all children are reached with immunisation is the joint responsibility of individual countries and of the global community.

In the following sections we look at the need for research and development agendas to be adapted so that they respond to the major causes of mortality and morbidity of the poor and vulnerable. These measures include the development and adaptation of products to better suit the contexts within which these populations live – for instance, where health systems and cold chains are weak. Low- and middle-income countries also need sustainable access to vaccines at affordable prices. For this, the international community should help promote competition in the market of vaccine development and supply, to ensure that developing countries have access to affordable vaccines. This is one of the targets in the MDG 8 (Develop a Global Partnership for Development). This can be done by facilitating competition, supporting technology transfer to build the capacities of emerging market producers, and through pooled purchasing.

We also look at the changing face of global poverty and the implications for the global aid architecture

for immunisation. A growing proportion of the world's poor now reside in middle-income countries (MICs); the majority of them in lower-middle-income countries (LMIC)¹ and fragile and conflict-affected states. As highlighted by Andy Sumner in his recent update of the distribution of global poverty data, this creates a 'poverty paradox', with the majority of the world's extreme poor no longer living in the poorest countries:² around half live in India (an LMIC) and China, a quarter in other MICs (namely LMICs such as Pakistan, Nigeria and Indonesia), and the remaining quarter in low-income countries (LICs).³ This shift in the distribution of global poverty changes the dynamic to some extent. It emphasises the need to look not only at absolute poor countries, and adds weight to the importance of addressing inequalities within countries. This is not to deter attention from LICs, but highlights the need to also look at the 'bottom billion'⁴ living in MICs.

We address the implications of this for all stakeholders, including the Global Alliance for Vaccines and Immunisation (GAVI Alliance)⁵. As countries' gross national income (GNI) increases, this means that many of them will no longer qualify for GAVI support, with serious implications for these countries, in particular in terms of vaccine affordability and procurement. As we seek to reach the final fifth of unimmunised children, national governments and key stakeholders at global level will need to adapt to these changing dynamics to create a conducive environment for promoting equity in immunisation.

VACCINES THAT MEET THE NEEDS OF THE POOR

RESEARCH AND DEVELOPMENT SHAPED BY THE BURDEN OF DISEASE

Pharmaceutical research and development (R&D) presents a huge opportunity to accelerate progress towards MDG 4 through investment in products that will address the complex disease burden and realities of resource-poor settings. While much progress has been made on this front, with pharmaceutical R&D investment leading to the development of a range of vaccines targeting numerous diseases, with specific attention to formulations, presentations and improved packaging for LICs, more still can be done. Vaccines are effective at protecting most children; however, since several existing vaccines were primarily developed to respond to the epidemiology and profile of diseases in industrialised countries, this makes some of them potentially less effective against the strains of diseases affecting developing countries. For instance, the pneumococcal vaccine does not contain all serotypes of the disease that affect children in particularly poor settings,⁶ and there are many diseases affecting realisation of MDG 4 for which there is not yet the vaccine technology.

Knowledge of disease epidemiology in developing countries is limited, owing to weak surveillance systems. Hence, it is first necessary to have better knowledge of what types of disease burden are affecting poor countries, and then to use that information to inform vaccine development. It is important that investment in research and development for new vaccines fits the epidemiological profile of diseases where the burden of vaccine-preventable disease is highest. To support this, efforts should be made to further develop national research capacity. One promising example of this is MenAfriVac – a meningitis A vaccine developed specifically for sub-Saharan Africa's Meningitis Belt.⁷

VACCINES THAT WORK IN POOR AND REMOTE CONTEXTS

In addition to vaccines not responding to disease profiles, existing vaccine technology can make delivery problematic in settings where many children are currently unreached. The adaptation of existing technologies to better suit the contexts in which they are needed most – for instance, where the health system and cold chain are weak, or where there are no skilled health workers – needs to be prioritised by the global vaccination community, including

pharmaceutical companies, to ensure that no child is left unreached.

Many vaccines require a cold chain that maintains temperatures between two and eight degrees Celsius,⁸ and require a skilled health worker to administer the vaccine. Where electricity supplies are unreliable or absent, and cold chains are weak, vaccines cannot survive. It has been estimated that nearly half of all global vaccines are spoilt as a result of failures in the cold chain.⁹ This is not merely a waste of resources; it significantly reduces the likelihood that the most remote and vulnerable will be reached.

Innovative technologies such as solar-powered refrigerators can help to expand access – as we saw in Jigawa, Nigeria (Box 7). Existing thermostability data for vaccines should also be revisited, or additional data collected, to determine whether guidelines could be revised to allow for use of some vaccines in a controlled temperature chain (CTC).¹⁰ Where applicable, vaccines should be recertified to reflect their actual stability outside of the cold chain. Vaccines should also be developed in more thermostable presentations. For example, promising new discoveries, such as the use of silk-based stabilisers, may extend the temperature window for some sensitive vaccines; however, these are still to be developed.¹¹

To administer injectable vaccines safely, health workers require a certain level of training and supportive supervision, but where children remain unimmunised, there tends to be a shortage of trained health workers.¹² By adapting the format of vaccines and their delivery mechanism so that they can be delivered by CHWs with less training, the task of immunisation could be shifted to the community more effectively. This will promote equitable coverage where communities are unable to access health facilities, and where skilled health workers are few. The success of task-shifting for oral polio vaccination is partly due to the ability of CHWs to administer the vaccine, as it is administered through drops in the mouth, rather than by injection.

Other adaptations also show potential. For example, the Uniject (a pre-filled single-use device) has been used by midwives to administer hepatitis B vaccination at birth.¹³ Unlike most vaccines, hepatitis B remains effective at room temperature for up to 30 days. Other new (or revisited) technologies like jet injectors,¹⁴ micro-needles¹⁵ and vaccines that can

be inhaled need further testing in order to receive regulatory approval. Efforts will have to be made to build communities' confidence and acceptance of such unfamiliar products.

Such developments have huge potential for narrowing equity gaps in immunisation coverage, and R&D resources should be invested to accelerate the production of adapted products and to ensure that they are widely available in the contexts where needs are greatest. This has implications for the pharmaceutical industry and for actors with market-shaping capacities, such as GAVI, to incentivise the development of such technologies and ensure sufficient affordable supply for the countries that need them most.

SUSTAINABLE ACCESS AND AFFORDABILITY

For countries to reach unreached children and sustain high levels of coverage, vaccine prices must be affordable for developing countries. With the recent introduction of new vaccines, the price of the expanded programme on immunisation has increased from \$1.37 per child in 2001¹⁶ to \$38.80 in 2011.¹⁷ This is nearly a 30-fold increase. Between 2000 and 2009, government per capita expenditure on health increased by just 1.8 times at the global level, and it slightly more than doubled in low- and lower-middle-income countries, reaching \$23 and \$56 respectively.¹⁸ The rising cost of vaccines places a particularly heavy burden on countries that are not eligible for GAVI support, and therefore cannot purchase vaccines at significantly reduced prices; those countries that do not qualify for 'tiered' pricing;¹⁹ and those countries that do not have access to pooled procurement.²⁰

Various strategies can make vaccines more affordable for developing countries. Although GAVI has managed to reduce prices greatly, there is still more room for lowering vaccine prices. Getting information on the 'real' cost of manufacturing vaccines would contribute to reaching this objective. The international community can also help increase competition in the market of vaccine development and supply, to ensure that developing countries have access to affordable vaccines – one of the targets in MDG 8 (Develop a Global Partnership for Development). This can be done by facilitating competition, or by supporting technology transfer to build the capacities of emerging market producers, which involves addressing

issues related to intellectual property, having the know-how and technology, regulatory barriers, and associated costs. Pooled procurement can bring down prices and improves forecasting and predictability of sales, often leading to more robust information for manufacturers so that they can produce adequate supply. Tiered pricing could enable the introduction of new vaccines at a more affordable price.²¹

INCREASING COMPETITION THROUGH EMERGING MARKET SUPPLIERS

There is particular hope for emerging market producers to drive down the prices of existing vaccines. Over the past decade, manufacturers in Brazil, Cuba, China and India, for example, have demonstrated their capacity to produce low-cost vaccines at international-quality standards. The Developing Country Vaccine Manufacturers' Network (DCVMN) – an alliance of vaccine manufacturers from emerging markets – aims to ensure a steady supply of good-quality vaccines that are accessible for developing countries.²² In just a decade, the GAVI Alliance's procurement of vaccines from emerging country manufacturers has increased from about 20% in 2001 to more than 50% in 2010.²³

Just like Indian generic medicines, Indian vaccines are being pushed as low-cost alternatives to high-priced vaccines produced by multinational pharmaceutical companies. In 2010/11 the vaccines market in India was estimated at around \$350 million, an increase of more than 22% from the previous year; it is expected to grow to \$1.7 billion by 2020.²⁴ Serum Institute of India Ltd is the largest WHO pre-qualified vaccine producer in the world for measles and measles-rubella combined vaccines, and the diphtheria, pertussis, tetanus and hepatitis-B (DTP-HB) combination vaccine.²⁵ An estimated two in every three immunised children worldwide have received a vaccine manufactured by Serum.²⁶

In March 2011, WHO recognised China's national regulatory authority, the State Food and Drug Administration (SFDA), as meeting international standards for vaccine regulation. This means that Chinese-produced vaccines are now eligible for WHO pre-qualification, after which manufacturers will be able to sell to the Pan American Health Organization (PAHO) and UNICEF. The Japanese encephalitis vaccine produced by the Chengdu Institute of Biological Products is the first Chinese application for WHO pre-qualification. It is hoped that China's entry to the global vaccine market will be significant

in lowering prices and reducing supply shortages over the longer term.

To date, competition between producers has been effective at driving down the price of several vaccines (Box 16).

There has been some concern about the quality of emerging manufacturer vaccines. For instance, India's Panacea Biotech's Easyfive Pentavalent and oral polio vaccines were recently removed from WHO's pre-qualified vaccines list because of problems concerning quality.³⁷ Another potential risk is the acquisition of emerging market companies by multinationals – such as Sanofi Aventis' recent purchase of Shantha, which may undermine the essential role of new market entrants in promoting competition and lowering prices.

GETTING THE KNOW-HOW THROUGH TECHNOLOGY TRANSFERS

Despite these successful examples, the difficulty of understanding how to produce such vaccines (ie, obtaining unpatented proprietary knowledge) can be a significant barrier to market entry.

Vaccines are different from drugs in that a true 'generic' vaccine does not exist. Owing to the biological nature of the product, it is impossible to certify that vaccines produced by different

manufacturers are identical.³⁸ Unlike in the case of drugs, reverse engineering (ie, taking apart a product to analyse its workings in detail) is also almost impossible.

Accessing the 'know-how' to produce a vaccine is where the obstacle often exists. Even if there is no patent on the product, or a party gains legal rights to use someone else's patent, they must have the specialised capabilities and equipment to understand and apply the knowledge. This is so complex that it is this difficulty, rather than the patents, that is the real barrier to competition for most vaccines.³⁹ Further, costs associated with clinical trials that are essential to prove safety and efficacy produce another major barrier, particularly for emerging market producers.⁴⁰

Patents might, however, become more of an issue in the case of new vaccines. For example, malaria is known to have a 'patent thicket' – a dense web of overlapping intellectual property rights that a company must navigate through in order to commercialise new technology. In such cases there may be potential for more innovative measures, such as joint intellectual property (IP) management, or 'patent pools'⁴¹ for IP related to vaccines, in order to increase manufacturers' access to IP, thereby promoting competition.⁴² Yet, for vaccines this may take a long time to materialise. Furthermore, in order to comply with the World Trade Organization's

BOX 16: DRIVING DOWN VACCINE PRICES THROUGH COMPETITION

The price of the recombinant **Hepatitis B** vaccine has declined by nearly 70% over the last couple of decades, due in part to competition from developing country manufacturers. Market prices dropped from just under \$0.60 per dose in the late 1990s to its current price of less than \$0.20 per dose.²⁷

For **Pentavalent**, competition from developing country vaccine manufacturers has led to a price drop from \$3.50 per dose in 2001²⁸ to \$1.75 in 2011.²⁹ This pressure led to both GlaxoSmithKline (GSK) and Crucell lowering their prices that are offered to UNICEF.³⁰

GSK also recently finalised its offer to supply its **rotavirus** vaccine to GAVI for \$2.50 per dose (\$5 for a course)³¹ – a 67% reduction in the current lowest available public price³² – while

Merck has offered its rotavirus vaccine to UNICEF for \$5.00 per dose, though decreasing to \$3.50 once purchase volume increases to 30 million doses.³³ Three emerging market companies from India – Bharat Biotech, Serum Institute and Shantha Biotechnics – are expected to start producing rotavirus vaccines for GAVI-eligible countries in 2015. Bharat's product³⁴ will be priced at \$1 per dose (\$3 for a course) – a 40% reduction from the GSK price.

Merck & Co Inc plans to offer the **human papillomavirus** vaccine to GAVI at \$5 per dose – representing an 86% reduction from its launch and introduction into the US national immunisation programme in 2006.³⁵ Shantha, Serum and Bharat are all currently trying to produce low-cost versions.³⁶

(WTO)'s Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPs), developing countries may have to implement changes, which may create new obstacles for vaccine development.⁴³

In response to intellectual property barriers, technology transfer to developing country suppliers can improve access to vaccines and foster competition,⁴⁴ which can push prices down. The transfer of technology to developing country manufacturers for basic EPI vaccines, for example, has resulted in lower prices of vaccines. Where a major company licenses another supplier, there is a risk that prices may remain higher than what the market would otherwise facilitate.

However, simply transferring the technology necessary to develop the vaccine means that R&D capacity in a country is not developed. Ensuring that technology transfers include a capacity building element so that recipients are able to produce the vaccine is therefore important.⁴⁵ Rather than simply transferring the technology, this can increase manufacturing capacity. This is also more of a negotiation and business strategy issue because it requires proactive transfer on behalf of the IP holder, beyond simply cancelling IP protection.

Another concern with technology transfers is that it is a lengthy process. In the interim, countries will need to continue to source their vaccines through existing channels, for which they might pay higher prices. Also, if technology transfers lead to too many producers existing in the market, there is the danger that supply could surpass demand, or the price may be driven so low that manufacturers do not find it profitable to keep producing and they leave the market. New models for technology transfer may be needed, particularly for new vaccines.

POOLED PROCUREMENT AND PURCHASING FOR NON-GAVI ELIGIBLE COUNTRIES

Price negotiations also play an important role in improving affordability and access. Low-income countries have normally adopted newer vaccines at lower prices, made possible through GAVI-negotiated or tiered pricing – which allows manufacturers to charge different prices in different markets – as well as through donor subsidies.

Pooled procurement is a purchasing strategy that creates economies of scale by consolidating demand, resulting in lower transaction costs and better leverage to negotiate pricing and contract

terms. Examples of existing pooled purchasing mechanisms include the GAVI Alliance for low-income countries, and regional pooling, for instance, the Gulf Cooperation Council Purchasing Programme (GPP) and the PAHO Revolving Fund.⁴⁶

The GAVI Alliance is a good example of pooled purchasing in its procurement of vaccines through UNICEF Supply Division for LICs whose eligibility is determined by gross national income (GNI).⁴⁷ GAVI has 'created a market' for vaccines by forecasting demand, negotiating multi-year contracting and guaranteeing funding.

In terms of regional pooling, the GPP has extended the purchasing power of its member countries by issuing joint tenders for a wide range of medical products, including vaccines. The PAHO Revolving Fund procures vaccines for most of the countries in Latin America and the Caribbean (Box 17), a region that has mainly middle-income countries (MICs). Through this mechanism, all 40 countries have the same access to products at the same single price for a one-year period. PAHO negotiates substantial discounts on prices with manufacturers, offering in exchange predictable demand for significant volumes and funding. The Regional Office for the Eastern Mediterranean (EMRO) of WHO is also seeking to create a mechanism similar to PAHO.

Income-based pooling for countries that are not eligible for GAVI's negotiated rates provides a potential opportunity, particularly for LMICs and MICs that may be graduating from GAVI support. It has also been suggested that vaccine manufacturers may be interested in this approach, given to the potential size of the market.⁵³ This approach could be especially beneficial to countries with small populations and therefore weaker purchasing power.

IMPLICATIONS OF THE 'BOTTOM BILLION' FOR THE IMMUNISATION AID ARCHITECTURE

The face of global poverty is changing. Rapid but unfairly distributed economic growth has led to many developing countries acquiring middle-income status. This includes the 'big five': Pakistan, India, Nigeria, China and Indonesia (collectively known as PINCI),⁵⁴ where two-thirds of the world's poor reside. As a result, a 'new bottom billion'⁵⁵ has emerged, representing the approximately three-quarters of the world's poor who live in MICs.⁵⁶ Another emerging dynamic is the rising share of the world's poor living in fragile and conflict-affected states. Looking at these two dimensions together, there is a group of countries

BOX 17: LESSONS FROM PAHO ON POOLED PROCUREMENT

The PAHO Revolving Fund has been procuring for the region since 1979. The fund is financed entirely through national budgets. Each country pays 3% of the net purchase price to a common fund to create 'working capital', allowing countries to pay suppliers 60 days after the delivery of vaccines.⁴⁸

National governments authorise PAHO to purchase vaccines on their behalf, so purchasing orders and payments are made by countries through PAHO, while suppliers ship the commodities directly to countries. PAHO undertakes annual demand forecasting for all participating member states and consolidates this request into a single regional quantity for each product. A single price for each product is calculated by averaging the prices of all selected producers.⁴⁹

PAHO's Revolving Fund is undoubtedly a success story. Over the last 30 years it has helped its member countries to strengthen immunisation systems and introduce new vaccines at more affordable rates.

However, some challenges have now arisen with the PAHO model. PAHO includes a 'most favoured nation' clause that demands that vaccines are made available at the lowest possible price charged anywhere in the world.⁵⁰ This makes it virtually impossible for manufacturers to propose even lower prices to poorer countries through tiered pricing.

The Advance Market Commitment (AMC) for the pneumococcal vaccine has also caused problems with PAHO and manufacturers. Under the terms of the AMC, the vaccine was offered to GAVI-eligible countries at \$7 per dose, eventually falling to \$3.50 per dose.⁵¹ The price currently offered to PAHO is \$14.24/16.34.⁵² Concessions have since been made and GAVI-eligible countries within PAHO were allowed to procure at lower rates than other member states. However, it is unclear how this will affect future vaccines.

that can be classified as middle-income fragile or failed states, which contain 180 million of the world's poor people.⁵⁷ These emerging dynamics have implications for how donors should operate; these implications should be considered in the post-2015 development paradigm, and go beyond the subject of this report.

The problem of vaccine affordability is particularly acute for LMICs – where more than 12 million of the world's unimmunised children live⁵⁸ – some of which will soon no longer be eligible for GAVI support. More expensive than traditional vaccines, new vaccines such as pneumococcal conjugate and rotavirus are widely used in low-income countries with GAVI support, as well as in upper-middle income countries, whose average per capita public expenditure on health is more than five times higher than that of LMICs.⁵⁹ Very few non-GAVI-eligible LMICs have adopted rotavirus and pneumococcal vaccines (only seven⁶⁰ and four,⁶¹ respectively). In addition to introducing new vaccines into immunisation systems, many LMICs still face problems in reaching all children with older vaccines that were introduced decades ago. The challenge of new vaccines is in addition to the biggest challenges

of reaching the unreached, and efforts are needed to equitably reach all children with a full package of immunisation.

For several LMICs without access to pooled procurement, price is a key deciding factor on whether or not to introduce new vaccines,⁶² in addition to the availability of funding, the political prioritisation of immunisation, and the prevalence of vaccine-preventable disease.⁶³ In response to these affordability and price issues, the Vaccine Product, Price, and Procurement (V3P) project was recently launched to assist LMICs in making evidence-based decisions on sustainable vaccine introduction through increased availability of relevant data and information.⁶⁴ In addition, UNICEF is currently developing a strategy to support new vaccine introduction in MICs, recognising the challenges these countries face in adopting new vaccines.⁶⁵

This certainly has implications for the GAVI Alliance and countries currently receiving its support for the introduction of new vaccines and strengthening health systems. A country's eligibility for GAVI support is determined by a maximum per capita income threshold of \$1,520 in 2012,⁶⁶ and a minimum DTP3

coverage of 70%.⁶⁷ Sixteen countries with per capita income greater than this threshold will have to graduate from GAVI support for the introduction of new vaccines in 2015. These LMICs currently account for one-third of the birth cohort in GAVI-eligible countries. This has significant implications on funding for immunisation in these countries, which will no longer be eligible for GAVI support and will have to significantly increase spending to cover what was previously subsidised by GAVI.⁶⁸

Given this complexity and the predicament for the 'bottom billion', GAVI should collaborate with partners to support better access to vaccines for graduating countries. In terms of vaccine supply, they should work together with key players, including UNICEF, using their leverage and market-shaping capacities to encourage price transparency and reductions.

A more nuanced approach should also be taken for GAVI-eligible countries as it is clear that a 'one size fits all' approach to eligibility is no longer

appropriate. This has already begun with the development of a strategy for GAVI's approach to fragile⁶⁹ and underperforming countries, creating a more tailored country-specific approach. It is vital that transparency is maintained in future eligibility decisions.

Furthermore, although equity within countries currently exists as an operating principle and an objective within GAVI's health systems goal, there is no clear strategy for how GAVI is encouraging countries to address inequalities in immunisation coverage. This is inadequate and should be a core part of GAVI's business model as reflected in its next Business Plan. Eligibility criteria could include the absolute number of unimmunised, and the relative disparities in coverage groups between different parts of the population, determined between districts, or by income, education, rural/urban residence or gender.

CONCLUSION AND RECOMMENDATIONS

No child should be denied their right to immunisation, but millions still are. Immunisation is a cost-effective and beneficial health service that should be in reach of all children. Within countries, much can be done to overcome inequalities. Strong routine immunisation is crucial to achieving this. As we have shown, several strategies exist to reach the unreached, and governments can learn from good practices in order to address inequalities in their countries.

However, as we have highlighted, unequal levels of immunisation coverage in countries are often systemic. It is not a matter of luck who is immunised and who is not, but more often a reflection of political priorities and unequal allocation of resources. With sufficient political will and financial investment, there is no reason why countries cannot get close to universal coverage of immunisation, but to do so will require a political commitment to reach the poorest and most marginalised.

It is not acceptable, though, to reach those children with immunisation alone. Through immunisation, access to other essential health interventions can be extended for children and their families who need these services most. Strategies to reach the hard-to-reach with immunisation must also be used to provide other services to the community in an accessible way. But we must go further still. Immunisation must be embedded within an integrated primary healthcare system to ensure sustainable access to essential healthcare for children and their families. Immunisation should be part of a coherent strategy to make equitable progress towards universal coverage of essential reproductive, maternal, newborn and child health (RMNCH) services. Such an approach should build an ongoing and empowered relationship between the community and the health service,

ensuring that the staff, facilities, medicines and access are provided in order that the community can access the full range of essential RMNCH services based on need.

The global community has a responsibility to ensure a conducive environment in which countries can access the vaccines they need for all children. Research and development must respond to the burden of disease and context where needs are greatest. Through technology transfers, emerging market producers can acquire the know-how to compete in the vaccine market and drive down prices so that they are more affordable. Lessons can be learned from existing pooled-purchasing mechanisms and new ones should be explored (eg, income-based pooling), in particular for the number of LMICs that will be graduating from GAVI support.

Issues concerning vaccine access and affordability will become even more salient in light of the changing context of global poverty. Nearly 1 billion of the world's poor now live in middle-income countries (many of them in lower middle-income countries), and this has implications not only for these countries themselves, but also for GAVI and other partners. Eligibility for support should be adapted to respond to this changing environment; it should be context-specific, tailored, and transparent.

The fact that one in five children remains without basic vaccination is wrong. The world is faced with a unique opportunity to give every child a chance to survive beyond their fifth birthday. We know what needs to be done and we must seize the opportunity to achieve and sustain universal access to the full benefits of immunisation. This is a call to action for this Decade of Vaccines to ensure that inequalities in immunisation are addressed through building robust and integrated services so that no child dies from preventable or treatable causes.

RECOMMENDATIONS

This report calls on governments, development partners, the private sector and civil society to implement the following recommendations.

FOR GOVERNMENTS:

- Develop strategies to address inequalities in immunisation that are integrated into national health plans and that strengthen health systems. They should be costed, funded and implemented.
- Empower communities and engage them meaningfully as strategies are developed, implemented and monitored.
- Where appropriate, resolve to build and invest in national R&D capacities and strengthen government regulatory capacity.

FOR GAVI:

- Make equity a top priority in the next GAVI Business Plan and revise the eligibility policy to include equity criteria.
- Urgently realise commitment to allocate 15–25% of budget to cash-based support, promoting synergies across the continuum of care.
- Use market-shaping with pharmaceutical manufacturers to encourage price transparency and reductions, and collaborate with partners, encouraging LMIC tiered pricing and pooled procurement for graduating countries.

FOR BILATERAL DONORS:

- Champion the opportunity of immunisation to promote equity across primary healthcare, and ensure sufficient funding for countries to strengthen health systems, including immunisation as part of the essential basic package of services.
- Continue investment in and commitment to vaccine R&D, including building R&D and regulatory capacities in emerging markets.

FOR WHO AND UNICEF:

- Champion equity as the priority agenda within the Decade of Vaccines, and the opportunity of immunisation to promote equity across primary healthcare, encouraging sufficient investment from country governments and donors alike.
- Ensure meaningful civil society representation in the monitoring and accountability framework for the GVAP.

FOR THE PRIVATE SECTOR:

- Prioritise R&D that responds to the burden of disease and the contexts in which the poor and marginalised live.
- Increase transparency about vaccine prices and pricing mechanisms and be open to opportunities for pooled purchasing and tiered pricing by income level, particularly for LMICs.
- Support capacity building of emerging market suppliers through untied technology transfers, strengthening regulatory capacity, training, etc.

FOR CIVIL SOCIETY:

- Empower local civil society to actively participate in immunisation and health systems.
- Engage in the GVAP monitoring and accountability framework with all key stakeholders at local, country, regional and global levels.

APPENDIX: METHODOLOGY

The research for this report is largely based on **qualitative** analysis of published and 'grey' literature, reports, strategies and other relevant documents. The research investigated and analysed factors and strategies that affect increased and more equitable immunisation coverage – recognising that there may be different phenomena influencing these. It also looked at the broader health system within which immunisation programmes operate.

Case studies included in the report were identified by Save the Children country teams and other experts working in the area of equity and immunisation, as well as through the literature reviewed. Information was provided by staff or key informants in countries, and has been extracted from project/programme reports, published documents and information available on the internet.

A **Lives Saved Tool** (LiST) analysis was undertaken by Johns Hopkins Bloomberg School of Public Health, looking at the impact of packaging other reproductive, maternal, newborn and child health (RMNCH) interventions with immunisation. Two analyses were done: the first was to estimate the impact on under-five mortality rates of other linked interventions achieving the same levels of coverage as DTP3 for the Countdown countries; and the second scaled up all immunisation as well as packaged interventions to 90% coverage. The data used for these analyses were: population trends from the 2010 revision of the World Population Prospects (UN Population Division); 2010 child mortality estimates from <http://www.childmortality.org>; causes of death in children under five (2010 estimates) from Liu et al, 2012; vaccine coverage values 2004–2010 from WHO/UNICEF estimates (last updated 3 August 2011¹); breastfeeding, Vitamin A, complementary feeding, and

insecticide treated nets (ITNs) coverage data from the most recent DHS or MICS for each country; and hand-washing estimates from Curtis et al, 2009.

For the **sub-national analysis carried out in India**, a study was carried out using a mixed-methods approach to analyse inequalities in immunisation at sub-national level. The first step of the qualitative component entailed a review of peer-reviewed and grey literature, which was used to inform the framework and design semi-structured guides for an exploratory qualitative study. These guides were used to shape discussions (focus group discussions and in-depth interviews) with key stakeholders at various levels of immunisation service delivery. A convenience purposive sampling design was adopted for the study.

Two better-performing (Himachal Pradesh and Tamil Nadu²) and two worse-performing (Uttar Pradesh and Rajasthan) states, in terms of immunisation coverage, were purposively selected for this study. Data from each state's District Level Household and Facility Survey (DLHS) 2007/08, and the Annual Health Survey (AHS) 2010/11 were used to list the top- and bottom-performing districts in the states. From these lists, the state capitals and three other districts (one better-performing and two poor-performing) were selected for the study. For states with high immunisation coverage and better programmatic performance, where the programmatic data and AHS data were concordant, DLHS-3 data was used for district selection (Himachal Pradesh and Tamil Nadu).

Findings from the qualitative and quantitative research were synthesised and results were triangulated in order to identify associations and generate possible explanations for high or low immunisation coverage in the particular areas of the country. Information has been extracted from a more comprehensive report for the purpose of this report.

ENDNOTES

EXECUTIVE SUMMARY

¹ UNICEF, WHO, World Bank and United Nations Population Division, 2012. *Levels & trends in child mortality – Report 2012*. New York: UNICEF.

² Based on global DTP3 coverage. WHO, 2012. *Global and regional immunization profile*. Geneva: WHO. Available at: http://apps.who.int/immunization_monitoring/en/globalsummary/GS_GLOProfile.pdf

³ 22.4 million children did not receive basic vaccines – diphtheria-tetanus-pertussis (DTP3) – in 2011, compared with more than 32 million children in 2000. Calculated based on global DTP3 coverage and the number of surviving infants for these years. Source: WHO, 2012. *Global and regional immunization profile*. Geneva: WHO. Available at: http://apps.who.int/immunization_monitoring/en/globalsummary/GS_GLOProfile.pdf

⁴ Glassman, A., Ignacio Zoloa, J. and Duran, D., 2012. Measuring government commitment to vaccination, *CGD Policy Paper 008*. Washington DC: Center for Global Development. Available at: <http://www.cgdev.org/content/publications/detail/1426396>

⁵ Efficacious vaccines can also reduce disease transmission among unimmunised individuals in the community through ‘indirect effects’ or ‘herd protection’. When a sufficient percentage of the population is vaccinated, the spread of the infectious agent declines. ‘Herd protection’ occurs when the reduction in disease incidence is greater than the proportion of individuals immunised. The coverage rate necessary to stop transmission depends on the particular disease. For example, measles requires very high coverage to attain herd protection. Source: Andre, F.E., Booy, R., Bock, H.L., Clemens, J., Datta, S.K., John, T.J., Lee, B.W., Lolekha, S., Peltola, H., Ruff, T.A., Santosham, M. and Schmitt, H.J., 2008. Vaccination greatly reduces disease, disability, death and inequity worldwide. *Bulletin of the World Health Organization*, 86(2): 81-160.

The aim should be for 100% coverage (with all the doses recommended), recognising that 100% is difficult to attain; however, aiming for this will bring coverage as close as possible to the ‘herd immunity’ threshold in the population concerned. Source: Plotkin, S., Fine, P., Eames, K. and Heymann, D.L., 2011. “Herd immunity”: A rough guide. *Clin Infect Dis.*, 52(7): 911-916.

⁶ In this report the term unimmunised is used. This includes both underimmunised children – ie, children who have had some vaccines but haven’t completed their basic series – as well as children who have had no immunisations at all. This definition is drawn from: John Snow Inc., 2009. *Epidemiology of the unimmunized child: Findings from the grey literature. IMMUNIZATIONbasics Project*. Geneva: WHO.

⁷ Rheingans, R., Cumming, O., Anderson, J. and Showalter, J., 2012. *Estimating inequities in sanitation-related disease burden and estimating the potential impacts of pro-poor targeting*. London: London School of Hygiene and Tropical Medicine and SHARE.

Note that this research does not quantify the relative costs of reaching the hard-to-reach.

⁸ This refers to the 22 million children worldwide aged 12–23 months who have not received three doses of the diphtheria-tetanus-pertussis (DTP) vaccine. Source: WHO, 2012. *Global and regional immunization profile*. Geneva: WHO. Available at: http://apps.who.int/immunization_monitoring/en/globalsummary/GS_GLOProfile.pdf

⁹ Based on DTP3 coverage in 2011. Source: WHO, 2012. *WHO vaccine-preventable diseases: monitoring system 2012 global summary*. Geneva: WHO. Available at: http://apps.who.int/immunization_monitoring/en/globalsummary/timeseries/tswucoveredt3p3.htm

¹⁰ Save the Children and ACTION, 2012. *Finding the final fifth: Inequalities in immunisation*. London: Save the Children Fund. Available at: <http://www.savethechildren.org.uk/resources/online-library/finding-final-fifth-inequalities-immunisation>

¹¹ In countries where inequalities in immunisation coverage by wealth quintile are widest. Based on an analysis carried out for: Save the Children and ACTION, 2012. *Finding the final fifth: Inequalities in immunisation*. London: Save the Children Fund. Available at: <http://www.savethechildren.org.uk/resources/online-library/finding-final-fifth-inequalities-immunisation>

INTRODUCTION

¹ UNICEF, WHO, The World Bank and United Nations Population Division, 2012. *Levels & trends in child mortality – Report 2012*. New York: UNICEF.

² Based on global DTP3 coverage. WHO, 2012. *Global and regional immunization profile*. Geneva: WHO. Available at: http://apps.who.int/immunization_monitoring/en/globalsummary/GS_GLOProfile.pdf

³ 22.4 million children did not receive basic vaccines – diphtheria-tetanus-pertussis (DTP3) – in 2011, compared with more than 32 million children in 2000. Calculated based on global DTP3 coverage and the number of surviving infants for these years. Source: WHO, 2012. *Global and regional immunization profile*. Geneva: WHO. Available at: http://apps.who.int/immunization_monitoring/en/globalsummary/GS_GLOProfile.pdf

⁴ This refers to the 22 million children worldwide aged 12–23 months who have not received three doses of the diphtheria-tetanus-pertussis (DTP) vaccine. Source: WHO, 2012. *Global and regional immunization profile*. Geneva: WHO. Available at: http://apps.who.int/immunization_monitoring/en/globalsummary/GS_GLOProfile.pdf

⁵ Based on DTP3 coverage in 2011. Source: WHO, 2012. *WHO vaccine-preventable diseases: monitoring system 2012 global summary*. Geneva: WHO. Available at: http://apps.who.int/immunization_monitoring/en/globalsummary/timeseries/tswucoveredt3p3.htm

⁶ In this report the term unimmunised is used. This includes both underimmunised children – ie, children who have had some vaccines but haven’t completed their basic series – as well as children who have had no immunisations at all. This definition is drawn from: John Snow Inc., 2009. *Epidemiology of the unimmunized child: Findings from the grey literature. IMMUNIZATIONbasics Project*. Geneva: WHO.

⁷ Save the Children and ACTION, 2012. *Finding the final fifth: Inequalities in immunisation*. London: Save the Children Fund. Available at: <http://www.savethechildren.org.uk/resources/online-library/finding-final-fifth-inequalities-immunisation>

⁸ In countries where inequalities in immunisation coverage by wealth quintile are widest. Based on an analysis carried out for: Save the Children and ACTION, 2012. *Finding the final fifth: Inequalities in immunisation*. London: Save the Children Fund. Available at: <http://www.savethechildren.org.uk/resources/online-library/finding-final-fifth-inequalities-immunisation>

⁹ Save the Children and ACTION, 2012. *Finding the final fifth: Inequalities in immunisation*. London: Save the Children Fund. Available at: <http://www.savethechildren.org.uk/resources/online-library/finding-final-fifth-inequalities-immunisation>

¹⁰ This is based on available disaggregated data across many countries and does not exclude that other determinants of inequalities also exist. We also recognise that other factors (eg, political will) may influence or underlie these dimensions; however, these factors are largely unmeasured.

¹¹ Social determinants of health are the circumstances in which people are born, grow up, live, work and age, and the systems put in place to deal with illness. These circumstances are in turn shaped by a wider set of forces: economics, social policies and politics. Source: WHO, 2012. *Social determinants of health, Key concepts*. Available at: http://www.who.int/social-determinants/thecommission/finalreport/key_concepts/en/index.html.

¹² Health Systems Knowledge Network, 2007. Challenging inequity through health systems. *Final report of the Health Systems Knowledge Network*. WHO Commission on the social determinants of health.

¹³ Halfon, N., Larson, K. and Russ, S., 2010. Why social determinants? *Healthcare Quarterly*, 4(Spec No 1): 8-204.

¹⁴ This was based on a literature review that drew heavily on the resources prepared for the Strategic Advisory Group of Experts meeting in November 2010, by the Centers for Disease Control and Prevention (*Epidemiology of the unimmunized child: Findings from the peer-reviewed published literature, 1999-2009*, WHO, 2009), John Snow Inc. (*Epidemiology of the unimmunized child: Findings from the grey literature*, IMMUNIZATIONbasics Project, WHO, 2009), and WHO (*Update on the epidemiology of the unvaccinated child*, Meeting of the Strategic Advisory Group of Experts, 9–11 November 2010).

¹⁵ Glassman, A., Ignacio Zoloz, J. and Duran, D., 2012. Measuring government commitment to vaccination, *CGD Policy Paper 008*. Washington DC: Center for Global Development. Available at: <http://www.cgdev.org/content/publications/detail/1426396>

¹⁶ At the end of 2010, global health leaders committed to making the next ten years the Decade of Vaccines, with the goal of ensuring that the full benefits of immunisation are extended to all people, regardless of where they are born, who they are, or where they live. See: <http://www.dovcollaboration.org/about-us/>

I WHY SHOULD WE FOCUS ON ADDRESSING INEQUALITIES IN IMMUNISATION AND HEALTH?

¹ UNICEF defines an equity-focused approach as a model that aims to accelerate health MDG progress, reduce disparities and lower out-of-pocket expenditures for the poor through three key measures: (1) upgrade selected facilities; (2) overcome barriers that prevent the poorest from using services even when they are available to them; and (3) task shifting. Source: UNICEF, 2010. *Narrowing the gaps to meet the goals*. New York: UNICEF. Available at: http://www.unicef.org/publications/files/Narrowing_the_Gaps_to_Meet_the_Goals_090310_2a.pdf

² UNICEF, 2010. *Narrowing the gaps to meet the goals*. New York: UNICEF. Available at: http://www.unicef.org/publications/files/Narrowing_the_Gaps_to_Meet_the_Goals_090310_2a.pdf

While the full return on investment may not be evident in the short-run, such an approach will yield more equitable and sustainable achievements.

³ Rheingans, R., Cumming, O., Anderson, J. and Showalter, J., 2012. *Estimating inequities in sanitation-related disease burden and estimating the potential impacts of pro-poor targeting*. London: London School of Hygiene and Tropical Medicine and SHARE.

Note that this research does not quantify the relative costs of reaching the hard-to-reach.

⁴ Glassman, A., Ignacio Zoloz, J. and Duran, D., 2012. Measuring government commitment to vaccination, *CGD Policy Paper 008*. Washington DC: Center for Global Development. Available at: <http://www.cgdev.org/content/publications/detail/1426396>

⁵ Efficacious vaccines can also reduce disease transmission among unimmunised individuals in the community through 'indirect effects' or 'herd protection'. When a sufficient percentage of the population is vaccinated, the spread of the infectious agent declines. 'Herd protection' occurs when the reduction in disease incidence is greater than the proportion of individuals immunised. The coverage rate necessary to stop transmission depends on the particular disease. For example, measles requires very high coverage to attain herd protection. Source: Andre, FE., Booy, R., Bock, H.L., Clemens, J., Datta, S.K., John, T.J., Lee, B.V., Lolekha, S., Peltola, H., Ruff, T.A., Santosham, M. and Schmitt, H.J., 2008. Vaccination

greatly reduces disease, disability, death and inequity worldwide. *Bulletin of the World Health Organization*, 86(2): 81-160.

The aim should be for 100% coverage (with all the doses recommended), recognising that 100% is difficult to attain; however, aiming for this will bring coverage as close as possible to the 'herd immunity' threshold in the population concerned. Source: Plotkin, S., Fine, P., Eames, K. and Heymann, D.L., 2011. "Herd immunity": A rough guide. *Clin Infect Dis.*, 52(7): 911-916.

⁶ In this report the term unimmunised is used. This includes both underimmunised children – ie, children who have had some vaccines but haven't completed their basic series – as well as children who have had no immunisations at all. This definition is drawn from: John Snow Inc., 2009. *Epidemiology of the unimmunized child: Findings from the grey literature*. IMMUNIZATIONbasics Project. Geneva: WHO.

⁷ UNICEF, 2010. *Narrowing the gaps to meet the goals*. New York: UNICEF. Available at: http://www.unicef.org/publications/files/Narrowing_the_Gaps_to_Meet_the_Goals_090310_2a.pdf; Frenk, J. and de Ferranti, D., 2012. Universal health coverage: good health, good economics. *The Lancet*, 380(9845): 862-864.

⁸ United Nations, 2012. *The Universal Declaration of Human Rights*. Available at: <http://www.un.org/en/documents/udhr/index.shtml> [Date accessed: 9 September 2012]

⁹ OHCHR, 2012. *Convention on the Rights of the Child*. Available at: <http://www2.ohchr.org/english/law/crc.htm> [Date accessed: 9 September 2012]

¹⁰ WHO, 2007. The right to health. *Factsheet No. 323*. Available at: <http://www.who.int/mediacentre/factsheets/fs323/en/index.html> [Date accessed: 9 September 2012]

¹¹ Frenz, P. and Vega, J., 2010. Universal health coverage with equity: What we know, don't know and need to know. *Background paper for the global symposium on health systems research*, 16–19 November 2010.

¹² WHO, 2010. *Key components of a well functioning health system*. Available at: http://www.who.int/healthsystems/EN_HSSkeycomponents.pdf

2 IMMUNISATION FOR ALL: WHAT IS NEEDED AT COUNTRY LEVEL?

¹ Chopra, M., Sharkey, A., Dalmiya N., Anthony D. and Binkin N., on behalf of the UNICEF Equity in Child Survival, Health and Nutrition Analysis Team, 2012. Strategies to improve health coverage and narrow the equity gap in child survival, health, and nutrition. *The Lancet*, 380(9850): 1331-1340.

² WHO Africa Regional Office, 2008. *Implementing the reaching every district approach – A guide for district health management teams*. WHO.

³ WHO, 2012. *Immunization service delivery – The RED strategy*. Available at: http://www.who.int/immunization_delivery/systems_policy/red/en/

⁴ WHO Africa Regional Office, 2008. *Implementing the reaching every district approach – A guide for district health management teams*. WHO.

⁵ IMMUNIZATIONbasics Project, 2009. *Periodic intensification of routine immunization – Lessons learned and implications for action*. Geneva: WHO.

⁶ Ibid.

For example, through extra vaccination posts and sometimes door-to-door services. This is not to be confused with mass immunisation campaigns for disease eradication (eg. polio and measles).

⁷ Collectively, these activities have been termed 'Periodic Intensification of Routine Immunization' or PIRI. Source: WHO, 2010. *Immunization practices advisory committee (IPAC)*, 29-30 June 2010. *Draft meeting report and recommendations*. Available at: http://www.who.int/immunization/sage/1_IPAC_meeting_1006_report_final_draft.pdf

⁸ IMMUNIZATIONbasics Project, 2009. *Periodic intensification of routine immunization – Lessons learned and implications for action*. Geneva: WHO.

⁹ LaFond, A.K., Kanagat, N., Sequeira, J.S., Steinglass, R., Fields, R., & Mookherji, S., 2012. Drivers of routine immunization system performance at the district level: Study findings from three countries. *Research Brief No. 3*. Arlington, VA: JSI Research & Training Institute, Inc., ARISE Project for the Bill & Melinda Gates Foundation.

- ¹⁰ Ibid.
- ¹¹ This may not be an exhaustive list, but highlights approaches identified in a literature review carried out by Ryman et al. Source: Ryman, T., Dietz, V. and Cairns, L., 2008. Too little but not too late: Results of a literature review to improve routine immunization programs in developing countries. *BMC Health Services Research*, 8: 134.
- ¹² WHO, 2012. WHO-UNICEF estimates of immunization coverage: Bangladesh. Available at: http://apps.who.int/immunization_monitoring/en/globalsummary/timeseries/tswucoveragebycountry.cfm?country=BGD
- ¹³ Uddin, J., Larson, C.P., Oliveras, E., Khan, A.I., Quaiyum, M.A., Saha, N.C., Khan, I.A., and Shamsuzzaman, 2008. *Effectiveness of Combined Strategies to Improve Low Coverage of Child Immunization in Urban Slums of Bangladesh*. Dhaka: International Centre for Diarrhoeal Disease Research.
- ¹⁴ Ibid.
- ¹⁵ Bill & Melinda Gates Foundation, 2012. 'Gates foundation announces winner of inaugural Gates vaccine innovation Award', 24 January 2012. Available at: <http://www.gatesfoundation.org/press-releases/Pages/gates-vaccine-innovation-award-winner-120124.aspx>
- ¹⁶ For example, since the launch of the Global Polio Eradication Initiative in 1988, polio cases have declined by 99%, from approximately 350,000 cases to 1,352 reported cases in 2010. Source: WHO, 2012. Polio. *Fact sheet No. 114, October 2012*. Available at: <http://www.who.int/mediacentre/factsheets/fs114/en/> [Date accessed: 18 October 2012]
- ¹⁷ CDC, 2012. *Progress in reducing measles, rubella, and CRS worldwide*. Available at: <http://www.cdc.gov/globalhealth/measles/progress/> [Date accessed: 18 October 2012]
- ¹⁸ WHO, Rotary International, CDC and UNICEF, 2011. *Global polio eradication initiative – Annual report 2010*. Geneva: WHO.
- ¹⁹ These are mass immunisation campaigns.
- ²⁰ Pan America Health Organization, 1995 & Mogedal and Stenson, 1999. Cited in: Msuya, J., Horizontal and vertical delivery of health services: What are the trade offs? Washington: The World Bank. Available at: http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2003/10/15/000160016_20031015125129/additional/310436360_200502761000211.pdf
- ²¹ Nassirou, A., Yemadji, N., Weiss, S. and Nassirou, K.W., 2005. *The immunization data quality audit (DQA) – Chad 2004*. Basel, Switzerland: The Swiss Centre for International Health – Swiss Tropical Institute.
- ²² Verguet, S., Jassat, W., Hedberg, C., Tollman, S., Jamison, D.T. and Hofman, K.J., 2012. Measles control in Sub-Saharan Africa: South Africa as a case study. *Vaccine*, 30(9): 1594–600.
- ²³ This is evident in several countries (eg, Angola, Chad, DRC) where recurrent outbreaks of polio, for example, can be attributed in part to low routine immunisation coverage and weak health systems. Source: WHO, Rotary International, CDC and UNICEF, 2012. *Global polio eradication initiative – Strategic Plan 2010-2012*. Geneva: WHO.
- ²⁴ GAVI Alliance, 2012. *GAVI boosts global response to measles outbreaks*. Available at: <http://www.gavialliance.org/library/news/press-releases/2012/gavi-boosts-global-response-to-measles-outbreaks/> [Date accessed: 2 October 2012]
- ²⁵ When a measles epidemic broke out in Lova Health Zone, Province Orientale in the DRC and spread to Ubundu Health Zone, measles vaccination varied widely across these regions. Coverage rates ranged from just 47% in Lova to 91% in Ubundu, which has been supported by the International Rescue Committee as part of a DFID-funded grant, subsidising the costs of care for pregnant women and children under five. Due to such high levels of coverage in Ubundu, local health authorities decided not to implement a mass vaccination campaign – this had cost savings and meant that health facility staff could continue their normal activities undisturbed. Source: Evidence provided by the International Rescue Committee.
- ²⁶ WHO. Impact of new vaccines introduction on immunization & health systems. Available at: http://www.who.int/immunization/sage/NUVI_IS_HS_final_Refs_12_April_2010.pdf [Date accessed: 15 October 2012]
- ²⁷ WHO, 2012. Polio. *Fact sheet No. 114, October 2012*. Available at: <http://www.who.int/mediacentre/factsheets/fs114/en/>; Measles and Rubella Initiative, 2012. *Routine immunization*. Available at: <http://www.measlesrubellainitiative.org/portal/site/mi/menuitem.49e6575162334463c1062b10133f78a0/?vgnnextoid=a2e32b2377583210VgnVCM10000089f0870aRCRD&cpsexcurrchannel=1> [Date accessed: 11 October 2012]; WHO, 2012. *Immunization, vaccines and biologicals – Measles efforts to focus on strengthening routine immunization*. Available at: http://www.who.int/immunization/sage/news_measles_strengthen_routine_immunization/en/index.html
- ²⁸ Duncan, R., 2012. Reaching every community in Cambodia using a targeted high risk strategy. Presentation at 'Identifying reasons for undervaccinated children at district level: A problem screening tool', Geneva, 5 October 2012.
- ²⁹ No cases were reported after September 2010. Data as of 17 October 2012.
- ³⁰ According to a range of government and partner agency surveys, coverage increased from 18.6% in 2005 to 66.8% in 2010. Data comes from the periodic Government of India District-Level Health Surveys, the National Family Health Survey (NFHS), the Coverage Evaluation Survey (CES) and house-to-house monitoring of the National Polio Surveillance Project.
- ³¹ UNICEF, 2008. *The state of the world's children 2008: Child survival*. New York: UNICEF.
- ³² Galichet, B., Goeman, L., Hill, P.S., Essengue, M.S., Hammami, N., Porignon, D., Kadama, P. and Van Lerberghe, W., 2010. Linking programmes and systems: lessons from the GAVI Health Systems Strengthening window. *Tropical Med and Intern Health*, 15(2): 208-215.
- ³³ Ferrinho, P. (forthcoming). *Perceptions of the usefulness of external support to immunization coverage in DRC: an analysis of the GAVI-Alliance cash-based support*; Ferrinho, P. (forthcoming). *Perceptions of the usefulness of external support to immunization coverage in Chad: an analysis of the GAVI-Alliance cash-based support*; Ferrinho, P. (forthcoming). *Blindness to "strategic gaps" in the GAVI-Alliance cash-based support (HSSI/ISS) to the health system of Uganda: 2008–2010*; Ferrinho, P. (forthcoming). *Analysis of the GAVI-Alliance cash-based support to the health system of Nigeria: 2002–2010*.
- ³⁴ See: <http://arise.jsi.com/>
- ³⁵ Larson, A. and LaFond, A.K., 2011. Drivers of routine immunization system performance at the district level: Ghana case study. *Research Brief No. 1*. Arlington, VA: JSI Research & Training Institute, Inc., ARISE Project for the Bill & Melinda Gates Foundation; LaFond, A.K., and Sequeira, J.M., 2012. Drivers of routine immunization system performance at the district level: Ethiopia case study. *ARISE Research Brief No. 2*. Arlington, VA: JSI Research & Training Institute, Inc., ARISE Project for the Bill & Melinda Gates Foundation; LaFond, A.K., and Sequeira, J.M., 2012. Drivers of routine immunization system performance at the district level: Cameroon case study. *ARISE Research Brief 4*. Arlington VA: JSI Research and Training Institute, Inc, ARISE project for Bill & Melinda Gates Foundation.
- ³⁶ Wonodi, C., Stokes-Prindle, C., Aina, M., Oni, G., Olukowi, T., Pate, M.A., Privor-Dumm, L. and Levine, O., 2012. Landscape analysis of routine immunization in Nigeria. Baltimore, MD: International Vaccine Access Center; Stokes-Prindle, C., Wonodi, C., Aina, M., Oni, G., Olukowi, T., Pate, M.A., Privor-Dumm, L. and Levine, O., 2012. Landscape analysis of routine immunization in Nigeria: Identifying barriers and prioritizing interventions. Baltimore, MD: International Vaccine Access Center.
- ³⁷ Anand, S. and Barnighausen, T., 2007. Health workers and vaccination coverage in developing countries: An econometric analysis. *The Lancet*, 369: 1277–85.
- ³⁸ This is evident in the maps depicting health worker shortages and unimmunised children in *Finding the Final Fifth: Inequalities in Immunisation* (Save the Children and ACTION, 2012).
- ³⁹ LaFond, A.K., and Sequeira, J.M., 2012. Drivers of routine immunization system performance at the district level: Ethiopia case study. *ARISE Research Brief No. 2*. Arlington, VA: JSI Research & Training Institute, Inc., ARISE Project for the Bill & Melinda Gates Foundation.

- ⁴⁰ ARISE, 2011. Landscape analysis synopsis: An initial investigation of the drivers of routine immunization system performance in Africa. Arlington, VA: JSI R&T, Inc./ARISE Project for the Bill & Melinda Gates Foundation; LaFond, A.K., Kanagat, N., Sequeira, J.S., Steinglass, R., Fields, R., and Mookherji, S., 2012. Drivers of routine immunization system performance at the district level: Study findings from three countries. *Research Brief No. 3*. Arlington, VA: JSI Research & Training Institute, Inc., ARISE Project for the Bill & Melinda Gates Foundation.
- ⁴¹ Not all CHWs are trained or allowed to administer vaccines, however, and therefore the national policy environment should be explored in these contexts.
- ⁴² The vaccine cold chain is a system used for keeping and distributing vaccines in good condition. It consists of a series of storage and transport links, all designed to keep vaccines within an acceptable range until it reaches the user. Source: WHO, 2004. The cold chain. In *Immunization in practice – A practical resources guide for health workers, 2004 update*. Geneva: WHO.
- ⁴³ LaFond, A.K., Kanagat, N., Sequeira, J.S., Steinglass, R., Fields, R., & Mookherji, S., 2012. Drivers of routine immunization system performance at the district level: Study findings from three countries. *Research Brief No. 3*. Arlington, VA: JSI Research & Training Institute, Inc., ARISE Project for the Bill & Melinda Gates Foundation.
- ⁴⁴ PATH, 2012. *Investing in stronger vaccine supply chains*. Washington: PATH, WHO and UNICEF; PATH and WHO, 2012. *Building next-generation vaccine supply systems: Supply chain modeling and optimization*. Available at: http://www.path.org/publications/files/TS_opt_evm_hermes_fs.pdf
- ⁴⁵ See PATH, 'Rethinking the vaccine supply chain'. Available at: <http://www.path.org/projects/project-optimize.php>
- ⁴⁶ The USAID | DELIVER PROJECT is being carried out by John Snow, Inc. See: <http://deliver.jsi.com>
- ⁴⁷ PATH, 2012. *Investing in stronger vaccine supply chains*. Washington: PATH, WHO and UNICEF
- ⁴⁸ PRRINN-MNCH. *Solar fever: Solar refrigerators offer relief to families in Jigawa*. Available at: <http://www.prrinn-mnch.org/case-studies.html> [Date accessed: 19 September 2012]
- ⁴⁹ The aim of this initiative was to drive innovation that can be used to increase routine immunisation coverage. It was a collaboration between CSK Consulting Pvt Ltd. and Dr John Shery of the Intel Corporation, with support from the Bill & Melinda Gates Foundation and in partnership with the Government of Bihar. Source: CKS Consulting Pvt. Ltd., 2009/2010. *Vaccine delivery innovation initiative: Project summary*. Bill & Melinda Gates Foundation.
- ⁵⁰ CKS Consulting Pvt. Ltd., 2009/2010. *Vaccine delivery innovation initiative: Project summary*. Bill & Melinda Gates Foundation.
- ⁵¹ Sasaki, S., Igarashi, K., Fujino, Y., Comber, A.J., Brunson, C., Muleya, C.M. and Suzuki, H., 2011. The impact of community-based outreach immunisation services on immunisation coverage with GIS network accessibility analysis in peri-urban areas, Zambia. *J Epidemiol Community Health*, 65(12): 1171-1178.
- ⁵² USAID and IMMUNIZATIONbasics, 2009. Summary document: *Making "reaching every district" operational – A step towards revitalizing primary health care*.
- ⁵³ Benin, Cameroon, Democratic Republic of Congo, Ethiopia, Ghana, Madagascar, Sierra Leone, Togo and Uganda.
- ⁵⁴ WHO-AFRO, 2007. *In-depth evaluation of reaching every district approach in the African Region*. WHO, UNICEF, CDC, USAID and IMMUNIZATIONbasics.
- ⁵⁵ USAID and JSI, Inc., 2009. *Making reaching every district operational: A step towards revitalizing primary health care*. IMMUNIZATIONbasics.
- ⁵⁶ USAID | DELIVER PROJECT, Task Order 4., 2011. *Using last mile distribution to increase access to health commodities*. Arlington, VA: USAID | DELIVER PROJECT, Task Order 4.
- ⁵⁷ VillageReach, 2011. *Health system strengthening in Mozambique – A national program to improve last mile distribution for rural communities*. Seattle, WA: Village Reach.
- ⁵⁸ VillageReach is a non-profit organisation based in Seattle, USA, though with its main operations in Mozambique and Malawi. Carrying out most of its programmes jointly with national and regional governments, they aim to improve access to healthcare for remote, underserved communities. They partner with governments, businesses, nonprofits, and other organizations to improve performance and reliability of health systems in the most inaccessible and isolated communities. See: <http://villagereach.org>
- ⁵⁹ USAID | DELIVER PROJECT, Task Order 4., 2011. *Using last mile distribution to increase access to health commodities*. Arlington, VA: USAID | DELIVER PROJECT, Task Order 4.
- ⁶⁰ VillageReach, 2009. *Comparison of costs incurred in dedicated and diffused vaccine logistics systems – Cost-effectiveness of vaccine logistics in Cabo Delgado and Niassa provinces, Mozambique*. Seattle, WA: Village Reach.
- ⁶¹ Kane, M., 2008. *Evaluation of the project to support PAV (Expanded Program on Immunization) in northern Mozambique, 2001–2008: An independent review for VillageReach with program and policy recommendations*. Seattle, WA: VillageReach.
- ⁶² For additional last mile strategies, see: <http://villagereach.org/vrsite/wp-content/uploads/2011/12/UsinLastMileDist.pdf>
- ⁶³ VillageReach, 2011. *Health system strengthening in Mozambique – A national program to improve last mile distribution for rural communities*. Seattle, WA: Village Reach.
- ⁶⁴ Kane, M., 2008. *Evaluation of the project to support PAV (Expanded Program on Immunization) in northern Mozambique, 2001–2008: An independent review for VillageReach with program and policy recommendations*. Seattle, WA: VillageReach.
- ⁶⁵ Shea, B., Andersson, N. and Henry, D., 2009. Increasing the demand for childhood vaccination in developing countries: A systematic review. *BMC Internat Health and Human Rights*, 9(Suppl 1): S5.
- ⁶⁶ LaFond, A.K., Kanagat, N., Sequeira, J.S., Steinglass, R., Fields, R., & Mookherji, S., 2012. Drivers of routine immunization system performance at the district level: Study findings from three countries. *Research Brief No. 3*. Arlington, VA: JSI Research & Training Institute, Inc., ARISE Project for the Bill & Melinda Gates Foundation.
- ⁶⁷ Shea, B., Andersson, N. and Henry, D., 2009. Increasing the demand for childhood vaccination in developing countries: A systematic review. *BMC Internat Health and Human Rights*, 9(Suppl 1): S5.
- ⁶⁸ LaFond, A.K., Kanagat, N., Sequeira, J.S., Steinglass, R., Fields, R., & Mookherji, S., 2012. Drivers of routine immunization system performance at the district level: Study findings from three countries. *Research Brief No. 3*. Arlington, VA: JSI Research & Training Institute, Inc., ARISE Project for the Bill & Melinda Gates Foundation.
- ⁶⁹ Santiago, P., 2011. Driving demand for immunization. *Decade of Vaccines Collaboration, News & Updates*, posted on 31 August 2011. Available at: <http://www.dovcollaboration.org/delivery/driving-demand-for-immunization/> [Date accessed: 2 October 2012]
- ⁷⁰ WHO, UNICEF and World Bank, 2009. *State of the world's vaccines and immunization*, 3rd ed. Geneva: WHO.
- ⁷¹ Shea, B., Andersson, N. and Henry, D., 2009. Increasing the demand for childhood vaccination in developing countries: a systematic review. *BMC International Health and Human Rights* 2009, 9(Suppl 1):S5.
- ⁷² Santiago, P., 2011. Driving Demand for Immunization. *Decade of Vaccines Collaboration, News & Updates*. Posted on 31 August 2011. Available at: <http://www.dovcollaboration.org/delivery/driving-demand-for-immunization/>
- ⁷³ Shea, B., Andersson, N. and Henry, D., 2009. Increasing the demand for childhood vaccination in developing countries: A systematic review. *BMC Internat Health and Human Rights*, 9(Suppl 1): S5; LaFond, A.K., Kanagat, N., Sequeira, J.S., Steinglass, R., Fields, R., & Mookherji, S., 2012. Drivers of routine immunization system performance at the district level: Study findings from three countries. *Research Brief No. 3*. Arlington, VA: JSI Research & Training Institute, Inc., ARISE Project for the Bill & Melinda Gates Foundation.

- ⁷⁴ Commission on information and accountability for Women's and Children's Health. *Keeping promises, measuring results*. Every Women Every Child. Available at: http://www.who.int/topics/millennium_development_goals/accountability_commission/Commission_Report_advance_copy.pdf
- ⁷⁵ Several examples of community scorecards used in countries can be found here: http://www.worldbank.org/socialaccountability_sourcebook/Regional%20database/cscsf.htm
- Various resources on community scorecards can be found here: <http://go.worldbank.org/QFAVL64790>
- ⁷⁶ Commission on information and accountability for Women's and Children's Health. *Keeping promises, measuring results*. Every Women Every Child. Available at: http://www.who.int/topics/millennium_development_goals/accountability_commission/Commission_Report_advance_copy.pdf
- ⁷⁷ Molyneux, S., Atela, M., Angwenyi, V. and Goodman, C., 2012. Community accountability at peripheral health facilities: a review of the empirical literature and development of a conceptual framework. *Health Policy Plan*, 27(7): 1-14.
- ⁷⁸ Goeman, L., Galichet, B., Porignon, D.G., Hill, P.S., Hammami, N., Essengue Elouma, M.S., Kadama, P.Y. and Van Lerberghe, W., 2009. The response to flexibility: country intervention choices in the first four rounds of the GAVI health systems strengthening applications. *Health Policy and Plan*, 25(4): 292-299.
- ⁷⁹ Ibid.
- ⁸⁰ This may carry over multiple governments, thus posing a problem in many countries as Ministers of Health and Finance change. Therefore, translating commitments into national legislation is important to ensuring that immunisation remains a priority in the national agenda.
- ⁸¹ WHO Africa Regional Office, 2008. *Implementing the reaching every district approach – A guide for district health management teams*. WHO.
- ⁸² UNICEF, 2012. *Vaccinating children in Haiti's hardest-to-reach communities*. Available at: http://www.unicef.org/infobycountry/haiti_61402.html [Date accessed: 13 September 2012]
- ⁸³ Fields, R. 2012. *A stakeholder consultation on investment strategies for routine immunization in Africa*. Arlington, VA: JSI Research & Training Institute, Inc. ARISE Project for the Bill and Melinda Gates Foundation.
- ⁸⁴ Sabin Vaccine Institute. *Sustainable immunisation financing*. Available at: <http://www.sabin.org/advocacy-education/sustainable-immunization-financing/economics> [Date accessed: 9 September 2012]
- ⁸⁵ World Bank and GAVI Alliance, 2010. *Immunisation financing toolkit: A resource for policy-makers and programme managers*. Available at: <http://siteresources.worldbank.org/HEALTHNUTRITIONANDPOPULATION/Resources/281627-1292531888900/IMMUNIZATIONFINANCINGTOOLKITFINAL121410.pdf>
- ⁸⁶ As per the 5th GAVI Board decision. Available at: http://fr.gavialliance.org/about/governance/boards/reports/5th_Board_agenda_Userfee_policy.php [Date accessed: 9 September 2012]
- ⁸⁷ WHO, 2012. *The world health report – Health systems financing: the path to universal coverage*. Geneva: WHO; Sachs, J., 2012. Achieving universal health coverage in low-income settings. *The Lancet*, 380(9845): 944-947.
- ⁸⁸ Zimbabwe, South Africa, Somalia, Palau, Myanmar, Eritrea, Equatorial Guinea, Djibouti, Comoros and Belize, for example, do not have a line item in their national budgets for the purchase of vaccines used in routine immunisation. Source: WHO, 2012. *Immunization financing – Indicators*. Available at: http://www.who.int/immunization_financing/indicators/en/ [Date accessed: 15 October 2012]
- ⁸⁹ Politi, C. and Sagna, O., 2011. *Analysis of immunisation financing indicators from the WHO-UNICEF Joint Reporting Form (JRF), 2008–2010*. Geneva: WHO; Lydon, P., Beyai, P.L., Chaudri, I., Cakmak, N., Satoulou, A. and Dumolard, L. *Government financing for health and specific budget lines: The case of vaccines and immunisation*. Available at: http://www.who.int/immunization/sage/financing_policy_practice.pdf [Date accessed: 9 September 2012]
- ⁹⁰ WHO, 2011. *The Abuja Declaration: Ten years on*. Geneva: WHO. Available at: <http://www.who.int/healthsystems/publications/Abuja10.pdf> [Date accessed: 9 September 2012]
- ⁹¹ WHO, 2012. *The world health report – Health systems financing: the path to universal coverage*. Geneva: WHO.
- ⁹² MSF, 2012. *Vaccines: simplifying immunisation*. Available at: http://www.msf.org.uk/simplifying_vaccines_20120515.news [Date accessed: 12 October 2012]
- ⁹³ Travis, P., Bennett, S., Haines, A., Pang, T., Bhutta, Z., Hyder, A.A., Pielemeier, N.R., Mills, A. and Evans, T., 2004. Overcoming health-systems constraints to achieve the Millennium Development Goals. *The Lancet*, 364(9437): 900-906.
- ⁹⁴ Barros, A., Ronsmans, C., Axelson, H., Loaiza, E., Bertoldi, A.D., França, G., Bryce, J., Boerma, J.T. and Victora, C.G., 2012. Equity in maternal, newborn, and child health interventions in Countdown to 2015: a retrospective review of survey data from 54 countries. *The Lancet*, 379(9822): 1225-1233.
- ⁹⁵ WHO, UNICEF and World Bank, 2009. *State of the world's vaccines and immunization*, 3rd ed. Geneva: WHO; Clements, C.J., Nshimirimanda, D. and Gasasira, A., 2008. Using immunization delivery strategies to accelerate progress in Africa towards achieving the Millennium Development Goals. *Vaccine*, 26(16): 1926-1933; Yakubu, A., Vandelaer, J., Mengiste, G., Shafique, F., Degefie, T., Davis, R. and Adegboyega, T., 2006. Immunisation programmes. In J. Lawn and K. Kerber (eds), *Opportunities for Africa's newborns: Practical data, policy and programmatic support for newborn care in Africa*. Geneva: WHO; Partapuri, T., Steinglass, R. and Sequeira, J., 2012. Integrated delivery of health services during outreach visits: A literature review of program experience through a routine immunization lens. *J Infect Dis.*, 205(Suppl 1): S20-27.
- ⁹⁶ Clements, C.J., Nshimirimanda, D. and Gasasira, A., 2008. Using immunization delivery strategies to accelerate progress in Africa towards achieving the Millennium Development Goals. *Vaccine*, 26(16): 1926-1933.
- ⁹⁷ Wallace, A., Dietz, V. and Cairns, L., 2009. Integration of immunization services with other health interventions in the developing world: what works and why? Systematic literature review. *Trop Med Int Health*, 14(1): 11-19.
- ⁹⁸ Ibid.
- ⁹⁹ Atun, R., de Jongh, T., Secci, F., Ohiri, K. and Adeyi, O., 2009. Integration of targeted health interventions into health systems: A conceptual framework for analysis. *Health Policy and Planning*, 25(2): 104-111.
- ¹⁰⁰ WHO, 2012. *WHO vaccine-preventable diseases: monitoring system 2012 global summary*. Geneva: WHO. Available at: http://apps.who.int/immunization_monitoring/en/globalsummary/timeseries/tswucoveredtp3.htm
- ¹⁰¹ Clements, C.J., Nshimirimanda, D. and Gasasira, A., 2008. Using immunization delivery strategies to accelerate progress in Africa towards achieving the Millennium Development Goals. *Vaccine*, 26(16): 1926-1933.
- ¹⁰² Adapted from: USAID, 2007. More juice from the squeeze: linking immunization services with other health interventions. *Immunization basics, Snap Shots*, April 2007, Issue 5. Factors are also drawn from: Yakubu, A., Vandelaer, J., Mengiste, G., Shafique, F., Degefie, T., Davis, R. and Adegboyega, T., 2006. Immunisation programmes. In J. Lawn and K. Kerber (eds), *Opportunities for Africa's newborns: Practical data, policy and programmatic support for newborn care in Africa*. Geneva: WHO; and Partapuri, T., Steinglass, R. and Sequeira, J., 2012. Integrated delivery of health services during outreach visits: A literature review of program experience through a routine immunization lens. *J Infect Dis.*, 205(Suppl 1): S20-27.
- ¹⁰³ Wallace, A., Dietz, V. and Cairns, L., 2009. Integration of immunization services with other health interventions in the developing world: what works and why? Systematic literature review. *Trop Med Int Health*, 14(1): 11-19; Partapuri, T., Steinglass, R. and Sequeira, J., 2012. Integrated delivery of health services during outreach visits: A literature review of program experience through a routine immunization lens. *J Infect Dis.*, 205(Suppl 1): S20-27; Kamara, L., Lydon, P., Bilous, J., Vandelaer, J., Eggers, R., Gacic-Dobo, M., Meaney, W. and Okwo-Bele, J.M., 2012. Global immunization vision and strategy (GIVS): A mid-term analysis of progress in 50 countries. *Health Policy and Planning*, 1-9.

- ¹⁰⁴ Wallace, A., Dietz, V. and Cairns, L., 2009. Integration of immunization services with other health interventions in the developing world: what works and why? Systematic literature review. *Trop Med Int Health*, 14(1): 11-19; Luman, E., 2009. *Evaluating integrated service delivery – Adding other services to routine immunization visits: The CDC experience*. Presented at the 2009 Global Immunization Meeting. Available at: http://www.who.int/immunization/newsroom/190209_E_Luman.pdf [Date accessed: 25 September 2012]
- ¹⁰⁵ Yakubu, A., Vandelaer, J., Mengiste, G., Shafique, F., Degefie, T., Davis, R. and Adegboyega, T., 2006. Immunisation programmes. In J. Lawn and K. Kerber (eds), *Opportunities for Africa's newborns: Practical data, policy and programmatic support for newborn care in Africa*. Geneva: WHO.
- ¹⁰⁶ Clements, C.J., Nshimirimanda, D. and Gasasira, A., 2008. Using immunization delivery strategies to accelerate progress in Africa towards achieving the Millennium Development Goals. *Vaccine*, 26(16): 1926-1933.
- ¹⁰⁷ Partapuri, T., Steinglass, R. and Sequeira, J., 2012. Integrated delivery of health services during outreach visits: A literature review of program experience through a routine immunization lens. *J Infect Dis.*, 205(Suppl 1): S20-27; Wallace, A., Dietz, V. and Cairns, L., 2009. Integration of immunization services with other health interventions in the developing world: what works and why? Systematic literature review. *Trop Med Int Health*, 14(1): 11-19.
- ¹⁰⁸ WHO, UNICEF and World Bank, 2009. *State of the world's vaccines and immunization*, 3rd ed. Geneva: WHO; Wallace, A., Dietz, V. and Cairns, L., 2009. Integration of immunization services with other health interventions in the developing world: what works and why? Systematic literature review. *Trop Med Int Health*, 14(1): 11-19.
- ¹⁰⁹ Measured as ownership of insecticide-treated nets.
- ¹¹⁰ Based on national DTP3 coverage in 2010.
- ¹¹¹ This is based on a one-year scale up in 75 'Countdown countries' (the countries where more than 95% of all maternal and child deaths occur, including the 49 lowest-income countries). We recognise that a one-year scale up may over estimate impact, but this is for illustrative purposes to show the potential impact of packaging interventions.
- ¹¹² As specified in the Global Vaccines Action Plan.
- ¹¹³ Between 2010 and 2020. Immunisation (including scaling up coverage of DTP, Hib, Pneumococcal, Rotavirus and Measles vaccine) alone would avert over 3.5 million under-five deaths. However, packaged with other essential interventions – such as vitamin A supplementation and insecticide-treated nets, as well as education on breastfeeding promotion, appropriate complementary feeding, and hand washing with soap – this would bring the total up to nearly 9 million.
- ¹¹⁴ The Alma-Ata Declaration was adopted at the International Conference on Primary Health Care Almaty (formerly Alma-Ata), Kazakhstan, 6–12 September 1978. It expressed the need for urgent action by all governments, all health and development workers, and the world community to protect and promote the health of all people. It was the first international declaration underlining the importance of primary healthcare. http://www.who.int/publications/almaata_declaration_en.pdf
- ¹¹⁵ Clements, C.J., Nshimirimanda, D. and Gasasira, A., 2008. Using immunization delivery strategies to accelerate progress in Africa towards achieving the Millennium Development Goals. *Vaccine*, 26(16): 1926-1933; Yakubu, A., Vandelaer, J., Mengiste, G., Shafique, F., Degefie, T., Davis, R. and Adegboyega, T., 2006. Immunisation programmes. In J. Lawn and K. Kerber (eds), *Opportunities for Africa's newborns: Practical data, policy and programmatic support for newborn care in Africa*. Geneva: WHO.
- ¹¹⁶ Integration is one of four Strategic Areas of the GIVS: "integrating immunisation, other linked health interventions and surveillance in the health systems context". Source: WHO and UNICEF, 2005. GIVS: *Global immunization vision and strategy 2006–2015*. Geneva and New York: WHO/UNICEF.
- ¹¹⁷ Integration is one of six Guiding Principles of the GVAP: "strong immunization systems, as part of broader health systems and closely coordinated with other primary health care delivery programmes, are essential for achieving immunization goals". Source: WHO, 2012. Draft global vaccine action plan, Report by the Secretariat. *Sixty-Fifth World Health Assembly A65/22*, 11 May 2012. Geneva: WHO.
- ¹¹⁸ Goeman, L., Galichet, B., Porignon, D.G., Hill, P.S., Hammami, N., Essengue Elouma, M.S., Kadama, P.Y. and Van Lerberghe, W., 2009. The response to flexibility: country intervention choices in the first four rounds of the GAVI health systems strengthening applications. *Health Policy and Plan*, 25(4): 292-299; Galichet, B., Goeman, L., Hill, P.S., Essengue, M.S., Hammami, N., Porignon, D., Kadama, P. and Van Lerberghe, W., 2010. Linking programmes and systems: Lessons from the GAVI Health Systems Strengthening window. *Tropical Medicine and International Health*, 15(2): 208-215.
- ¹¹⁹ The IMR has been cut in half between 2009 (baseline MNCH household survey) and 2011 (mid-term household survey). Source: PRRINN-MNCH. *Assessment of Changes in MNCH outcomes and service use after 2 years of implementation – Results from the Mid-Term Survey*. Available at: <http://www.prrinn-mnch.org/documents/midtermhouseholdsurveyresults.pdf> [Date accessed: 17 October 2012]
- ¹²⁰ PRRINN-MNCH. *Assessment of Changes in MNCH outcomes and service use after 2 years of implementation – Results from the Mid-Term Survey*. Available at: <http://www.prrinn-mnch.org/documents/midtermhouseholdsurveyresults.pdf> [Date accessed: 17 October 2012]
- ¹²¹ PRRINN-MNCH. *Achievements*. Available at: <http://www.prrinn-mnch.org/lessons-learned-achievements.html> [Date accessed: 17 October 2012]
- ¹²² See: <http://www.prrinn-mnch.org/>
- ¹²³ ARK is a philanthropic partnership focused on transforming children's lives. They work in health, education and child protection around the globe. Originally set up by leaders of the alternative investment industry, they leverage intellectual, financial and political investment to deliver the highest social returns for children.
- ¹²⁴ The programme is also supported by GlaxoSmithKline, DFID, Comic Relief and other philanthropic organisations.

3 AN ENABLING ENVIRONMENT FOR UNIVERSAL IMMUNISATION: WHAT IS NEEDED AT GLOBAL LEVEL?

¹ According to World Bank classifications. Countries with GNI per capita between US\$1,026 and US\$4,035 are classified as lower middle-income countries and those with GNI per capita between US\$4,036 and US\$12,475 are classified as upper middle-income.

² It is important to note though that LICs typically have higher rates of poverty incidence and a larger poverty gap, and therefore this changing context should not deter efforts to address poverty or inequalities in LICs.

³ Sumner, A., 2012. Where Will the World's Poor Live? An update on global poverty and the new bottom billion. *Working Paper 305*, September 2012. Washington, DC: Center for Global Development.

⁴ The 'new bottom billion' refers to the estimated nearly 1 billion poor people who live in middle-income countries; recognising that many of the world's poor no longer live primarily in low-income countries. Moving from a US\$1.25 to a US\$2 a day poverty line, this would double the poor in MICs from nearly 1 billion to almost 2 billion. The increase in LICs is smaller, from 320 to 490 million. Source: Sumner, A., 2012. Where Will the World's Poor Live? An update on global poverty and the new bottom billion. *Working Paper 305*, September 2012. Washington, DC: Center for Global Development.

⁵ The GAVI Alliance is a public-private partnership focused on saving children's lives and protecting people's health by increasing access to immunisation in poor countries. It funds vaccines for children in the world's 70 poorest countries.

⁶ Bill & Melinda Gates Foundation, 2009. *Pneumonia: Strategy overview*. In *Global health program – November 2009*. Seattle: Bill & Melinda Gates Foundation.

⁷ PATH and WHO, 2012. *Meningitis Vaccine Project*. Available at: <http://www.meningvax.org/index.php> [Date accessed: 6 October 2012]

⁸ UNICEF, 2012. *A global leader in vaccine supply*. Available at: http://www.unicef.org/immunization/index_leader.html [Date accessed: 6 October 2012]

- ⁹ National Institutes of Health, 2012. *Vaccine and antibiotics stabilized so refrigeration is not needed*. NIH News, 9 July 2012. Available at: <http://www.nih.gov/news/health/jul2012/nibib-09.htm> [Date accessed: 2 October 2012]
- ¹⁰ In other words, outside of the cold chain. Many vaccines are actually more heat stable than indicated on their current label. Source: PATH and WHO, 2012. Taking advantage of the true heat stability of vaccines. *Optimize Fact Sheet*. Available at: http://www.who.int/immunization_delivery/optimize/true_heat_stability_vaccines.pdf
- ¹¹ National Institutes of Health, 2012. *Vaccine and antibiotics stabilized so refrigeration is not needed*. NIH News, 9 July 2012. Available at: <http://www.nih.gov/news/health/jul2012/nibib-09.htm> [Date accessed: 2 October 2012]
- ¹² This evident in the maps depicting health worker shortages and unimmunised children in *Finding the final fifth: Inequalities in immunisation* (Save the Children and ACTION, 2012).
- ¹³ Sutanto, A, et al. 1999. Home delivery of heat-stable vaccines in Indonesia: outreach immunization with a prefilled, single-use injection device. *Bulletin of the World Health Organization*, 77 (2).
- ¹⁴ Jet injectors use pressure rather than needles to deliver vaccine as a fine stream of fluid that passes through the skin and into the tissue. See: http://www.path.org/projects/jet_injector.php
- ¹⁵ Microneedle patches consist of tiny needles coated with vaccine, while others use the skin's moisture to dissolve the vaccine into the intradermal layer. See: http://www.path.org/publications/files/TS_update_microneedle.pdf
- ¹⁶ This included diphtheria, tetanus and pertussis (DTP), tuberculosis, measles and polio. Source: Médecins Sans Frontières, 2012. *The right shot: Extending the reach of affordable and adapted vaccines*. Geneva: MSF.
- ¹⁷ Vaccination against Hepatitis B was added in 2004, Haemophilus influenzae type B in 2006, pneumococcal conjugate in 2007 (in GAVI-eligible countries from 2010), and rotavirus vaccine in 2009 (in GAVI-eligible countries from 2011). This excludes programmatic costs or associated vaccine wastage costs. Source: Ibid.
- ¹⁸ WHO, 2012. *World health statistics – 2012*. Geneva: WHO.
- ¹⁹ Tiered pricing (or differential pricing) is the charging of different prices for the same product to different classes of buyers – eg, LICs charged a reduced price for vaccines through bulk procurement systems, compared to the open market rate. See: http://www.who.int/immunization_financing/options/en/briefcase_pricingtiers.pdf
- ²⁰ Pooled procurement brings together multiple buyers into a single body to purchase vaccines on behalf of those buyers. See: http://www.who.int/immunization_financing/tools/Brief_12_Pooled_Procurement.pdf
- ²¹ Médecins Sans Frontières and Oxfam, 2010. *Giving developing countries the best shot: An overview of vaccine access and R&D*. Geneva, Switzerland: MSF.
- ²² See the website of the Developing Country Vaccine Manufacturers' Network: <http://www.dcvmn.org/>
- ²³ GAVI Alliance, 2011. *Investing in immunisation through the GAVI Alliance – The evidence base*. Geneva: GAVI Alliance.
- ²⁴ Bhadoria, V., Bhajanka, A., Chakraborty, K. and Mitra, P. India pharma 2020: Propelling access and acceptance, realising true potential. New Delhi: McKinsey & Company, Inc.
- ²⁵ The Times of India, 2011. 'City's Serum institute plays vital role in saving lives', Jun 14, 2011. Available at: http://articles.timesofindia.indiatimes.com/2011-06-14/pune/29660929_1_new-vaccines-city-based-vaccine-vaccine-producer [Date accessed: 2 November 2012]
- ²⁶ PricewaterhouseCoopers Pvt. Ltd., 2010. *India pharma Inc.: Capitalising on India's growth potential*. PwC PL.
- ²⁷ GAVI Alliance, 2011. *Investing in immunisation through the GAVI Alliance – The evidence base*. Geneva: GAVI Alliance.
- ²⁸ This price was offered by GSK.
- ²⁹ This is the price offered by the Serum Institute of India, the lowest price available at present.
- ³⁰ Though not as low as the price offered by Serum. Crucell offers their product at a price of \$2.8–3.2 per dose and GSK at \$2.95 per dose. Source: UNICEF, 2012. Vaccine Price Data. Available at: http://www.unicef.org/supply/files/12_01_13_DTP-HepB-Hib.pdf [Date accessed: 15 October 2012]
- ³¹ PATH, 2011. *Improving access to lifesaving vaccines – Rotavirus vaccine manufacturers offer to cut prices for the world's poorest countries*. Available at: <http://www.path.org/news/an110607-vaccine-price-cut.php> [Date accessed: 17 September 2012]
- ³² GAVI Alliance, 2011. GAVI welcomes lower prices for life-saving vaccines. Available at: <http://www.gavialliance.org/library/news/press-releases/2011/gavi-welcomes-lower-prices-for-life-saving-vaccines/> [Date accessed 17 September 2012]
- ³³ PATH, 2011. *Improving access to lifesaving vaccines – Rotavirus vaccine manufacturers offer to cut prices for the world's poorest countries*. Available at: <http://www.path.org/news/an110607-vaccine-price-cut.php> [Date accessed: 17 September 2012]
- ³⁴ Bharate (in collaboration with PATH) expects to get a licence for Rotavac in 2014 and WHO pre-qualification in 2015. It has recently finished the third phase of clinical development for safety and efficacy.
- ³⁵ MSH. *Access to affordable medicines, vaccines & technologies*. Available at: http://www.msh.org/resource-center/publications/upload/ccd_report_111027QuickChapter.pdf
- ³⁶ Padmanabhan, S., Amin, T., Sampat, B., Cook-Deegan, R. and Chandrasekharan, S., 2010. Intellectual property, technology transfer and developing country manufacture of low-cost HPV vaccines – A case study of India. *Nat Biotechnol.*, 28(7): 671–678.
- ³⁷ WHO, 2012. *Pentavalent vaccine, Easyfive, removed from WHO list of prequalified vaccines*. Available at: http://www.who.int/immunization/newsroom/newsstory_dtp_hepb_removed_prequal_list/en/index.html [Date accessed: 20 September 2012]; WHO, 2012. *Panacea OPV delisted from WHO's prequalified vaccines list*. Available at: http://www.who.int/immunization_standards/vaccine_quality/delisting_opv_panacea/en/index.html [Date accessed: 20 September 2012]
- ³⁸ Even when a new vaccine is closely modelled on an existing one, its safety and efficacy must be independently demonstrated in clinical trials. Source: Médecins Sans Frontières and Oxfam, 2010. *Giving developing countries the best shot: An overview of vaccine access and R&D*. Geneva, Switzerland: MSF.
- ³⁹ Some exceptions though include the HPV and pneumococcal vaccines. For example, Indian companies are currently trying to make low-cost versions of the HPV vaccine through non-patent infringing methods; however, this is a costly exercise. According to Serum, patents hindered its pneumococcal vaccine development, which has now been delayed availability to 2015.
- ⁴⁰ 'Bio-similars' are not granted the same regulatory benefits as generics: while generics only require proof of bio-equivalence, bio-similars must prove correlates of protection or conduct successful phase III trials.
- ⁴¹ A patent pool is an agreement by multiple patent holders to share intellectual property among themselves or to license a portfolio of patents as a package to others.
- ⁴² For instance, the Medicines Patent Pool (MPP) is a recent example of an initiative to increase access to affordable HIV medicines in developing countries. The MPP negotiates with patent holders to share their intellectual property, and then licenses them to generic manufacturers to facilitate the production of low-cost HIV medicines.
- ⁴³ Padmanabhan, S., Amin, T., Sampat, B., Cook-Deegan, R. and Chandrasekharan, S., 2010. Intellectual property, technology transfer and developing country manufacture of low-cost HPV vaccines – A case study of India. *Nat Biotechnol.*, 28(7): 671–678.
- Before TRIPS, many developing countries, such as India, did not award product patents for biopharmaceuticals (including vaccines). Local companies, therefore, became skilled at copying medicine cheaply. After joining the WTO in 1995, India (like other developing country manufacturers that are WTO members) had to change its patent policy and must now take into account international pharmaceutical companies'

product patent rights on vaccines and related technologies. Patents granted in developing countries may therefore restrict a manufacturers' ability to develop vaccines, and sell them in local and other developing countries markets. This in turn could reduce their incentives to develop vaccines. Source: Ibid.

⁴⁴ 64% of all basic EPI vaccines purchased by United Nations purchasing agencies are now made by developing country manufacturers. Source: WHO, 2011. *Increasing access to vaccines through technology transfer and local production*. WHO.

⁴⁵ WHO, 2011. *Increasing access to vaccines through technology transfer and local production*. WHO.

⁴⁶ The World Bank and GAVI Alliance, 2010. Brief 12: The vaccine market – Pooled procurement. *Immunization Financing Toolkit*. Available at: http://www.who.int/immunization_financing/tools/Brief_12_Pooled_Procurement.pdf

⁴⁷ 57 countries are currently eligible for GAVI support based on a gross national income (GNI) per capita below or equal to US\$1,520.

⁴⁸ Pan American Health Organization, 2011. *PAHO Revolving Fund*. Available at: http://new.paho.org/hq/index.php?option=com_content&view=article&id=1864&Itemid=2234&lang=en; http://www.paho.org/English/ad/fch/im/Revol_Fund.htm [Date accessed: 18 October 2012]

⁴⁹ Ibid.

⁵⁰ Médecins Sans Frontières and Oxfam, 2010. *Giving developing countries the best shot: An overview of vaccine access and R&D*. Geneva, Switzerland: MSF.

⁵¹ GAVI Alliance and The World Bank. *Advance market commitments for vaccines – Creating markets to save lives*. Geneva: GAVI Alliance; Médecins Sans Frontières and Oxfam, 2010. *Giving developing countries the best shot: An overview of vaccine access and R&D*. Geneva, Switzerland: MSF.

⁵² For the Pneumococcal Conjugated Pediatric 10 Valent and 13 Valent. Source: Pan American Health Organization, 2012. *Expanded program of immunization vaccine prices for year 2012 – Amendment 1*. Available at: http://new.paho.org/hq/index.php?option=com_docman&task=doc_download&gid=17031&Itemid=&lang=en

⁵³ Results for Development Institute, 2011. *Synthesis report: New vaccine adoption in lower-middle-income countries*. Results for Development Institute.

⁵⁴ The largest countries to graduate from LIC to MIC status since 1999 are China (which graduated in 1999), Indonesia (re-graduated in 2003) and India (2007), Nigeria (2008) and Pakistan (2008).

⁵⁵ The 'new bottom billion' refers to the estimated nearly 1 billion poor people who live in middle-income countries, recognising that many of the world's poor no longer live primarily in low-income countries. Source: Sumner, A., 2012. *Where Will the World's Poor Live? An update on global poverty and the new bottom billion*. *Working Paper 305*, September 2012. Washington, DC: Center for Global Development.

⁵⁶ The MICs, however, are a diverse group of countries, ranging from the BRICS (Brazil, Russia, India, China and South Africa) to fragile states such as Pakistan and Nigeria. They also cover a wide income range – the highest income MIC has a per capita income that is ten times that of the lowest. MICs are also characterised by high levels of inequality.

⁵⁷ Brookings, 2011. *Two Trends in Global Poverty*. Available at: <http://www.brookings.edu/research/opinions/2011/05/17-global-poverty-trends-chandy> [Date accessed: 1 October 2012]

⁵⁸ Save the Children and ACTION, 2012. *Finding the final fifth: Inequalities in immunisation*. London: Save the Children Fund. Available at: <http://www.savethechildren.org.uk/resources/online-library/finding-final-fifth-inequalities-immunisation>

⁵⁹ WHO, 2012. *World health statistics – 2012*. Geneva: WHO.

⁶⁰ El Salvador, Guatemala, Iraq, Micronesia, Marshall Islands, Morocco and Paraguay.

⁶¹ El Salvador, Marshall Islands, Guatemala and Morocco

⁶² Makinen, M., Kaddar, M., Mollrem, V., Wilson, L., 2012. New vaccine adoption in lower-middle-income countries. *Health Policy and Planning*, 27: 39-49.

⁶³ Results for Development Institute, 2011. *Synthesis report: New vaccine adoption in lower-middle-income countries*. Results for Development Institute.

⁶⁴ WHO, 2011. *Global immunization news*, 31 August 2011. Available at: http://www.who.int/immunization/GIN_August_2011.pdf

⁶⁵ UNICEF Supply Division, 2012. Key updates. Industry consultation. UNICEF. Available at: http://www.unicef.org/supply/files/VC_IC2_Key_updates_final.pdf [Date accessed: 8 November 2012]

⁶⁶ From 2011 onwards the threshold will be adjusted for inflation annually with the most recent World Bank GNI data used to determine the list of eligible countries. The 2012 threshold is based on 2010 GNI per capita data released by the World Bank in July 2011.

⁶⁷ National DTP3 coverage must be over 70% (WHO/UNICEF estimates 2010), except for applications for Yellow fever and Meningococcal A vaccines.

⁶⁸ Makinen, M., Kaddar, M., Mollrem, V., Wilson, L., 2012. New vaccine adoption in lower-middle-income countries. *Health Policy and Planning*, 27: 39-49.

⁶⁹ Out of the 57 GAVI-eligible countries, 44 were categorised as fragile, based on the analysis of varying definitions of fragility on different lists.

APPENDIX: METHODOLOGY

¹ Estimates from the latest WHO update (July 2012) were not used as the system used for the LiST analysis had not yet been updated with this data.

² Due to logistical problems, the data collection could not be completed in Tamil Nadu.

IMMUNISATION FOR ALL

No child left behind

No child should be denied their right to immunisation, but millions still are. One child in five misses out on basic vaccinations.

Immunisation for All identifies country-level strategies to reach the unreached. It argues that, while immunisation campaigns have been very successful, more comprehensive systems are required in order to achieve and sustain high equitable immunisation coverage. This also has the potential to bring other essential health services to children who are unreached.

This report also identifies factors at the global level that will help to create a more conducive environment for countries to achieve and sustain universal immunisation coverage. This involves research and development agendas that respond to the needs of the poor and most vulnerable, and technologies and packaging that work in poor and remote contexts. It also requires sustainable access to sufficient supply of vaccines at affordable prices through increasing competition, technology transfers, and exploring the opportunities for pooled procurement and tiered pricing. With more of the world's poor living in middle-income countries, affordable and sustainable access to vaccines is more urgent than ever.

Finally, *Immunisation for All* makes a series of recommendations to governments, development partners, the private sector and civil society. It urges all actors to seize the opportunity we have this decade to achieve universal access to immunisation.

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