Exemplars in Under-5 Mortality: Peru Case Study

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Abbreviations

ACT:	Artemisinin-based Combination Therapy
AMDD:	Averting Maternal Death and Disability
ANC:	Antenatal Care
ANC4+:	Four or more Antenatal Care Visits
ANC6+:	Six or more Antenatal Care Visits
ARI:	Acute Respiratory Infection
ART:	Antiretroviral, Antiretroviral Therapy
BEmONC:	Basic Emergency Obstetric and Newborn Care
CB-IMCI:	Community-Based Integrated Management of Childhood Illness
CEmONC:	Comprehensive Emergency Obstetric and Newborn Care
COD:	Cause of Death
CRECER:	National Strategy for Poverty Reduction and Economic Opportunities
CRED:	Control de Crecimiento y Desarrollo (Control of Growth and Development)
CRS:	Congenital Rubella Syndrome
DDT:	Dichlorodiphenyltrichloroethane
DHS:	Demographic and Health Survey
DIRESA:	Dirección Regional de Salud (Regional Health Directorates)
DPT:	Diphtheria, Pertussis and Tetanus
EBI:	Evidence-Based Intervention
EmOC:	Emergency Obstetric Care
EmONC:	Emergency Obstetric and Newborn Care
EPI:	Expanded Program on Immunization
EPIAS:	Exploration, Preparation, Implementation, Adaptation, and Sustainment
EsSalud:	Seguro Social de Salud del Peru (Social Health Insurance)
FB-IMCI:	Facility-Based Integrated Management of Childhood Illness
FEMME:	Foundations to Enhance Management of Maternal Emergencies
GBD:	Global Burden of Disease
GDP:	Gross Domestic Product
HBB:	Helping Babies Breathe
HCW:	Health Care Worker
Hib:	Haemophilus Influenzae type B vaccine
HIV/AIDS:	Human Immunodeficiency Virus/ Acquired Immunodeficiency Syndrome
HR:	Human Resources
HRH:	Human Resources for Health
IDB:	Inter-American Development Bank
IHME:	Institute for Health Metrics and Evaluation
IMCI:	Integrated Management of Childhood Illness
INEI:	Instituto Nacional De Estadistica eInformatica
IRS:	Indoor Residual Spraying

ITN:	Insecticide-Treated Nets
JUNTOS:	National Program for Direct Support for the Poor
KI:	Key Informant
KII:	Key Informant Interview
KMC:	Kangaroo Mother Care
LBW:	Low Birth Weight
LLIN:	Long-Lasting Insecticide-Treated Nets
LMIC:	Low- and Middle-Income Country
LRI:	Lower Respiratory Infection
M&E:	Monitoring and Evaluation
MCH:	Maternal and Child Health
MDG:	Millennium Development Goal
MINSA:	Ministerio de Salud
MMR:	Measles, Mumps, and Rubella
MOH:	Ministry of Health
MTCT:	Mother-To-Child Transmission
NCEPCD:	National Center for Epidemiology, Prevention, and Control of Diseases
NGO:	Non-Governmental Organization
NICU:	Neonatal Intensive Care Unit
NMCP:	National Malaria Control Program
NMR:	Neonatal Mortality Rate
NRP:	Neonatal Resuscitation Program
OOP:	Out-Of-Pocket
ORS:	Oral Rehydration Salts
PAHO:	Pan-American Health Organization
PAMAFRO:	Global Fund's Malaria Control Program in Andean-Country Border Regions
PARSALUD:	Programa de Apoyo a la Reforma del Sector Salud
PCR:	Polymerase Chain Reaction
PCV:	Pneumococcal Vaccine
PHC:	Primary Health Care
PICU:	Pediatric Intensive Care Unit
PMTCT:	Prevention of Mother-to-Child Transmission
PNC:	Postnatal Care
PNI:	Programa de Nutrición Infantil
RDT:	Rapid Diagnostic Testing
RHF:	Recommended Home Fluids
SEG:	Seguro Escolar
SERUMS:	Servicio Rural y Urbano Marginal de Salud
SIS:	Seguro Integral de Salud (Comprehensive Health Insurance)
SIVICO:	Community Surveillance System
SMI:	Seguro Materno Infantil

Strategy 5x5x5: Commitment to reduce stunting in children under 5 years by 5 percentage points in a period of 5 years
TB: Tuberculosis
TBA: Traditional Birth Attendant
THE: Total Health Expenditure
TOT: Training of Trainers
TT: Tetanus Toxoid
U5: Under-5
U5M: Under-5 Mortality
UGHE: University of Global Health Equity
UNAIDS: Joint United Nations Programme on HIV/AIDS
UNFPA: United Nations Population Fund
UNICEF: United Nations Children's Fund
US CDC: United States Center for Disease Control and Prevention
WASH: Water, Sanitation, and Hygiene
WHA: World Health Assembly
WHO: World Health Organization

1 Executive Summary

1.1 Background

1.1.1 Exemplars in Global Health Under-5 Mortality Project

The Exemplars in Under-5 Mortality (U5M) project aims to identify lessons from countries' successes in reducing under-5 mortality to inform the decision-making of leaders, policymakers, and funders. The University of Global Health Equity is collaborating with Gates Ventures and the Bill & Melinda Gates Foundation to understand exemplar countries successful reduction of under-5 mortality (U5M) – a high priority issue within global health. The project is designed to identify and disseminate cross-cutting implementation strategies and policy lessons that can be adapted and adopted in other countries working to achieve similar progress. The scope is limited to deaths amenable to improvement in health care delivery and quality and focuses on the uptake of recommended evidence-based interventions (EBIs) to reduce U5M between 2000 and 2015. We applied an implementation science lens and mixed methods to understand not just what was selected and quantitative outcomes, but how and why the EBIs were implemented.

1.1.2 Peru

Peru is the third largest country in South America. Located on the western Pacific coast of South America, the country is divided into three distinct geographic regions: the Pacific coast, the highlands of the Andes mountains, and the jungle of the Amazon rainforest. Peru experienced steady population growth over the study period – from 26.5 million in 2000 to 30.5 million in 2015. Its rural population declined for decades prior to the study period and by 2000, 74% of the population resided in urban areas. This remained relatively constant and in 2015, 77% of the population resided in urban areas, largely in Lima.

Between the 1970s and 1990s, Peru struggled with years of internal political conflict and violence under the terrorist group the Shining Path. The Shining Path declined during Alberto Fujimori's government from 1990 to 2000 and Peru began its economic resurgence. Beginning in 2001, there was significant and sustained commitment by the government, civil society, and other stakeholders to achieve the Millennium Development goals (MDGs). In 2002, civil society, government organizations, and political parties signed the National Agreement (Acuerdo Nacional) to strengthen democracy, promote social justice, equity and universal access to health care services and education, maintain transparency and decentralization, address poverty, and improve efficiency. This agreement was effective in ensuring that even as leadership changed, the national government would continue to follow the set of key priorities and facilitate sustained progress. The Acuerdo Nacional created momentum across the country for commitment and action for solidarity and empowerment through better heath, economic development, education, and care for the poor and vulnerable populations. This commitment was sustained through changes in government and enabled much of the progress with key maternal and child health indicators.[1]

Prior to the study period, in 1990, Peru experienced the worst inflation crisis in its history while terrorist violence targeted both public and private production of goods. The economy gradually began recovering in 1993, aided by policies to address the crisis, improved stability in the country as the Shining Path lost power, and the rising price of minerals, Peru's top export, on the global market. This recovery of relative political and economic growth continued through the study period, with Peru's Gross Domestic Product (GDP) quadrupling from $51.7B in 2000 to $211.4B in 2017.[2] The GDP per capita also increased from $1,956 in 2000 to $6,228 in 2015 (Figure 1).[3]

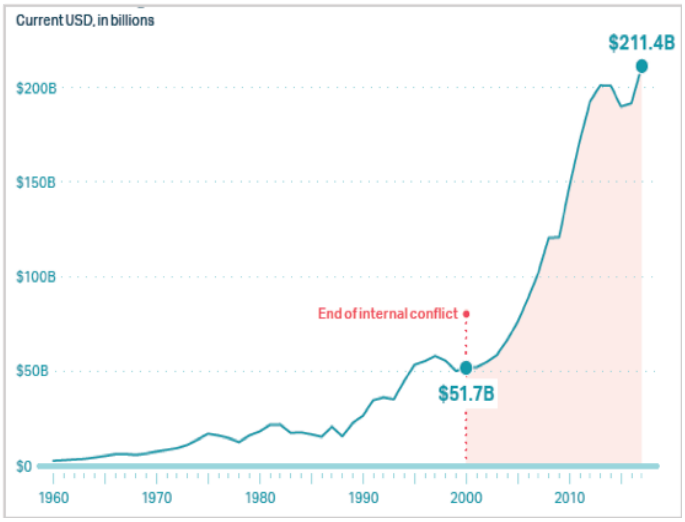

Figure 1: Peru's GDP (Current USD), 1960-2017

This economic growth and implementation of numerous safety net programs such as the *Juntos* program and free school feeding and human capital development for female heads of households in the country started before the study period. It increased access to education and social insurance and contributed to decreasing poverty rates in Peru over the study period.[4,5] The proportion of Peru's population living below the national poverty line decreased impressively from 59% in 2004 to 22% in 2015.[5] Income inequality also declined – the country's GINI index decreased from 49 in 2000 to 43 in 2015. In 2015, Peru's GINI index was lower than that of its neighbors: Bolivia (47), Brazil (51), Chile (48), and Colombia (51).[6]

Peru's health system is made up of the public sector (which serves the majority of the population), and a growing private sector (which serves about 6% of the population). The public sector has three public entities (the Ministry of Health, health establishments from Social Health Insurance (Seguro Social de Salud del Perú-EsSalud) and the Health services of the Armed Forces and National Police). Peru's total health expenditure as a percentage of GDP increased slightly from 4.3% in 2000 to 4.5% in 2015, though remained still lower than the Caribbean and Latin American average (7.11%). Out-of-pocket (OOP) expenditure remained consistently high throughout the study period, 27.9% in 2000 and 28.9% in 2015, although below the regional average in 2014 (32.7%). Beginning in 1997, Peru launched a free health insurance program for children between the ages of 3 to 17 enrolled in public school, with free health insurance services expanding through the Maternal and Child Insurance Program in 1998. Both programs were combined to become *Seguro Intergral de Salud (*SIS) in 2001, which provides free basic health insurance to pregnant women and children.

Throughout the study period, the community health agents initiative expanded to include training for malaria testing and treatment, promotion of hand washing and hygiene, nutrition education, vaccines and other prevention methods, delivery of first aid services, and monitoring nutrition status of children and pregnant and post-partum women. Limited numbers of doctors and nurses remained a challenge in Peru, with a steady migration of trained health care workers leaving the country. The Ministry of Health (MOH)

aimed to address this by training more health care professionals and obliging those who wanted to work in the health system to first spend one year of Urban Rural Marginal Internship Program delivery services (Servicio Rural y Urbano Marginal de Salud- SERUMS) at primary care facilities.[7] These approaches contributed to an increase in the number of doctors and nurses in the country, from 14.1 doctors per 10,000 people and 8.2 nurses per 10,000 people in 2000 to 22.3 doctors per 10,000 people and 25.9 nurses per 10,000 people in 2016. However, distribution of health care workers (HCWs) was not equal across all regions of the country, reflecting an ongoing challenge.

Access to health facilities varied significantly by region and population density. A key informant expressed that the Ministry of Health did invest in health infrastructure during the study period and the number of ministry-run health facilities improved from about 2,500 in the early 1990s to 8,500 at the time of case study development. Additionally, access to reproductive health care services increased, such as through the creation of Maternal Waiting Homes and midwife education programs in rural regions and increased antenatal care (ANC) services mentioned in more detail below.

1.1.3 Methods

In collaboration with the UGHE team and with support from Gates Ventures, EvaluServe carried out a desk review of published and gray literature related to Peru's general political, cultural, and economic context as well as EBIs implemented to reduce U5M. The UGHE team partnered with an in-country consultant team – Dr. Patricia Garcia, Anna Larson MPH, and Marco Carcamo MD of Cayetano Heredia University – to conduct and analyze key informant interviews (KIIs) with policymakers, implementers, and partners in Peru to understand the implementation strategies, policies, and contextual factors most relevant to the success in reducing U5M in Peru. Using qualitative methods, implementation strategies, and approaches (transferable knowledge) that could be implemented in other countries were extracted. Additional analyses from the International Center for Equity in Health (Federal University of Pelotas) and geospatial mapping from the Institute for Health Metrics and Evaluation (IHME) (University of Washington) were used to understand changes in equity for mortality and EBI coverage.

1.2 Dropping Under-5 and Neonatal Mortality in Peru

Peru's U5M rate was 38.6 deaths per 1,000 live births in 2000. As part of the national equity-focused agenda, there was significant leadership and investment to improve health for all through a range of policy and heath system interventions. Associated with this work, Peru experienced an impressive drop in U5M over the study period – from 38.6 deaths per 1,000 live births in 2000 to 16.6 per 1,000 live births in 2015, a decrease of 57%. Progress in neonatal mortality also occurred over the study period. Peru's neonatal mortality dropped from 15.5 deaths per 1,000 live births in 2000 to 7.6 per 1,000 live births in 2015, a decrease of 51%.[8] These improvements occurred across all wealth quintiles in the country and the equity gap between rates of these quintiles narrowed impressively for both under-5 mortality and neonatal mortality. However, while smaller, a notable gap between the poorest two quintiles and all others remained for U5M, as well as ongoing inequities based on urban versus rural residence and by geographic region. U5M rates in Peru ranged from highest of 40/1,000 in Loreto to lowest of 14/1,000 in Lima and Tumbes in 2014.

The equity gap for the neonatal mortality rate (NMR) was smaller than seen for U5M at the start of the study period and narrowed significantly by 2015, with a small gap persisting between the wealthiest and all others. While equity between urban and rural settings improved for NMR, regional differences remained, with the largest gap between Ayacucho (18/1,000) and Arequipa (4/1,000) in 2014 (Figures 2 and 3).

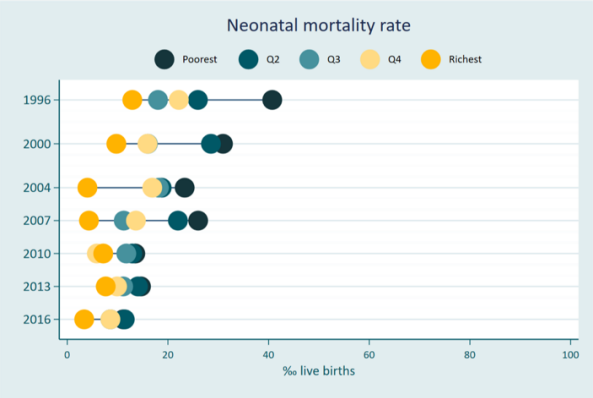

Figure 3: Equity Analysis of NMR in Peru by Wealth Quintile, 1996-2016 (Source: Victora et al, 2018)

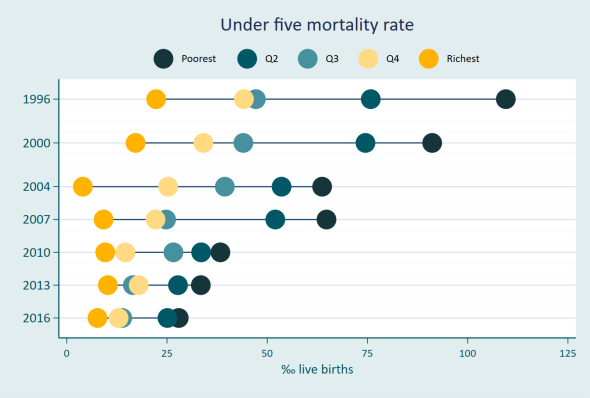

Figure 2: Equity Analysis of U5M in Peru by Wealth Quintile, 1996-2016 (Source: Victora et al, 2018)

1.3 Causes of Under-5 and Neonatal Mortality

COD of Under-5

The IHME estimates that the top three contributing causes of under-5 deaths in Peru in 2000 were lower respiratory infections (20%), diarrheal diseases (5.4%), and nutritional deficiencies (4%). At the end of the study period in 2015, the top three causes of U5M were lower respiratory infections (15.7%), HIV/AIDS (6.5%), and diarrheal diseases (2.9%).

Though lower respiratory infections and diarrhea remained two of the most common causes of death (CODs) throughout the study period, rates of death in the under-5 population for the two causes decreased by 7% (163/100,000 in 2000 to 54/100,000) and 9% (32/100,000 in 2000 to 3.9/100,000) respectively. U5M caused by nutritional deficiencies decreased from 32/100,000 in 2000 to 3.9/100,000 in 2015.

COD of Neonatal

The top three causes of neonatal death in Peru at the start of the study period in 2000 and end in 2015 were the same with decreases seen in all three: prematurity (6,416/100,000 to 2,276/100,000), birth asphyxia and birth trauma (3,914/100,000 to 2,140/100,000) and sepsis and other infections (2,832/100,000 to 2,125/100,000 in 2015).

1.4 How Peru Dropped U5M and NMR

The success in dropping U5M and NMR in Peru represented a combination of implementation strategies to increase coverage of EBIs to increase access to care and reduce disease incidence, as well as contextual factors which enabled or challenged this work. Contextual factors impacted U5M reduction in various ways by addressing amenable CODs directly through increasing prevention and access to care as well as policies and initiatives outside the health care delivery systems broadly impacting the incidence of disease, and improving the resiliency of children. Cross-cutting factors such as the country's focus to reduce poverty and poverty-related inequity, economic development, and consistent leadership commitment to improving health, particularly for women and children facilitated this progress to improving EBI implementation and reducing U5M more broadly. These facilitating contextual factors were seen at the global, national, regional, and individual levels.

Evidence-Based Intervention Implementation: Successes and Challenges

Peru implemented most of the preventive and curative EBIs known to address the leading and other COD for U5 in Peru. These included vaccinations, treatment of diarrhea and pneumonia, and treatment and prevention of malaria, as well as EBIs intended to reduce neonatal mortality through improving care in the antenatal, perinatal, and postnatal periods.

During the study period, Peru achieved impressive, high coverage of many key EBIs. ANC4+ (four or more visits of antenatal care) coverage was fairly high at the start of the study period (69% in 2000) due to prior efforts and reached 96% in 2016. Facility-based delivery coverage improved from 57% in 2000 to 87% in 2015. Coverage remained high during the study period for previously introduced vaccines and new vaccines such as rotavirus, pneumococcal vaccine (PCV), and pentavalent (87%, 90%, and 90% coverage in 2015, respectively).

However, progress was not uniform across EBIs. For example, coverage remained fairly low for indicators associated with Integrated Management of Childhood Illness (IMCI), such as treatment of diarrhea with oral rehydration salts (ORS) or recommended home fluids (RHF) (35.5% in 2000 and 35% in 2014) while others such as acute respiratory infections (ARIs) with antibiotics increased but remained far from universal (27% in 2004-06 and to 41% in 2014). Coverage of vitamin A supplementation was extremely low at 4% in 2011 and Peru did not achieve sustained improvement in coverage over the study period (Table 1).

Progress was also not uniform across populations in Peru, with ongoing disparities in coverage for some EBIs. For example, as noted above, facility-based delivery reached high national-level coverage during the study period. However, large regional differences remained, with coverage ranging from 67% in Loreto to 99.7% in Ica.[9]

EBI Implementation Strategies

In implementing the EBIs, Peru utilized a variety of cross-cutting implementation strategies which supported the work. The most common implementation strategies included:

1. Strong nationally-led development and implementation of protocols and guidelines
    - National policies accompanied implementation of key EBIs
2. Implementation research and other inquiry to inform design and adaptation
    - Engagement and inquiry of community and consumers
    - Driven by Peruvian academia and MOH
3. Early and ongoing engagement of stakeholders including partners and in-country experts
    - Involvement throughout all stages of implementation
    - Ex: multi-stakeholder meeting conducted to present results of drug efficacy studies for new malaria treatment regimens prior to introduction of artemisinin-based combination therapy (ACTs)
4. Leveraging donor and partner support and expertise
    - Use of donor and partner resources (both technical and financial) to aid feasibility of introduction and widespread implementation of EBIs
5. Data use for decision-making
    - Utilization of data from many sources throughout implementation of EBIs, including data use for prioritization, to understand disease burden and ensure appropriateness of EBIs, and to inform implementation
6. Human resource (HR) strengthening (primarily training)
    - Training and other HR strengthening activities like supportive supervision facilitated implementation of new EBIs or expansion of coverage for existing ones
7. Integration of EBIs into existing systems and a focus on primary care
    - Peru built upon existing systems and programs for implementation of new EBIs rather than using standalone approaches
8. Focus on equity
    - Introduction of new vaccines like PCV, rotavirus, and haemophilus influenzae type B vaccine (Hib) prioritized the poorest areas of the country first prior to full national scale-up
    - Infrastructure strengthening in regions with very scarce population
9. Use of conditional cash transfers
    - The Juntos conditional cash transfer program was designed to break the cycle of poverty but included conditional cash transfers for receiving services such as ANC and immunizations to increase uptake
10. Cultural sensitivity to drive adaptation
    - Adaptation of delivery services at health facilities based on identified disparities in facility-based delivery and cultural practices and preferences
        - Establishment of maternal waiting homes for pregnant women and their families to stay prior to delivery
        - Following adoption of vertical delivery standards in 2005, facilities set up birthing rooms were women could deliver in a standing or squatting position with their husbands and other family members present

1.5 Contextual Factors

In addition to the introduction and expansion of EBIs, contextual factors were important in the analysis of U5M reduction. Reflecting the theory of change and research framework used in this study (see appendix), contextual factors were identified at levels from global to individual. Factors were also identified by whether they were important indirectly in the successes or challenges of implementing the EBIs, or by how they were important indirectly in contributing or hindering Peru's efforts to reduce U5M. These could act through reducing risk of disease (ex. water, sanitation, and hygiene – WASH; economic development), increasing knowledge and ability to access care broadly (ex. education, increase in health facilities) and child and family resilience. Many of these contextual factors have also been identified in other Exemplars U5M case studies as facilitators or barriers to reductions in U5M.

At the national level, multiple key informants identified Peru's **sustained economic growth** as a key facilitator to the country's progress in improving health outcomes, particularly U5M. One KI said, "*Economic growth is what has improved the health indicators."* This growth contributed to reduced poverty and led to increased investment in health, including health-specific and other infrastructure such as roads which improved access to care.

Effective and consistent **national leadership and prioritization of maternal and child health (MCH) initiatives** were also key to setting goals around U5M reduction and achieving this progress in Peru. Early in the study period, the National Agreement resulted in sustained, multi-party prioritization of development goals such as U5M reduction and funding for essential programs to meet these goals. The Roundtable for the Fight Against Poverty, established in 2001, also helped to make the MCH agenda a national priority in Peru and facilitated commitments and designated resources to this cause. The Roundtable's strong presence in national politics contributed to the development of policies and programs that targeted improvement in child health indicators. As explained by a KI, *"the Roundtable has addressed the public policy discussion on [MCH] issues and subsequently contributed to better mechanisms for cleaning up public policy in relation to mortality and in particular neonatal mortality."*

Similarly, the government had a strong commitment and political agenda to **reduce poverty in Peru**, improving resilience of children and their families. The Roundtable for the Fight Against Poverty set an anti-poverty agenda at the national level. Peru developed a **social policy framework to reduce inequities** in the groups most affected by poverty, such as indigenous and rural populations. Programs like the National Strategy for Poverty Reduction and Economic Opportunities (CRECER) and *Juntos* aimed to directly address these inequities, including those resulting from violence in the 1990s.

Others important contextual factors facilitating EBI implementation and U5M reduction more broadly at the national, Ministry of Health and community/individual levels included:

- Investment in health
- Health sector reforms
- Ongoing health systems strengthening efforts (infrastructure and human resource for health-HRH)
- Innovation in research and integration of results into policy
- Data availability and use
- WASH improvements

1.6 Transferable Lessons

There were a number of replicable strategies from Peru that would be relevant for other countries aiming to accelerate decline in U5M, learning from Peru's successes and challenges. These include:

1. Embed the implementation strategies into broader efforts for equity addressing vulnerability of the most disadvantaged including anti-poverty initiative and plan for equity in implementation (with improved focus on the most vulnerable populations) from the start while working to improve care for all.
2. Ensure national commitment to U5M reduction that is resilient to changes in government and leadership by embedding into agreements designed to be sustained.
3. Ask for and use available evidence or develop locally relevant evidence for decision-making to determine need and appropriateness of EBIs, where adaption is needed, and key implementation strategies based on global and local factors and results both in planning and during implementation.
4. Integrate new initiatives into existing system capacity and combine vertical programs into a more primary care-focused model.
5. Engage the community to understand challenges before and during implementation and be willing to adapt to make culturally appropriate and acceptable.
6. Engage and consult stakeholders and leverage their expertise during planning and throughout implementation, including within the MOH, donors, implementing partners, professional bodies, and communities.
7. Build research and data-driven decision-making capacity at a national level.
8. Invest in improving resilience to disease through poverty reduction and education.

Table 1. Coverage of Selected EBIs in Peru, 2000-2014 (Source: DHS)

U5 Cause of Death	Intervention	2000	2004-2006	2011	2014
Acute Respiratory Infections	Children with symptoms of ARI taken to health facility (%)	61.6	69.6	64.7	60.4
	Children with symptoms of ARI who received antibiotics (%)	-	27.3	37.2	40.5
	Vaccination: 3 doses of DPT/pentavalent vaccine (%)	-	-	81.4	77.8
	U5 with symptoms of ARI – 2 weeks preceding survey (%)	*20.2*	*18*	*16.4*	*16.8*
Diarrheal Diseases	Oral rehydration solution (%)	21.9	25.0	29.8	28.2
	Children with diarrhea taken to health facility (%)	40.3	44.6	36.6	33.3
	U5 with diarrhea – 2 weeks preceding survey (%)	*15.4*	*14.8*	*13.9*	*12.1*
	Advice or treatment of fever sought from a health facility or provider (%)	55.9	66	67	60
	Treatment of children with fever with antimalarial drugs (%)		29.5	53.2	
	U5 with fever – 2 weeks preceding survey (%)	*25.9*	*23.9*	*21.5*	*20.4*

Measles	Measles vaccination coverage (%)	84.4	85.6	85	79
Malnutrition	Exclusive breastfeeding from 0-5 months (%)	67.2	63.3	71.7	68
	U5 receiving vitamin A supplements in the six months preceding survey (%)	74.2		3.9	5.7
	U5 stunted (%)	31	29.3	19.5	14.6
	U5 wasted (%)	1.1	1	0.4	
Other vaccine preventable diseases	Full vaccination coverage with 3 doses DPT, 3 doses polio, measles, and BCG (%)	66.3	65.7	71.5	61.1
Neonatal Causes of Death	Total fertility rate (15-49) (%)	2.8	2.6	2.6	2.5
	Antenatal care: 4+ visits by a skilled provider (%)	69.1	87.8	94.1	96.9
	Vaccination: Tetanus protection at birth (%)		70.1	76.3	77.8
	Delivery in a health facility (%)	56.8	72.3	85.1	89.5
	Delivery attended by skilled provider (%)	61.5	75.4	86.9	89.9
	Delivery by C-section (%)	13	17.4	24	28.6
	Postnatal care: Postnatal visit for baby within 2 days of birth (%)	4.6			
	Median birth interval (months)	36.9	44.2	50.2	
	Teenagers who have begun childbearing (%)	2.3	1.9	2.6	2.9

2 Introduction

2.1 Exemplars in Global Health

The Exemplars in Global Health project was started by Gates Ventures and cofounded by the Bill & Melinda Gates Foundation to inform high impact global health decisions by making it easier to replicate large-scale national and global health successes through evidence-based narratives. The core of the project is to identify the knowledge and evidence detailing the successes, as well as the drivers of and barriers to those successes, among "exemplars" – positive outlier countries that have demonstrated outperformance relative to peers or beyond what might be expected given context and/or financing. The content goes beyond traditional research and peer-reviewed literature to better understand how these exemplars were able to achieve success beyond their regional neighbors and other comparable countries. The analysis and conclusions are designed to be data-driven and rigorous, but also to create knowledge that is transferable and accessible and has the potential to be used across a range of key stakeholders. Therefore, the content developed by the Exemplars project is intended primarily for an audience of national policymakers, implementers, and funders – people with the potential to significantly impact global health policy and implementation at scale.

2.2 Exemplars in Under-5 Mortality

As a part of the broader Exemplars project, the University of Global Health Equity (UGHE) is working with the teams at Gate Ventures and the Bill & Melinda Gates Foundation to better understand countries' successes in reducing under-5 mortality (U5M) between 2000 and 2015. This work was designed with two aims: 1) developing and testing an implementation research framework and mixed methods approach to understand the successes of these countries, and 2) extracting actionable and transferable knowledge focused on implementation strategies and key contextual factors to inform other countries working towards the same goal. The scope of mortality was limited to amenable causes of death (CODs) – those which are potentially preventable with a stronger and higher quality health care system. The work was divided into a number of activities. These included: 1) identifying evidence-based interventions (EBIs) in use in low- and middle-income countries (LMICs) which addressed the main causes of U5M and neonatal mortality; 2) developing and applying a mixed method implementation science-based approach to understanding how the EBIs put into place by these exemplar countries were prioritized, implemented, adapted, and sustained; 3) understanding how the EBIs implemented by a country were prioritized, adapted, implemented, and sustained through research into both existing publicly available sources and primary key informant interviews; and 4) identifying the key contextual factors and policy interventions within and beyond the health sector critical to each country's success at the global, country, community, and health system levels. The work was guided by an implementation research framework developed to understand decreases in U5M, which was informed by a number of frameworks in use for U5M (e.g. Countdown 2015, WHO) and in implementation science. The framework and identified EBIs can be found in Appendix A.

With input from a technical advisory panel, seven countries meeting "exemplar" criteria for U5M were chosen based on the rates of decline in U5M compared with countries in their region or with similar economic resources. These countries were also chosen from a larger list of Exemplar countries to represent

a range of locations and sizes, with the goal of identifying the range of factors and implementation strategies which were unique and common to countries that have over-performed in U5M.

2.3 Peru

Background

Peru is the third-largest country in South America, situated in the western area of the continent on the Pacific coast. The country is divided into three geographical regions: the coast, highlands, and jungle (Figure 4).[10]

Peru's population grew steadily over the study period, from 26.5 million in 2000 to 30.5 million in 2015.[11] The majority (52%) of the population resides in the coastal region, followed by the highlands (36%). Though the Amazon rainforest makes up almost 60% of the area of Peru, only 12% of the population lives there.[12] Peru's rural population as a proportion of the total population has long been declining. The percentage of the population residing in urban areas increased overtime from 46.8% in 1960 to 64.6% in 1980, 73% in 2000, and 77.4% in 2015; making the rural areas less populated.[13]

Figure 4: Map of Peru with Regions[1]

Spanish is spoken by the large majority of the population. However, dozens of other languages are also spoken in Peru. The most commonly spoken of these, Quechua, is also an official language and is spoken by about 19% of the population.[14]

Governance

Peru has faced long periods of political instability following its independence from Spain in 1821. After establishing their independent governmental structure, between 1840 and 1860, Peru had a growing economy, in part due to *guano de las islas* (natural fertilizer from sea bird excrements). Later, conflict with Spain and then with Chile (1866 through 1883) led to a "National Reconstruction" phase in which military leaders ran the country until 1895. In the following years, civilian and military governments ruled, some more corrupt than others. In 1968, the Revolutionary Government of the Armed Forces took control of the government and attempted to change the old models of Peruvian society. According to some experts, in many ways this was partially successful, but also had significant negative economic impacts. The populist governments of the 1980s (Fernando Belaunde Terry and Alan García Pérez) only aggravated the economic crisis and failed to contain terrorism such as the Shining Path (Sendero Luminoso) guerrilla movement, an opposition Maoist movement established in 1970.[15] As the military was concentrated in cities, the Shining

Path occupied poor urban and rural areas, mainly Huancavelica, Apurimac, and Ayacucho.[15] From 1985-1989, the opposition movement extended its operations in Lima, Puno, Pasco, Junín, and Huánuco.[16] The movement used terrorist and guerrilla strategies which took lives of around 70,000 people until 1992 when its leaders were arrested. The terrorism led to frequent political conflicts which contributed to economic crisis and limited access to health care services, particularly for the poor.[17] Between 1990-2000, Alberto Fujimori's government faced this critical situation of improving the country's economy and defeating the terrorism. While improvement in some areas like the economy occurred under Fujimori's leadership, he left power at the beginning of the study period due to charges of human rights violations and corruption, for which he was subsequently imprisoned.

Over the 15 years of the study period, Peru underwent a number of leadership transitions, at times causing political unrest, although also seeing consistent economic growth throughout the period (see section below). After Fujimori's resignation, a transitional government took power led by Valentin Paniagua, and in 2001, a new period of democratic government began, with Alejandro Toledo elected president, the first elected Quechua president. In 2002, civil society, the government organizations, and political parties signed The National Agreement (*Acuerdo Nacional*) to strengthen democracy, promote social justice and equity, maintain transparency and decentralization, promote universal access to health care services, and improve competitiveness and efficiency. Moving forward, presidents elected after the signing of this National Agreement continued to adhere to certain specific priorities which were outlined in the document. Priorities such as promotion of food security and nutrition and elimination of poverty would later impact U5M reduction. In addition, a Truth and Reconciliation Committee was also established to determine the extent of the killings and violence committed during the period of 1980s-2000 when the Shining Path was in existence.

In 2006, Toledo lost re-election, and former president Alan García Perez was elected. While in power, Garcia focused on addressing social inequities and continuing the economic growth observed up to that time in Peru. In 2011, Olanta Humala, a leftist former army officer was elected. During his term, economic growth in Peru continued, though there were ongoing complaints, especially of his handling of social issues including disputes between environmentalists and mining interests. The challenge of accusations of corruption was ongoing throughout the study period. In fact, after their presidencies, Toledo was arrested and awaiting extradition to Peru from prison in the United States, while Garcia was accused of corruption and committed suicide to avoid arrest.[18,19] The following two presidents, Ollanta Humala and Pedro Pablo who had been elected in 2011 and 2016, respectively, were also arrested for corruption committed during their presidential leadership.[20–22]

Government Structure

Since establishment by the Constitution of Peru in 1993, Peru has had a democratic republic government consisting of three branches – executive, legislative, and judicial. In addition to the President, the executive branch includes the Council of Ministers led by the Prime Minister. The branch includes 19 ministries, including the Ministry of Health (MOH).

In 2002, in addition to the central government, 25 regional governments were created as autonomous entities destined to administer the 24 departments and the province of Callao. Lima, being the capital of the

country, is not included in any region and has an independent municipal government with the level of regional government. Regional governments consist of a governor and a council, which are elected by direct vote and serve for a period of four years. Peru is further divided up into 25 administrative regions also known as departments and one special province, the Constitutional Province of Callao (Figure 4). In addition to the regional governments, there are 1,866 local (municipal) governments.

Decentralization

Established in a constitutional reform in 2002, Peru's government began significant decentralization during the study period which continued after 2015. The reform introduced three main aspects of decentralization: 1) **regional governments** were to be created based on departments, 2) **regions could be created from one or more contiguous departments following approval through a referendum,** and 3) **citizens would participate** in drafting of **regional and local budgets** and plans and would ensure accountability of the decentralized governments. A series of **laws establishing frameworks** for decentralization quickly followed to support the process. As a result, functions and resources were transferred from national to local and regional governments.[23] Since 2003, regional governments were responsible, at least in theory, for developing action plans to implement activities based on national policies and sectorial plans. In the area of health, they were responsible for activities such as building and ensuring health infrastructure and services and organizing, maintaining, and supervising health services.[24] However, implementation of decentralization had been slow, with marked differences between regions and with difficulties in complying with national policies, due to lack of local capacities, inadequate use or resources, or lack of political will (e.g. in one region, the governor was against vaccination and the MOH had to intervene in response to a risk for an outbreak in the region that could affect other regions too).

Economic Status and Development

Peru experienced the most severe inflation crisis in its history in 1990, during a time in which terrorist violence targeted both public and private production of goods. In the early 1990s, to address this, Fujimori's government implemented new adjustment measures to address this crisis. In 1993, Peru's economy gradually began significant recovery, aided also by the raise in the price of minerals globally, as well as control over terrorism. As shown in Figure 5, the country's Gross Domestic Product (GDP) grew impressively over the study period of 2000 to 2015. While Peru had been a lower-middle income country since 1950,[2] **in 2008 when the GDP per capita was $4,220 USD, the country became an upper-middle-income country based on the World Bank's classification**.

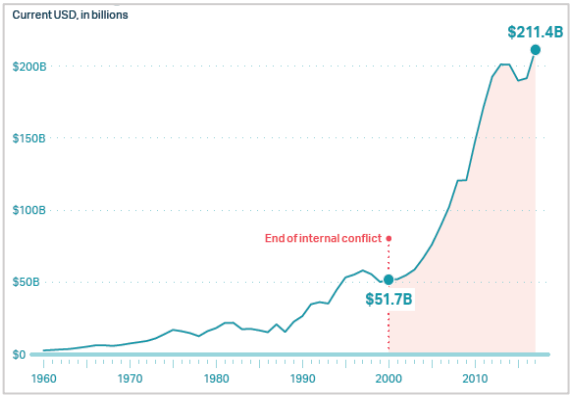

Figure 5. Peru's Growth Domestic Product (GDP) Growth (in US $ billion)

Peru's economy relies heavily on metal and mineral exports, which typically account for 55% of its total exports. In 2013, exports of goods and services were 25% of total GDP while services accounted for 50%.[25]

High international prices for these exports contributed to economic growth over the study period, but a decrease in prices led to a decline in economic growth at the end of the study period starting in 2014 to 2017.

This economic growth and implementation of safety net programs such as free school feeding and human capital development for female heads of households in the country started before the study period and led to decreasing poverty rates in Peru over the study period.[5,26] The proportion of Peru's population living below the national poverty line decreased impressively from 59% in 2004 to 22% in 2015.5 Income inequality also declined – the country's GINI index, a measure commonly used to represent wealth distribution, decreased from 49 in 2000 to 43 in 2015. In 2015, Peru's GINI index was lower than that of its neighbors: Bolivia (47), Brazil (51), Chile (48), and Colombia (51).[6]

Under-5 Mortality in Peru

Peru experienced an impressive drop in U5M over the study period – from 38.6 deaths per 1,000 live births in 2000 to 16.6 2015 (Figure 6). Progress in neonatal mortality also occurred over the study period (Figure 6). Peru's neonatal mortality dropped from 15.5 deaths per 1,000 live births in 2000 to 7.6 per 1,000 live births in 2015 (Figure 6). As shown in Table 2, Peru's declines in both U5M and Neonatal Mortality Rate (NMR) between 2000 and 2015 surpassed progress of neighboring countries. U5M dropped by 57% during this period, while NMR decreased by almost half (49.7%). Stunting among children under 5, a major contributor to U5M, decreased from 31.3% in 2000 to 14.6% in 2014; with reducing rates from 30.1% in 2000 to 13.4% in 2014 in female children under 5.[27]

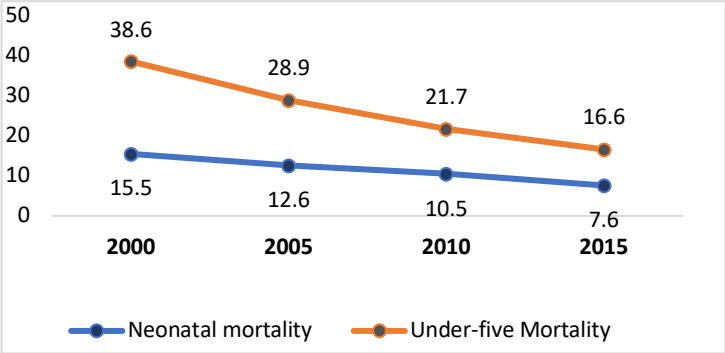

Figure 6. Trends in Under-5 and Neonatal Mortality in Peru (Deaths per 1,000 Live Births) - 2000 to 2015 (Source: IHME)

Table 2. Change in Under-5 Mortality (U5M) and Neonatal Mortality Rates (NMR) of Peru and Neighboring Countries, 2000-2015 (Source: IHME)

Country	U5M (deaths/1,000 live births)			NMR (deaths/1,000 live births)		
	2000	2015	Change (%)	2000	2015	Change (%)
Peru	38.6	16.6	-57.0	15.5	7.8	-49.7
Brazil	41.4	19.8	-52.2	17.5	9.2	-47.4
Ecuador	34.6	18.6	-46.2	16.3	8.3	-49.1
Colombia	25.6	15.4	-39.8	13.8	8.1	-41.3
Chile	11.4	8.0	-29.8	5.8	5.1	-12.1
Bolivia	71.3	32.9	-53.9	25.8	15.3	-40.7

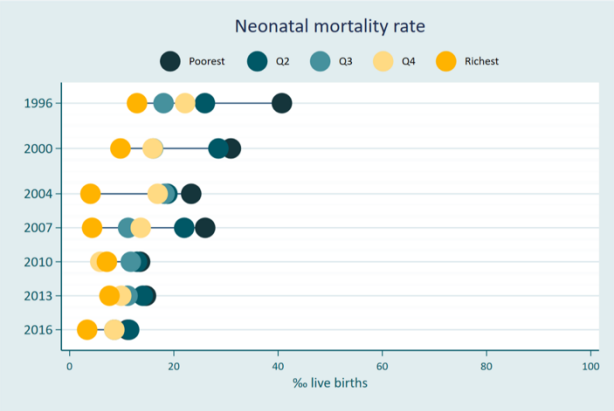

Figure 8. Equity Analysis of Under-5 Mortality Rate in Peru (1996-2016) (Source: IHME)

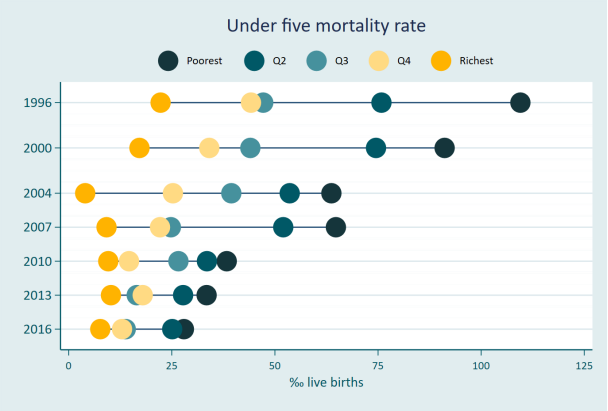

Figure 7. Equity Analysis of Neonatal Mortality rate in Peru (1996-2016) (Source: IHME)

Causes of Mortality in Children Under 5 in Peru

The top three contributing causes of under-5 deaths in Peru in 2000 as estimated by IHME were lower respiratory infections (20%), diarrheal diseases (5.4%), and nutritional deficiencies (4%) (Table 3). At the end of the study period, in 2015, the top three causes were lower respiratory infections (15.7%), HIV/AIDS (6.5%), and diarrheal diseases (2.9%). While remaining in the top three killers of children under 5 (U5), U5M rates for respiratory infections and diarrhea decreased by 67% and 77%, respectively.

Table 3. Causes of Under-5 Mortality in Peru, 2000-2015 (Source: IHME)

Cause of death	Rate of deaths per 100,000 under-five population (% of deaths)			% change in rate (2000–2015)
	2000	2005	2015	
Lower respiratory infections (LRI)	163	117	54	-67%
HIV/AIDS	7.7	11	22	186%
Diarrheal diseases	44	23	10	-77%
Nutritional deficiencies	32	17	3.9	-88%
Meningitis	8.6	7	2.9	-66%
Tetanus	0.16	0.09	0.03	-81%

Throughout the study period, the top three CODs in neonates were prematurity, birth asphyxia, and sepsis and other infectious conditions (Table 4). Impressive decreases in the rates of all top CODs shown in the table were reported – ranging from 23% to 87% reduction.

Table 4. Causes of Neonatal Mortality in Peru, 2000-2015 (Source: IHME)

Cause of Death	Rate of deaths per 100,000 neonates (% of deaths)			% change in rate (2000–2015)
	2000	2005	2015	
Prematurity	6,416 (32%)	4,911 (30%)	2,276 (24%)	-65%
Birth asphyxia and birth trauma	3,914 (19%)	3,487 (21%)	2,140 (22%)	-45%
Sepsis and other infectious conditions of the newborn	2,832 (14%)	2,873 (17%)	2,125 (22%)	-25%
Congenital anomalies	2,514 (12%)	2,453 (15%)	1,929 (20%)	-23%
Lower respiratory infections	1,558 (7.7%)	1,055 (6.3%)	542 (5.6%)	-65%
Diarrheal diseases	125 (0.61%)	62 (0.37%)	20 (0.21%)	-84%
Tetanus	7 (0.04%)	4 (0.02%)	0.9 (0.01%)	-87%

Subnational Geographic Equity in U5M and NMR

Peru saw a relative reduction of U5M and NMR by 62% and 48%, respectively, with coastal regions tending to have higher reductions than more distant regions. In addition, there was overall absolute reduction of subnational equity gap in U5M (81 deaths/1,000 to 26 deaths/1000) and NMR (39 deaths/1000 lives births to 13 deaths/1000 live births). The regions which lagged behind tended to have lower EBI coverage, higher stunting, and were more remote, but were similar in other areas such as female literacy.[28,29]

Ministry of Health

The Ministry of Health (MOH or *Ministerio de Salud - MINSA* in Spanish) is the national authority in public health and health service provision regulation. The MOH provides health services for the majority of the country's population.[30] The MOH is responsible for general health promotion, disease prevention, and ensuring access to comprehensive health care for all citizens in Peru. Although Peru's health system is decentralized, the MOH is responsible for developing and implementing national health policies and guidelines as well as monitoring compliance and the national health response which are implemented at all levels of the health system.

Health System and Structure

Despite a largely public health system, Peru's health system is fragmented into four systems and also includes a small private health sector. Peru's public health sector is divided into sub-systems: a) health services from the MOH including those in regions managed directly by the regional health directorates (*dirección regional de salud* or DIRESA) which represent the vast majority of services in the country; b) Health establishments from Social Health Insurance (Seguro Social de Salud del Perú- EsSalud (social security system dependent on the Ministry of Labor); c) health, social security (EsSalud), and d) the Health Services of the

Armed Forces (Ministry of Defense) and National Police (Ministry of Internal Affairs (*Ministerio del Interior*). The MOH and DIRESAs operate the largest network of public health facilities in Peru, which provides services for about 70% of the country's total population. EsSalud is the second-largest provider of health services in the public service, serving about 25% of the population. EsSalud's system covers Peru's salaried formal sector workers and their families. The Health Services of the Armed forces and National Police exclusively serve workers of these organizations and their families.[31] These three public entities provide services to their specific populations through their own facilities, with limited exchange of services.

The private health sector in Peru provides health services for about 6% of the country's population.[30] This sector includes a non-profit sector which is very small, which consists of non-governmental organizations (NGOs), the Peruvian Red Cross, church-based and social action organizations, and others.

In 2015, Peru had 26.9 primary care centers and 0.81 hospitals per 100,000 population. However, availability of health facilities varied greatly by region (Table 5). The ratio of primary care facilities per 100,000 was highest in Amazonas at 111.5 and lowest in Lima at 7.8. The ratio of hospitals per 100,000 ranged from just 0.33 in Piura to 2.22 in Moquegua.

Table 5. Health Facilities in Peru by Region, 2015

Department	Population (2015)	Primary care centers		Hospitals	
		Number	Per 100,000 population	Number	Per 100,000 population
Amazonas	422,629	471	111.5	7	1.7
Ancash	1,148,634	417	36.3	12	1.0
Apurimac	458,830	389	84.8	6	1.3
Arequipa	1,287,205	279	21.7	12	0.9
Ayachuco	688,657	397	57.7	10	1.5
Cajamarca	1,529,755	844	55.2	11	0.7
Callao	1,013,935	74	7.3	7	0.7
Cusco	1,316,729	358	27.2	9	0.7
Huancavelica	494,963	411	83.0	5	1.0
Huanuco	860,548	316	36.7	5	0.6
Ica	787,170	154	19.6	9	1.1
Junin	1,350,783	514	38.1	12	0.9
La Libertad	1,859,640	319	17.2	30	1.6
Lambayeque	1,260,650	194	15.4	6	0.5
Lima	9,834,631	763	7.8	53	0.5
Loreto	1,039,372	413	39.7	7	0.7
Madre De Dios	137,316	99	72.1	2	1.5
Moquegua	180,477	62	34.4	4	2.2
Pasco	304,158	264	86.8	6	2.0
Piura	1,844,129	427	23.2	6	0.3
Puno	1,415,608	471	33.3	15	1.1
San Martin	840,790	376	44.7	9	1.1
Tacna	341,838	87	25.5	2	0.6
Tumbes	237,685	50	21.0	3	13
Ucayali	495,511	215	43.44	3	0.6
Total	31,151,643	8,364	26.9	251	0.8

Health Infrastructure

Most of the health infrastructure in the country is public and under the Ministry of Health's jurisdiction. In Peru, health centers and health posts are located at the community level and typically serve as the first contact for patient care. Health posts make patient referrals to health centers which serve wider catchment areas. At the regional level, regional hospitals provide more advanced services and receive referrals from health centers. At the national level, national referral hospitals provided specialized services for patients referred by regional hospitals.[32]

Human Resources for Health

The World Health Report 2006 reported that Peru was one of the few countries in Latin America facing a human resources for health (HRH) crisis. This crisis was worsened by concentration of HRH in Lima and other major cities. One major factor contributing to the shortage was migration of HRH to other countries. During the period of 1994 to 2008, more than 1,400 doctors and nurses from Peru migrated outside of the country. As a result, HRH density in Peru was as low as 14.1 doctors and 8.2 nurses per 10,000 inhabitants in 2002.

To address this challenge, in 2005 the Peruvian MOH approved the National Policy Guidelines for the Development of HRH, the country's national HRH strategic plan. This included training of more health care professionals, with an increase number from 14.8 doctors and 19.2 nurses to 22.3 doctors and 25.9 nurses per 10,000 population by 2016 (Figure 9).[33] This increase was first seen for nurses with a slower but steady rise in physicians.

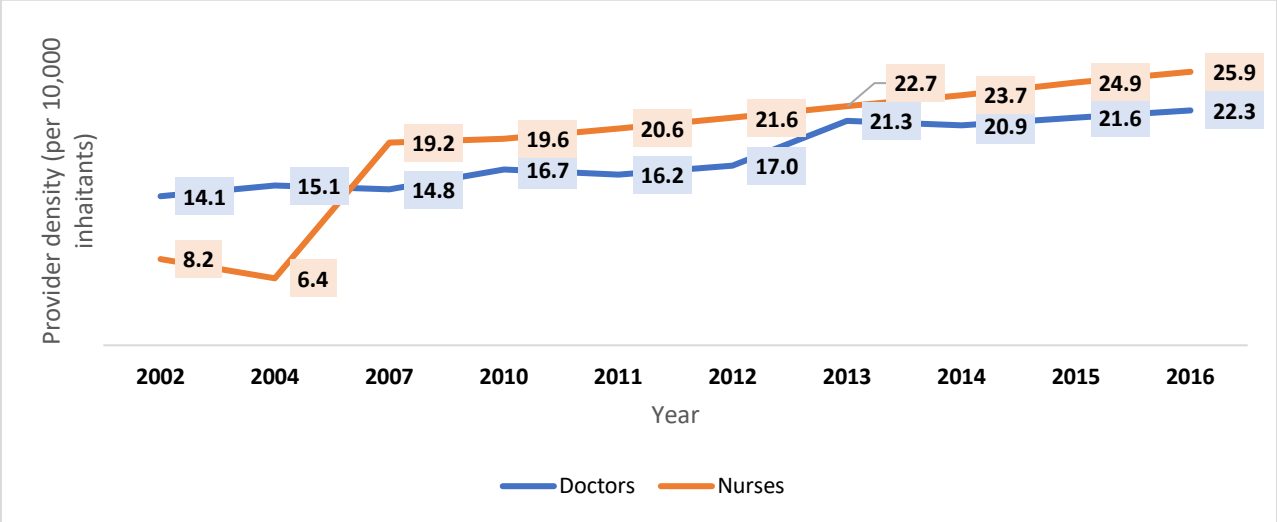

Figure 9. Number of Doctors and Nurses (Per 10,000 Inhabitants) in Peru, 2002-2016 (Source: Scudin, 2016)

Since 1985, the national rural retention program, **Servicio Rural y Urbano Marginal de Salud** (SERUMS), has worked to distribute and retain health workers in remote areas of Peru. Recent graduates of health care training programs who participate in this program commit to one year of work in a rural setting, though the program aims to retain workers in the rural areas following completion of the initial rural placement. In an effort to improve retention in rural areas, the MOH increased salaries of health workers in rural and remote

communities, including those participating in the SERUMS program. Over the study period, the number of doctors and nurses per 10,000 population increased in every region of the country during the study period.[24] However, differences in provider density by region were still reported later in the study period. In 2012, Cajamarca had the lowest at 4.3 doctors per 10,000 population, while Loreto had the lowest density of nurses at 6.2 per 10,000 population.

Community Health Agents or *Promotores de Salud*

Due to the difficulties in access especially in rural areas, Manuel Nunez Butron, a Peruvian physician, started recruiting community people and traditional healers and training them in health prevention very early in the 20th century. These efforts represented the beginning of the concept of community health agents in Peru.[34] In the 1990's, the cadre of community health agents as unpaid volunteers began to grow and began to support some health programs, such as the malaria control program. These volunteers, known in Peru as *Promotores de Salud* (community health promoters), were members of the community, including (but not exclusively) very few traditional healers, committed to help their own community and ability to receive training and perform selected activities.[35] In some communities, the members of the community identified their own promotores. In some regions (especially Andean), this process resulted in primarily men being selected as *promotores*, since they were considered the "leaders" of the community. However, over time the cadre has progressively began to include more women across the country.

Expansion of their roles occurred in the malaria program, where health promoters were trained to collect blood samples and bring the samples to the nearest health facilities for testing. In many areas of the country, the scope also include treatment, providing medication packages to individuals diagnosed with malaria, improving access to treatment in the community.[35] The work scope of *promotores* expanded to include areas like promotion of hand washing and hygiene, education regarding nutrition, vaccines, and other prevention measures, delivery of first aid services, and monitoring of nutrition status for children, pregnant and postpartum women.[36] Traditional birth attendants, after training, also became involved in formal health services in some regions as *promotores*.[37]

The MOH worked with various organizations such as NGOs to improve community access to primary health care services, often utilizing *promotores,* although the areas of focus were diverse. One example was its work with the NGO CARE Peru implementing the Enlace program from 1996 to 2000 and Redes project from 2000 to 2004 in northern rural provinces to train promotores on diarrhea and pneumonia management.[38] The Good Start program also trained *promotores* on growth monitoring and psychosocial development of children.[39] In addition, the Child Nutrition Program (*Programa de Nutrición Infantil* [PNI]) worked with the *promotores* to improve health and nutrition through conducting regular growth monitoring of children and educating mothers on appropriate nutrition practices. Community Committees were established for different health-related issues such as education and youth which focused on activities related to nutrition, health, hygiene, and sanitation. The Community Surveillance System (SIVICO) consisted of charts and a physical mapping of the entire community in relation to the status of health, nutrition, water, and sanitation, therefore monitoring progress of the community activities and provided feedback based on surveillance findings.

Health Expenditure

Peru's total health expenditure (THE), as a percentage of GDP remained low during the study period although Peru's total spending on health as a percentage of GDP slightly increased from 4.3% in 2000 to 4.5% in 2015, still below the Caribbean and Latin America average. Percentage of health expenditure provided by the government was similar in Peru (58.7%) to the regional average (56.7%).[31] The government funding for health as a total percentage of funding for health increased from 52% in 2000 to 60% in 2015.[40] External health expenditure ranged from 0.2% to 2.4% of total health expenditure but remained low throughout the study period, with government and out-of-pocket expenditure accounting for the majority of spending.[41]

Out-Of-Pocket (OOP) Expenditure for Health

The OOP expenditure for health as a percentage of total health expenditure remained high throughout the period. IHME found that Peru's OOP as a percentage of THE remained constant from 27.9% in 2000 to 28.9% in 2015.[40] However, it was below that of the region (32.7%) in 2014.[31] In addition to high OOP, 43.3% of household spending on health was used for paying private health care services and 40.1% for medications. Public health care services accounted for only 11.6% of the amount that households spent on health. The high OOP reflected that some Peruvians preferred to use private health services because of quick delivery of quality health care services, which were difficult to obtain in public health facilities.[31]

Lower-middle and some groups of low-income individuals including those in the informal sector were particularly challenged by the need for OOP payments for health care, in part due to gaps in insurance. These populations are not subsidized through the publicly financed SIS either because they are not classified as poor or because are unable to access the EsSalud, the formal sector insurance scheme, because they work in informal sectors (see below). They may also often be unable to access private insurance due to the cost of the premium.

Health Insurance

Peru initiated a range of insurance schemes to increase financial protection and access to health care starting with the most vulnerable (poor, children) and then extending more broadly, providing a safety net for those in need. In 1997, Peru launched a free school insurance program, Seguro Escolar (SEG), to provide free health care coverage via the public health system to children between the ages of 3 and 17 enrolled in public schools across the country. SEG, which was financed by the government, was implemented to encourage parents to enroll their school-age children in schools. Although there was no systematic study to assess the net increase in coverage, many hospitals reported higher attendance by children following establishment of the program.[42,43]

In 1998, the Maternal and Child Insurance Program (Seguro Materno Infantil - SMI) was launched to provide health insurance coverage to pregnant women and children under 5. The SMI received funding from the Peruvian government, the Inter-American Development Bank (IDB) and World Bank. In 2001, the government decided to merge the SMI and SEG to create the Comprehensive Health Insurance (Seguro Integral de Salud – SIS).[44] The SIS aimed at addressing limited access to health services of mothers and all

children under 18 children within poor or extremely poor categories – regardless of public-school attendance.[45] In 2013, the government established integrated networks to enable SIS beneficiaries to receive care at facilities administered by EsSalud, the Armed Forces of the Republic of Peru or the National Police of Peru, but this integration was ultimately not successful for reasons not found.[46]

Social Security Health for Formal Sector Workers

In Peru, a contributory social health insurance system for workers and families has existed since 1930s.[47] In 1999, the Social Security Health Insurance Institution was renamed to EsSalud. It was financed by payroll contributions (9%) and provided health services through its own network of public facilities, including primary, secondary, and tertiary services. Specific categories of workers (e.g. rural workers, domestic employees, and fishermen) in small businesses were also included in EsSalud and contributed 3% of their payroll to the insurance. As of 2013, 379 health facilities were included in the EsSalud network of services, of which 64 were in Callao and Lima.[48]

Private Insurance

Private insurance contributed very little to overall insurance coverage in the country, covering only 3-5% of the Peruvian population in 2008. The Social Security Health Act of 2002 in Peru allowed the formal sector workers to contribute a quarter of the mandated contribution to social security and have private health insurance, though the large majority remain covered by EsSalud rather than private insurance.[49,50]

Poverty Reduction

Peru was innovative in adapting the poverty reduction cash transfer scheme from Mexico (*Progresa/Oportunidades*), renamed *Juntos*, and launched in 2005. The program focuses on reaching the populations with the highest poverty rates and remained in place despite changing governmental leadership. By directing cash transfers through women, the scheme recognized the need to change the role and power of women in their households while addressing education and health to break the cycle of poverty and support families most impacted by the violence preceding the study period. Unique to Peru, the program also targeted populations that were particularly vulnerable due to the prior conflict in the country, including by rolling out first in communities most significantly affected by Shining Path terrorism.[51]

Households within each participating community were evaluated based on the following characteristics:

- Percentage of illiterate women in the household
- Percentage of children between 6 and 14 years of age attending school
- Access to industrial sources of fuel
- Number of appliances in the household
- Access to public services and type of materials used in home structure

Households classified as poor using the eligibility criterion based on these characteristics were eligible for participation in *Juntos.*

Cash transfers are received based on the following conditionalities:

1. Children 5 years or younger must have their growth monitored in accordance with MOH protocols (visits in which immunization, vitamin A and iron supplementation, physical evaluation, and nutritional monitoring are also conducted)
2. Pregnant women must receive ANC
3. Children between 6 and 14 years of age must be enrolled in school with compulsory attendance
4. Children must have national ID

Fulfilment of these conditionalities is monitored on a bimonthly basis by program fieldworkers to ensure compliance.[52] Inclusion of EBIs such as vaccinations and ANC as required conditionalities for receipt of cash transfers likely contributed to increased coverage of these EBIs in populations participating in *Juntos.*

Health Equity

In addition to broader efforts to improve health equity through poverty reduction and access, Peru was committed to health equity reflected in the strategy to start implementation of a number of EBIs targeting areas most in need. Peru Countdown to 2015 report[53] showed an overall increase in coverage and reduction in the equity gap from 26% in 2000 to 11% in 2015, and similar results in many of the key reproductive, maternal, newborn, and child health indicators.[53,54] For example, there was a narrowing of the equity gap including vaccines (though decrease in coverage for some), demand for family planning satisfied with modern methods, and oral rehydration therapy (ORT) between 2004-2012. However, others showed persistent wide equity gaps such as skilled birth attendance and ANC by skilled providers (see ANC and skilled birth attendance sections) (Figures 10 and 11).[53] Peru was also a country which showed reductions in mortality similar to those in coverage.

However, although there was improvement, inequity in U5M based on maternal education remained, decreasing from 35 per 1000 live births in 2000 to 20 per 1000 live births in 2012 in children of mothers with at least secondary education. Children of mothers without education saw a large decrease from 106 per 1000 live births in 2000 to 43 live births in 2012, still remaining higher than their more educated peers.[55]

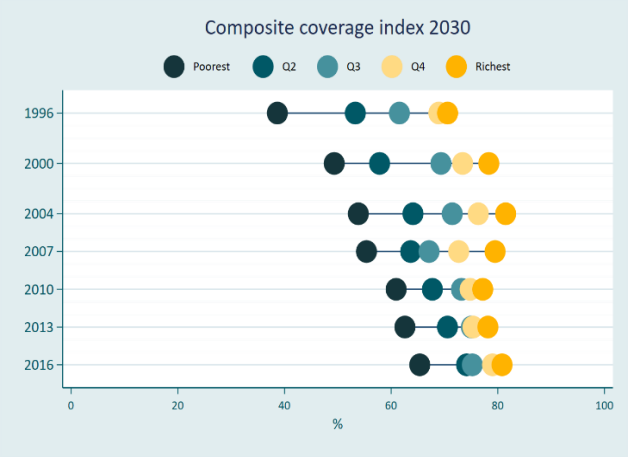

Figure 11. Composite coverage index in Peru (Source: Victora et al., Countdown2030)

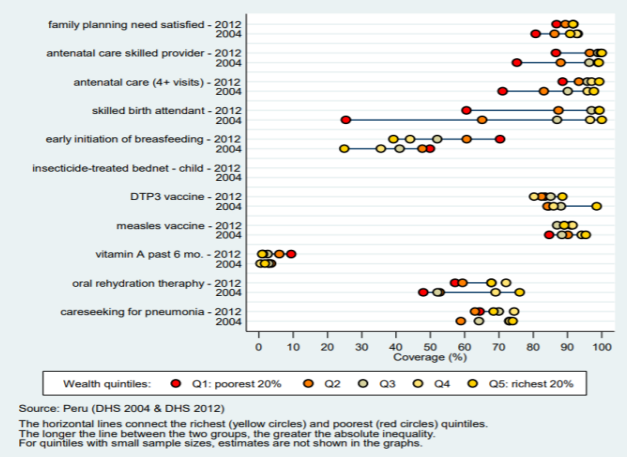

Figure 10. Peru Equity Profile (Source: Countdown2030)

Women's Empowerment and Gender Equity

Peru improved gender equity between 2000-2015, building on earlier successes in some areas. For example, the literacy rate for adult females in Peru increased from 82% in 2004 to 91% in 2015, but slightly lower than the South American average of 93% (in 2015). The percent of uneducated women of childbearing age decreased from 5.1% in 2000 to 2% in 2014.[28,29]

Reproductive Health

Reproductive health indicators among women generally improved or remained stable over the study period. Peru also reduced total fertility rate from 2.8 in 2000 to 2.3 in 2015 children per woman with higher rates in rural areas.[56] Teenage pregnancy generally remained stable at 13%.[27] The median birth interval in Peru increased from 36.9 months in 2000 to 51.1 in 2012, though rates of current use of modern methods of contraception among married women remained fairly stable during this period (50.4% in 2000 to 52.2% in 2014). Overall contraceptive use by women improved from 69% in 2000 to 75% in 2014.[9]

3 Methods for Case Study

The methodology was designed to achieve the following goals of generating new and actionable insights through applying implementation science methods to selected Exemplar countries to:

- Identify and evaluate the methods of deciding on the policies and EBIs to reduce under-5 mortality and their implementation strategies and execution.
- Understand supporting and obstructing contextual factors from these countries.

3.1 Project Framework

Both the desk review and the primary research are informed by an implementation science framework designed specifically for the Exemplars in Under-5 Mortality project (see Appendix A). While we are often able to identify policies and EBIs chosen by a country to reduce U5M, the key lessons in how these were chosen, implemented, adapted, and sustained are often missing from available published or gray literature. Because the same policies and interventions brought different results in different countries, implementation science offers important tools for how to think more holistically about how and why countries were able to reduce U5M, and from where lessons in replication can be drawn. To guide the overall work, we developed a framework used to understand the contribution of contextual factors and the different levels of actors involved: global, national, ministry, subnational, facility, and community. Details and the framework can be found in the appendix.

3.2 Desk Review

The EvaluServe and UGHE teams undertook an extensive review of available information and published data on the rates and progress of U5M, including policies, strategies, EBIs available to potential exemplar countries, and the uptake and implementation of these EBIs in Peru. Initial secondary research was performed through MEDLINE (PubMed) and Google Scholar using the search terms “child mortality” or “under-5 mortality” and Peru. Further searches included specific EBIs, CODs, or contextual factors as search terms (e.g. “insecticide-treated nets,” “malaria,” or “community health workers”). Initial desk research by Gates Ventures was synthesized and then reviewed by the UGHE team for accuracy and completeness. Following this, additional support was provided by the UGHE team to increase the capture of published literature relevant to the work.

The desk review was an iterative process, with ongoing additions occurring throughout the primary research process as additional sources (published articles, reports, case studies) were identified. Reflecting the scope of U5M-specific interventions (EBIs), we did not include in-depth reviews of important contextual factors including interventions that contributed to U5M reduction, including education, poverty reduction, water and sanitation, and programs designed to improve nutritional status beyond sever acute malnutrition and breastfeeding, but included evidence of increased coverage of EBIs where available and relevant and from existing reviews of those factors in Peru.

3.3 Primary Research

In collaboration with our in-country partner in Peru, Dr. Patricia Garcia, we identified key informants (KI) reflecting a broad range of experience and viewpoints. Key informants were chosen based on the topics identified in the desk review and through other analyses in the close collaboration with in-country partners, prioritizing these KIs able to provide information on the Exploration, Preparation, Implementation, Adaptation, and Sustainment (EPIAS) stages during the period of study. Key informants included current and former Ministry of Health employees responsible for high-level strategic direction of the ministry or specific disease or intervention areas; implementing partners; and other multilateral organizations or donor organizations who had managed partner-supported or partner-led activities. Some informants represented more than one area or role based on their experience over the 16 years and were interviewed for each of their multiple viewpoints. While we prioritized individuals active in the study period, we were also able to capture some experiences from 1995-2000 and after 2016.

Informed by the framework and review of relevant literature on contextual factors and implementation outcomes, we developed core interview guides for four main routes of inquiry.

1. Global and national level actors
2. Ministry of Health actors
3. Project managers and implementers for specific CODs or EBIs
4. Other partners

The interviews were designed to address the EBI implementation process, from exploration to preparation, implementation, adaptation, and sustainment. This includes critical contextual factors at the relevant global, national, ministry, and local levels. The interviews also identify additional sources of data and information which could be added to the knowledge base and understanding already developed from the desk review.

All interviews were led by study team members while operating recorders. Following the close of the interviews, tape recordings were transcribed. All interviews were conducted in Spanish with translation to English during transcription.

3.4 Analysis and Synthesis

The UGHE team used a mixed methods explanatory approach, applying the framework to understand the progress (or lack thereof) for each COD and coverage of chosen EBIs, as well as facilitators and barriers at the local, national, and global levels. This approach aimed to create a better understanding of what, how, and why the Government of Peru was able to achieve success in decreasing U5M and what the challenges were. The analyses were also informed by the extensive work completed by other initiatives, including Countdown 2015, World Health Organization (WHO) maternal and child health initiatives, the International Center for Equity in Health, and others. Qualitative data sources used included Demographic and Health Survey (DHS), Global Burden of Disease (GBD) 2017, and Joint United Nations Programme on HIV/AIDS (UNAIDS).

Key Informant interviews were coded by the researchers using a code book developed from the framework and expanded based on findings from previous and this framework was used to extract the EPIAS steps and contextual factors. A priori codes for contextual factors were adapted and expanded as emerging themes were identified.

3.5 Human Subjects Review

The study was reviewed by the relevant IRBs in Rwanda and Peru. All key informants provided written informed consent before interviews were conducted and no data were identifiable in quotes.

4 Evidence-Based Interventions

We prioritized evidence-based interventions (EBIs) based on the specific CODs for children U5 in Peru based on the literature review and modeling from IHME of relative rates of different CODs in U5 and neonatal populations (Table 6).

Table 6. Coverage of Selected EBIs, 2000-2014 (Source: DHS)

U5 Cause of Death	Intervention	2000	2004-2006	2011	2014
Acute Respiratory Infections	Children with symptoms of ARI taken to health facility	61.6	69.6	64.7	60.4
	Children with symptoms of ARI who received antibiotics		27.3	37.2	40.5
	Vaccination: 3 doses of DPT/pentavalent vaccine			81.4	77.8
	U5 with symptoms of ARI – 2 weeks preceding survey	*20.2*	*18*	*16.4*	*16.8*
Diarrheal Diseases	Oral rehydration solution	21.9	25.0	29.8	28.2
	Children with diarrhea taken to health facility	40.3	44.6	36.6	33.3
	U5 with diarrhea – 2 weeks preceding survey	*15.4*	*14.8*	*13.9*	*12.1*
	Advice or treatment of fever sought from a health facility or provider	55.9	66	67	60
	Treatment of children with fever with antimalarial drugs		29.5	53.2	
	U5 with fever – 2 weeks preceding survey	*25.9*	*23.9*	*21.5*	*20.4*
Measles	Measles vaccination coverage	84.4	85.6	85	79
Malnutrition	Exclusive breastfeeding from 0-5 months	67.2	63.3	71.7	68
	U5 receiving vitamin A supplements in the six months preceding survey	74.2		3.9	5.7
	U5 stunted	31	29.3	19.5	14.6
	U5 wasted	1.1	1	0.4	
Other vaccine preventable diseases	Full vaccination coverage with 3 doses DPT, 3 doses polio, measles, and BCG	66.3	65.7	71.5	61.1
Neonatal Causes of Death	Total fertility rate (15-49)	2.8	2.6	2.6	2.5
	Antenatal care: 4+ visits by a skilled provider	69.1	87.8	94.1	96.9
	Vaccination: Tetanus protection at birth		70.1	76.3	77.8
	Delivery in a health facility	56.8	72.3	85.1	89.5
	Delivery attended by skilled provider	61.5	75.4	86.9	89.9
	Delivery by C-section	13	17.4	24	28.6
	Postnatal care: Postnatal visit for baby within 2 days of birth	4.6			
	Median birth interval (months)	36.9	44.2	50.2	
	Teenagers who have begun childbearing	2.3	1.9	2.6	2.9

4.1 Pneumonia, Diarrhea, and Malaria

4.1.1 Facility-Based Integrated Management of Childhood Illness (FB-IMCI)

Table 7. Facility-Based IMCI Key Implementation Strategies

Implementation Strategies

• Data use for
  ○ Decision-making
  ○ Understand disease burden
  ○ Monitoring and evaluation
• Leveraging donor and partner support
• Integration
  ○ Vertical to integrated primary health care (PHC)
  ○ Into existing systems
• Small-scale testing
• Learning from other countries and incorporating global recommendations
• Stakeholder engagement
• Adaptation of global guidelines and training tools to develop protocols and guidelines
  ○ Data driven for targeted health care workers (HCWs) and scope (adding malnutrition)
• HR Strengthening
• Training of Trainers (TOT)
• Supportive Supervision
• Focus on equity

EXPLORATION

Peru introduced the Diarrhea Disease Control program in 1980 and Respiratory Infection Control program in 1987. Both programs focused on implementing, coordinating and monitoring interventions targeting diarrhea and acute respiratory infections (ARIs) (such as pneumonia), respectively.[57,58] Despite investments in these programs, coverage of diarrhea treatment with ORT in 1992 was only 28% while the proportion of children with symptoms of ARI taken to a health facility was only 35%. Data on children with symptoms of ARI who received antibiotics were not found.[9]

In 1995, WHO and United Nations Children's Fund (UNICEF) developed the Integrated Management of Childhood Illness (IMCI) strategy to guide the treatment of the most common childhood illnesses including diarrhea, pneumonia, and malaria. IMCI focuses on improving health providers' abilities to diagnose and treat the common illnesses causing morbidity and mortality in high child mortality countries and improving family and community health behaviors through integrating health education.[59]

Following WHO and UNICEF's recommendations and recognizing the national burden of ARIs, diarrhea, malnutrition and localized burden of malaria in some regions such as Pasco and Junin, as well as the need for an integrated approach to addressing these conditions in children under 5, Peru rapidly decided in 1995, to implement FB-IMCI. This decision was made following a **regional** meeting of child health stakeholders in Bolivia in the same year to discuss the IMCI strategy, reflecting adaptation from regional learnings. A KI in explaining the rationale for Peru's adoption of IMCI said: *"…each vertical program became completely*

inefficient. We wasted human resources to train for a week for each program, and the child was the same. If a child came in the hospital with a cough and diarrhea, a doctor would evaluate him for coughing, and then he would tell the family to go to diarrhea unit. In the end the mother was completely confused, and sometimes she received different suggestions from doctors in different areas..." Another KI added that Peru "*very enthusiastically accepted [IMCI because] …it made all the sense in the world: before then, sick children went to a health facility and there was a healthy children consult office, a diarrhea practice, a respiratory infections practice, a micronutrient practice, and with this the child's care was split into fragments, it didn't make any sense.* ***So IMCI what it did was to look at the child integrally***."

PREPARATION

The MOH collaborated with **international and local stakeholders** to prepare for the introduction of FB-IMCI in Peru. In early 1996, an **IMCI Coordinating Committee** was formed, consisting of members from the MOH and several national programs including the program managers of the Diarrhea Disease Control program and Respiratory Infection Control program. Preparations included adaptations of generic IMCI protocols with technical support from WHO and financial support from the World Bank, United States Agency for International Development **(USAID), and IDB**. In speaking of the process of **adapting protocols** to Peru's context, as an example of data driven adaptation, a KI said that for example, regarding the malnutrition component: "*…the (generic) protocol was based on only weight and age… We captured weight, age, [arm and head] size, everything, the basic indicators of anthropometry. The protocol didn't have that so we had to incorporate it."* Generic IMCI training materials were also adapted, translated, back-translated, and printed in preparation for implementation.

According to KIs, by 1996, the MOH used data for decision-making, **using a 1995 survey** of ARI care for children conducted in public health facilities in nine of the country's 25 political regions to identify initial provider target groups for IMCI training. The survey found that 75% of children were treated by doctors and the remaining 25% by nurses and nurse auxiliaries. As a result, the MOH decided that doctors and nurses would receive IMCI training.[60] A KI added that during preparations, the selection of **small-scale testing** sites was determined by the feasibility of training completion and a focus on equity. Junín, Pasco, and Huánuco districts were chosen due to their **high infant mortality rates and high rates of ARI**, diarrhea, malaria, and malnutrition among U5s. These districts were also selected for a number of other factors. Selection of districts which were not participating in other major health projects implemented in Peru at that time, including ones focusing on child health, reflected Peru's focus on equity. Two districts (Ferreñafe and Caylloma) were selected because they were the **poorest areas in their departments**, while Callao was chosen because its location just outside of Lima allowed for close follow-up of implementation.

A KI noted "*There was a lot of pressure, because everyone wanted to be a pilot region. But we said no, we're going to run a pilot in specific areas and our ability to do a pilot is limited to 12 training workshops, that was about five to 30 people each workshop, and that's what we did, in selected regions*."

At the end of the preparation phase, an operational plan for small-scale testing was developed.

IMPLEMENTATION

Small-scale testing of IMCI began in selected health facilities in six districts in Peru in October 1996. In addition, in 1997, the MOH selected six additional districts (Andahuaylas, Ayacucho, Ica, Puno, Tacna, and Ucayali) for early implementation of IMCI because they were priority districts for Proyecto 2000.[61]

Initial training for IMCI providers was conducted using a **TOT approach** with support from UNICEF, Pan-American Health Organization (PAHO), USAID, and the Peruvian Society of Pediatrics. In order to ensure feasibility and cost-efficiency of the initial training, the duration of the training was adapted, shortened from the original WHO-recommended 11 days to only seven days.[62] This reduction in duration was made to minimize the time health workers spent out-of-post as well as to reduce the financial and human resource burden of the training. In addition to cost and person-time considerations, Peru took this decision because many of the doctors and nurses receiving trainings as part of the existing ARI and diarrhea programs.[62] Trainings were followed up with **supervision visits**, six weeks later.

In 1999, the MOH conducted an assessment comparing health worker performance in districts implementing FB-IMCI and those which had not begun implementing it. The assessment found that overall, **quality of care received by children was higher in districts implementing IMCI** with health workers in IMCI districts more likely to perform key actions required for thorough assessment of the child, such as checking for three general danger signs and key symptoms.[62] According to KIs, prior to the assessment, the MOH **committed to expanding FB-IMCI implementation to all 34 health districts of the country between 1997 and 2001, reflecting** Peru's early commitment to scale up.

However, despite the country's focus on rapid scale up and recognized need for integration of vertical programs targeting causes of U5M by 2001, training coverage remained very low through 2005 with only 10% of doctors and nurses receiving IMCI training.[36,63] Between 2003-2005, assessment of FB-IMCI implementation as part of a multi-country evaluation also found that FB-IMCI was "insufficiently institutionalized" at both the district and national levels. Only 8% of facilities in implementation districts had at least 60% of its health workers trained in IMCI. The study identified several potential constraints to effective scale-up of FB-IMCI in Peru, including insufficient training and follow-up, lack of institutionalization of IMCI, high staff turnover, and lack of political commitment and prioritization above vertical programs.[36] These findings were supported by a KI who said: "*IMCI existed at the same time as vertical programs and competed in political priorities and budget with these programs… Why exactly? I don't know, because when we were talking to the authorities… that are in charge of implementing the policies and programs, they said, 'Yes IMCI is spectacular' but it doesn't mean I have a budget for it nationally (so) despite everything that happened with IMCI…they (vertical programs) were discontinued much more recently and in fact coexisted (with IMCI) for many years.*"

Another KI added that IMCI did not have a dedicated program manager, with the manager of the Respiratory Infection Control program acting as the IMCI program manager. The KI also described the transition to a fully integrated IMCI as: "*a difficult transition in which IMCI lost and vertical programs continued to take center stage, continued to perform their functions, and continued to be implemented.*"

ADAPTATION DURING IMPLEMENTATION

By 2005, the MOH integrated existing vertical ARI and diarrhea programs into IMCI (while the vertical malaria control program was integrated prior to the study period), institutionalizing it as a strategy of the 2003 Comprehensive Childhood Health Care Model. This reflected the beginning of some global de-emphasis of vertical programs which influenced the priorities of donors. As a KI explained: *"We had a lot of things going in our favor, when the Lancet started launching those series about child survival, in 2003… When you review the series… they were pointing towards integrated care… the country programs as such disappeared in 2003 (and) there comes the comprehensive mode of care."*

Another adaptation was the incorporation of a neonatal component into FB-IMCI in 2006 recognizing the increasing contribution of neonatal mortality to overall U5M. IMCI also incorporated identification of risk factors in pregnancy to ensure potential causes of newborn deaths were identified and addressed quickly.

Further, a champion led the integration of FB-IMCI into the undergraduate pre-service training curriculum of medical and nursing schools in 2009, reflecting Peru's focus on sustainability.[64] The country's early adoption of a computerized IMCI training software in 2009[64] also reduced the time spent training away from the workplace and facilitated ongoing update of knowledge and skills for health facility workers to improve feasibility and reach.

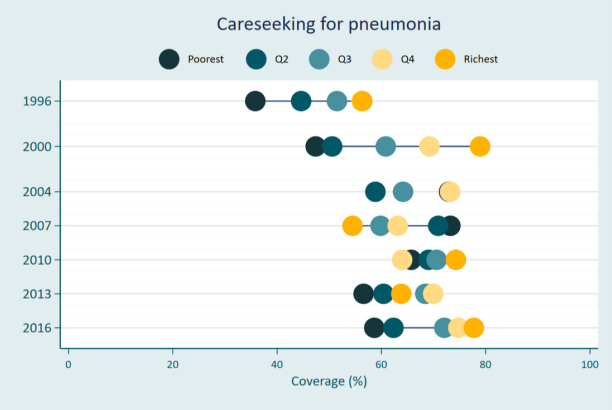

Figure 12. Equity Plot of Care-Seeking for Pneumonia by Wealth Quintile, 1996-2016 (Source: Victora et al.)

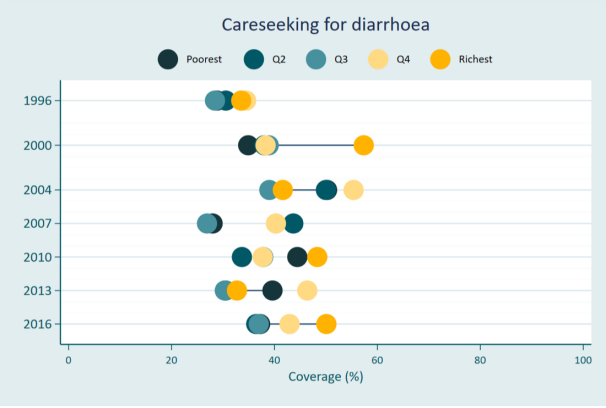

Figure 13. Equity Plot of Care-Seeking for Diarrhea by Wealth Quintile, 1996-2016 (Source: Victora et al.)

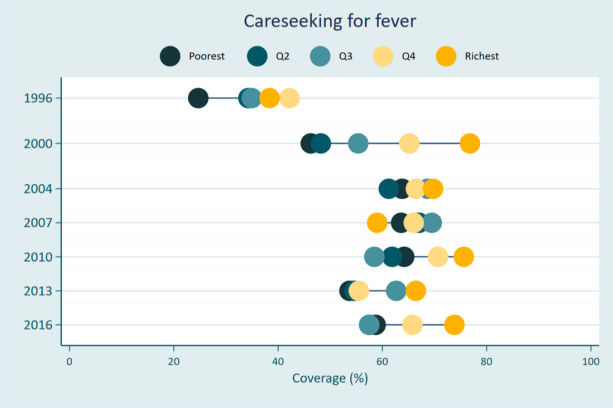

Figure 14. Equity Plot of Care-Seeking for fever by Wealth Quintile, 1996-2016 (Source: Victora et al.)

The acceptance and reach of IMCI improved from uptake in 1996, when Peru began small-scale testing of FB-IMCI, care-seeking for fever (from health facility or other provider) was 35% increased to 68% in 2009 although dropped a little to 60% by 2014. Of note, improvement may also be as a result of CB-IMCI introduction as the DHS indicator for this condition includes community-based providers (see below). Similarly, care-seeking for diarrhea from a health facility was 32% in 1996 and improved to 45% by 2009 although also dropped to 33% in 2014. For ARIs, care-seeking from health-facilities continued to improve from 49% in 1996 to 69% in 2009 and 74% in 2012 but also dropped to 60% by 2014. Despite these improvements, equity plots for care-seeking (Figures 12-14) indicate limited improvement in the equity gap for care-seeking by wealth quintile from 2000 to 2016. Regional disparities in care-seeking were also reported by the DHS. For example, care-seeking for diarrhea ranged from 17% in Cusco to 51% in Pasco in 2014.

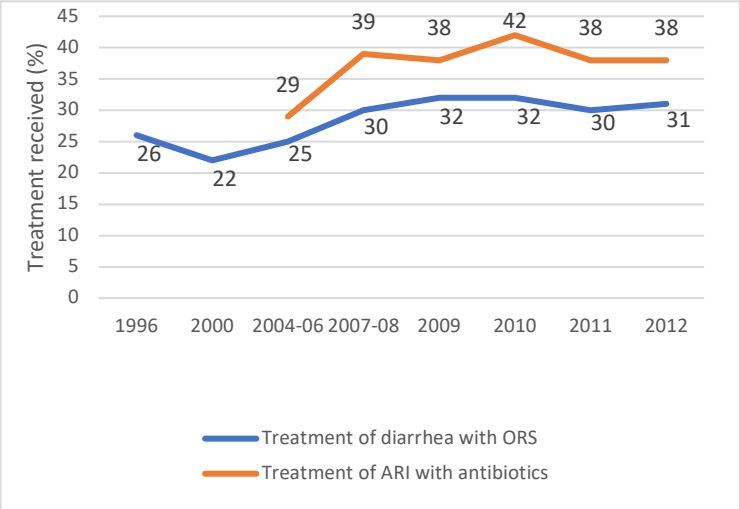

Figure 15. Treatment of Diarrhea with ORS and ARI with Antibiotics (1996-2012) (DHS 1996-2012)

Though care-seeking improved over the study period, less improvement in coverage of treatment was seen (Figure 15). DHS surveys over the course of the study period showed limited improvement in treatment of ARI and diarrhea in children, both of which are included in FB-IMCI. Only 31% of children U5 with diarrhea received ORS in 2012, only slightly better than the 26% in 1996. The proportion of children under 5 with ARI symptoms that received antibiotics while also remaining low, improved from 29% in 2004-06 to 38% in 2012. Similar to care-seeking, DHS reported regional disparities for treatment of ARI and diarrhea. For example, coverage treatment with antibiotics was lowest in Tacna at 7% and highest in Tumbes at 73%.[9]

By 2015, the proportion of deaths attributable to the main diseases covered by IMCI had dropped. Deaths due to LRIs had decreased from 163/100,000 to 54/100,000 of U5 population, 44/100,000 to 10/100,000 for diarrhea, and 0.12/100,000 to 0.01/100,000 for malaria. However there were other contributors including drop in incidence rates for ARI and diarrhea, which dropped from 20% to 6% and 15% to 12%, respectively, as well as other interventions including Community-Based Integrated Management of Childhood Illness (CB-IMCI) and vaccination as well as contextual factors affecting access and resilience such as decrease in stunting and improvements in water, sanitation, and hygiene (WASH).

Table 8. Facility-Based IMCI Implementation Strategy and Outcomes

Implementation Outcomes	Implementation Strategy	Evidence
Appropriateness	Data use to understand disease burden Learning from other countries	(+): Rates of diarrhea, ARI, and fever reported by caregivers in the 2 weeks preceding the DHS survey was 18%, 20% and 28%, respectively, in 1996, the year FB-IMCI was introduced.[9] Leading CODs included in IMCI (+): A KI mentioned that FB-IMCI introduction reflected Peru's need for an integrated approach to addressing health issues of U5s as a KI explained that Peru 'very enthusiastically accepted (IMCI because) …it made all the sense in the world: before then, sick children went to a health facility and there was a healthy children consult office, a diarrhea practice, a respiratory infections practice, a micronutrient practice, and with this the child's care was split into fragments, it didn't make any sense. So IMCI what it did was to look at the child integrally'.
Acceptability	Stakeholder engagement- IMCI coordinating committee Adaptation of global guidelines and protocols for local context	(+): High and improving care-seeking rates between 1996 and 2012 suggested high acceptability of FB-IMCI although for diarrhea, the facility care-seeking rates did not increase markedly (See effectiveness and coverage cell) Data on care-seeking for malnutrition were unavailable for the team to review.
Feasibility	Adaptation of global guidelines for local context and shortening training Stakeholder engagement- IMCI coordinating committee Small-scale testing including selection of districts based on in part feasibility of conducting training and access Leveraging partner and donor support TOT and integration into in-service training Adaptation based on global recommendations- Introduction of computerized IMCI training software	(?): Coverage data not available (-) By 2001, only two departments in Peru had reached "full implementation" per WHO standards

Effectiveness and coverage (reach)	Data use for decision-making- targeting doctors and nurses for trainings. Data use for adaptation- FB-IMCI focus on neonatal and identification of risks in pregnant women Incorporating into national policy Working to integrate vertical programs (delayed but successful)	(+): A study on ARI treatment seeking, found that 75% of children were treated by doctors and the remaining 25% by nurses and nurse auxiliaries (+/-): ORT coverage improved slightly from 22% in 2000 to 31% in 2012 but remained low (See ORT section). (+/-): The proportion of children under 5 with ARI symptoms that received antibiotics improved from 29% in 2004-06 to 38% in 2012 but remained low. (+): In 1996, when Peru began small-scale testing of FB-IMCI, care-seeking for fever (from health facility or another provider) was 35% and by 2000 increased to 56% and 68% in 2009 although dropped to 60% by 2012. Similarly, care-seeking for diarrhea (from a health facility) was 32% in 1996 and improved to 45% by 2009 although dropped to 35% in 2012. For ARIs, care-seeking from health-facilities continued to improve from 49% in 1996 to 69% in 2009 and 74% in 2012. (+): By 2015, the proportion of deaths attributable to LRIs had decreased from 163/100,000 to 54/100,000 of U5 population. For diarrhea, this dropped from 44/100,000 to 10/100,000 These drops in U5 deaths attributable to each condition reflected the effectiveness of FB-IMCI but may also reflect the drop in incidence rates for ARI and diarrhea, improved nutritional status and additional care from CB-IMCI (See Malnutrition and Other Malaria Interventions section also). See also Other Diarrhea, Neonatal, Malnutrition and Other Malaria Interventions sections.
Fidelity	Data use for decision-making- targeting doctors and nurses for trainings. Training (TOT) Supervision Development of protocols and guidelines Leveraging in-country, partner and international communities support- training and other technical support Monitoring and evaluation	(-): By 2001, training coverage remained very low with only 10% of doctors and nurses receiving IMCI training.[36,63] (-): The multi-country evaluation found that only 8% of facilities in implementation districts having at least 60% of its health workers trained in IMCI. (-): The multi-country evaluation found insufficient training and supervision and high staff turnover[36]

Cost	Adapting global guidelines for local context- reduced training time for cost, preservice training and computerized IMCI training software	Not found
Sustainability	Integration into systems Integration into pre-service training	(-): Early challenges with integration of vertical programs into IMCI as a KI explained: "IMCI existed at the same time as vertical programs and competed in political priorities and budget with these programs …they (vertical programs) were discontinued much more recently and in fact coexisted (with IMCI) for many years". (-): Multi-country evaluation found lack of institutionalization and prioritization (+): FB-IMCI Integration into pre-service curriculum for nurses and doctors in 2009 (+): The MOH institutionalized IMCI as a strategy of the 2003 Comprehensive Childhood Health Care Model.
Equity	Focus on equity- small-scale testing in poorer areas and those with high infant mortality rates and high rates of ARI, diarrhea, malaria, and malnutrition among U5s.	(-): Equity plots in Figures 12-14 show slightly improved but persistent gaps in care-seeking rates for pneumonia, diarrhea and fever among the different wealth quintiles in Peru. See also CB-IMCI.

4.1.2 Community-Based Integrated Management of Childhood Illness (CB-IMCI)

Table 9. CB-IMCI Key Implementation Strategies

Implementation Strategies

• Leveraging partner support and expertise and implementation capacity
• Leveraging existing systems
  ○ Promotores
• Development of guidelines
• Stakeholder engagement
• Community engagement
• National leadership and accountability
• Rapid scale
• Community-based care delivery
• Data use
  ○ For decision-making
  ○ For prioritization (households targeted)
  ○ For adaptation
• HR strengthening
  ○ Training (TOT)
  ○ Task shifting
See also FB-IMCI.

EXPLORATION

As noted in the FB-IMCI section, Peru introduced the Diarrhea Disease Control program in 1980 and Respiratory Infection Control program in 1987. At community level, the Respiratory Infection Control program focused on health promotion campaigns, particularly pneumonia prevention during the winter. Community-level efforts of the Diarrhea Disease Control program were not found.[57]

A CB-IMCI strategy was not yet developed by WHO and UNICEF in 1995 when Peru decided to adopt FB-IMCI and according to a KI: *"When the IMCI came, only the clinical component came... But when we met, we said that not only could it be the clinical part, the most important part of child care is in the community management component. We saw… that these… practices have evidence-based impacts that would see impacts if promoted adequately. In Peru, we adapted the practices and began to adapt them into the community component."* The same KI added that the decision to implement what became known as CB-IMCI was backed by both government, donors, and partners' commitment, having recognized its importance.

Like FB-IMCI, another KI emphasized that the rationale for CB-IMCI introduction reflected the need for integrated care for the child at community level: *"…we have a* ***rich experience of (promotores****), before we had (Promotores) of tuberculosis, of malaria, of diarrhea, each program had its own (promotores). The challenge was to change the logic toward a comprehensive vision, that they are going to make a comprehensive family visit, and not only see the child, but see the child's surroundings, and all that we had to do*."

CB-IMCI in Peru was intended to incorporate key family and community practices to promote infant and child health through community education and mobilization (e.g. on breastfeeding and complementary feeding practices), prevention and appropriate home care (diarrhea and pneumonia case management) and referrals.[65]

PREPARATION

By 1996, led by the IMCI coordinating committee, a key component of preparations for what would become known as CB-IMCI was **community engagement** targeted at teachers, community leaders (e.g. mayors). Preparations also included the development of **training guidelines with support from PAHO**. During preparations, implementation of CB-IMCI was assigned to both government Promotores and non-government organizations (NGOs) working in different areas of the country. Regarding the decision, a KI said: *"We try not to have a lot of people… doing everything, the idea instead is that you mobilize, help and support those who are (already) on the sites. We… worked, trained Promotores with the IMCI manuals."*

Initial work on Peru reflected the community components of FB-IMCI, but then expanded to include components of treatment whether prior to referral or as primary treatment.

IMPLEMENTATION

CB-IMCI implementation began with five-day trainings of Promotores in 1997. Training included both didactic and practical sessions and was supported by PAHO, Social Security, universities, UNICEF, NGOs, and

the Peruvian Red Cross. A TOT strategy was employed for the training such that health center staff trained Promotores. CB-IMCI was rolled out in phases and according to a KI, it was implemented to the extent that resources were available. Training was rapidly scaled, surpassing training levels achieved by FB-IMCI so that by 2001, approximately 2,500 Promotores had been trained in CB-IMCI. At the time, approximately one CB-IMCI-trained promotores was available per 500 children nationally.[62] However, a KI expressed that training ultimately did not reach the targeted number of Promotores.

Trained community health agents (Promotores) visited households identified as "high risk" using a community map, once a month. The Promotores carried out identification of high-risk households locally, using a number of indicators such as mother's education, vaccination status of children under 5, children under 5 with a Control of Growth and Development (Control de Crecimiento y Desarrollo-CRED) card, access to safe drinking water, and adequate waste management. They used active and passive methods of case-finding to locate children with diarrhea and pneumonia in their communities. When a child with possible pneumonia was identified, Promotores assisted in transporting the child to a nearby health facility after administering an initial dose of cotrimoxazole (if in remote communities). A strong system supported referrals by Promotores. "Evacuation brigades" comprised of volunteer community members were formed to transport sick children to the nearest health facility and radio contact ensured their arrival at the facility. Strong communication methods also facilitated these referrals. Promotores provided families of children with referral slips and also received "counter-referral" feedback forms from facilities upon diagnosis and treatment of the referred child. These forms included follow-up recommendations to guide Promotores' monitoring of referred and treated cases in the community. Using these recommendations, Promotores were able to assist mothers in care of their children and ensure compliance with prescribed treatment regimens.

NGOs such as CARE (through its Enlace and Redes projects), Carita, Prisma, and Plan International implemented CB-IMCI in different parts of the country, under the leadership of the MOH which provided the training for Promotores and supervision through staff from health facilities. Peru's strategy of leveraging partner support for CB-IMCI contributed to its success as a KI explained: *"...compared to FB-IMCI, the community management (CB-IMCI) is the one that at the time was much stronger because many NGOs began to orient their work around this and promoted the community component (CB-IMCI)*."

An evaluation of CARE's Enlace program found that the percentage of children under 2 years with suspected pneumonia who were seen at a health facility nearly doubled from 37% in 1996 to 71% in 2000. Twice as many cases received follow-up visits by Promotores, increasing from 40% of sick children at baseline to 81%.[38] However these results were limited to Enlace program areas and were not consistent with national DHS data noted below.

As noted, in the FB-IMCI section, in 1996, just before implementation of CB-IMCI in Peru began, care-seeking for fever (from health facility or other provider) was 35% and by 2000 increased to 56% and 68% in 2009 although dropped to 60% by 2014. DHS reported similar progress in care-seeking for ARI – care-seeking improved from 46% in 1996 to a high of 68% in 2012, but also dropped to 60% by 2014 (no explanation was identified). Improvement was more limited for diarrhea, with care-seeking increasing from 30% in 1996 to

43% in 2007-08 then dropping to just 33% in 2012. DHS surveys also showed limited improvement in treatment of ARI and diarrhea in children. Only 31% of children U5 with diarrhea received ORT in 2012, from 26% in 1996. Meanwhile, the proportion of children under 5 with ARI symptoms that received antibiotics while also remaining low, improved from 29% in 2004-06 to 38% in 2012.

ADAPTATION DURING IMPLEMENTATION

Early in implementation, Peru realized that the five-day training for CB-IMCI resulted in Promotores being absent from implementing their roles. Accordingly, Peru adapted the training duration and focus to emphasize the main areas as a KI described: *"…we made some accommodations because in some communities, (Promotores) couldn't stay five days in training because they had to work, they had to do other things. We cut it to three days and we gave more emphasis to the topic of nutrition and nutrition conditions, hygiene and safety, always diarrhea and respiratory infections, but we made malaria and other things a lower priority."*

SUSTAINMENT

Not found

Table 10. CB-IMCI implementation strategies

Implementation Outcome	Implementation Strategy	Evidence
Appropriateness	CB-IMCI introduction reflected the need to provide comprehensive care at community level	(+): Rates of diarrhea, ARI, and fever reported by caregivers in the 2 weeks preceding the DHS survey was 18%, 20% and 28%, respectively, in 1996, just before CB-IMCI was introduced.[9] (+): The rationale for CB-IMCI introduction reflected the need for integrated care for the child at community level: '…we have a rich experience of Promotores), before we had (Promotores) of tuberculosis, of malaria, of diarrhea, each program had its own (Promotores). The challenge was to change the logic toward a comprehensive vision, that they are going to make a comprehensive family visit, and not only see the child, but see the child's surroundings, and all that we had to do'. See malnutrition section also.
Acceptability	Community engagement	(+). Enlace program evaluation found care-seeking for children under 2 with suspected pneumonia increased from 32% to 60%
Feasibility	Stakeholder engagement National leadership and accountability Leveraging partner support Leveraging existing systems	(?): Program coverage data not available

	Task shifting	
Effectiveness and Coverage (Reach)	Rapid scale Data use for adaptation	(+/-): ORT coverage improved slightly from 22% in 2000 to 31% in 2012 but remained low (See ORT section). (+): An evaluation of CARE's Enlace program found that the percentage of children under 2 years with suspected pneumonia who were seen at a health facility nearly doubled from 37% in 1996 to 71% in 2000. Twice as many cases received follow-up visits by Promotores, increasing from 40% of sick children at baseline to 81%.[38] (+): In 1996, just before implementation of CB-IMCI in Peru began, care-seeking for fever (from health facility or another provider) was 35% and by 2000 increased to 56% and 68% in 2009 although dropped to 60% by 2012. Care-seeking data for ARI and diarrhea were unavailable for the team to review (+/-): DHS surveys over the course of the study period showed limited improvement in treatment of ARI and diarrhea in children. Only 31% of children U5 with diarrhea received ORS in 2012, from 26% in 1996.
Fidelity	Guidelines development Training (TOT) National leadership and accountability Use of counter-referral feedback from facility-based health workers to Promotores	Not found
Cost		Not found
Sustainability		Not found
Equity	Community-based delivery	(-): Equity plots in Figures 12,13, and 14 show the persistent gaps in care-seeking rates for pneumonia, diarrhea and fever among the different wealth quintiles in Peru, despite improvements overall. (-): Regional variation in care-seeing for pneumonia, diarrhea, and fever reported by DHS

4.1.3 Diarrhea-Specific Interventions

4.1.3.1 Oral Rehydration Solution (ORS) and Zinc

Table 11. ORS and Zinc Key Implementation Strategies

Implementation Strategies
• Integration into existing systems • Development of protocols and guidelines including adaptation of global guidelines for use in local context • Leveraging partner support

- Human Resource (HR) strengthening
  - Training
- Data use for adaptation

IMPLEMENTATION PRE-2000

Prior to implementation of IMCI in Peru, diarrhea case management was implemented through vertical programs. The National Oral Rehydration Program established in 1980 implemented ORS for management of dehydration cases. The program emphasized training of health providers, national production of ORS sachets, and national-level distribution with the support of organizations such as UNICEF and USAID.

Two years after the establishment of the National Oral Rehydration Program, the MOH created the National Diarrhea Disease Control Program (renamed the Prevention and Control of Diarrheal Disease Program in 1985), which sought to reduce both morbidity and mortality associated with diarrhea in Peru. In addition to ongoing distribution of ORS, the MOH implemented a Health Literacy Program from 1982 to 1984, which used a social marketing strategy involving stakeholders like local municipalities and private drugstores to actively promote ORS use at the community level.

In the late 1980s, the MOH and its partners began to strengthen the role of community oral rehydration units in treatment of diarrhea. In collaboration with UNICEF, it launched the First Summer Campaign for Diarrhea Control in 1988. This initiative established 2,400 active units across Peru, trained thousands of community volunteers, and distributed over 1.6 million ORS sachets through the units by 1989. Community oral rehydration units were further expanded at the national level as part of the MOH's Five-Year Plan for Prevention and Control of Diarrheal Diseases (1995-1999). This plan additionally expanded training of health workers in diarrhea case management through partnership with the Training of Health Personnel Program.[66]

Despite these efforts to implement and promote ORS, its use of ORS in children under 5 with diarrhea in Peru was low at around 20% despite high knowledge with 75.9% of women with a live birth in the three years preceding the DHS knowing about ORS for treatment of diarrhea.[9]

ADAPTATION

Treatment of diarrhea with ORS was integrated into the scope of Peru's IMCI program, which has been implemented in the country since 1996. Following integration, the vertical National Diarrhea Disease Program ended.[66]

In 2006, the Ministry of Health published technical guidelines for the management of common childhood diseases, aligning the national recommendations for the management of diarrhea with international guidelines for ORS.[67] In 2014, the Ministry of Health provided an update to these guidelines,[67] incorporating zinc supplementation into standard treatment of diarrhea based on data of its effectiveness. Zinc supplementation for diarrhea began in 24 health facilities in Ayacucho and Ventanilla districts, which covered a population of over 45,000 children under 5.[68] The Zinc Saves Children program, which was launched in Peru by the International Zinc Association with support from UNICEF and the Government of

Peru, supported expansion of zinc for diarrhea treatment to 45 health centers in 2012 then 188 in 2013. This expansion was accompanied by multiple meetings and workshops to train 1,364 professionals and technicians on use of zinc as part of treatment of diarrhea. In 2013, the program estimated that 5,700 children with diarrhea received zinc.[69] Zinc supplementation for diarrhea continued to expand across Peru, reaching 760 health centers in six of the country's 24 regions in 2015.[70] However, national coverage of zinc treatment is not reported by DHS.

Use of ORS had a modest increase over the study period from 21.9% reported by the 2000 to 32% in 2015 with considerable areas for improvement (Figure 16).[29] Large regional differences were also reported – from only 14% in Tacna to 45% in Madre de Dios and Cajamarca.[9] Other treatments for diarrhea reported included antibiotics (17.3% in 2015) and home remedies (27.4% in 2015). Although use of home remedies had dropped from 50% in 2000, no significant change in antibiotic use (recommended in national guidelines only for diarrhea with blood and mucus) was reported.[29,71] Though ORS use remained quite low, acceptability at least in Lima was actually high – a 2012 study conducted in Lima found that 73% of surveyed caregivers of children under 3 would give commercially available ORS to their child. Data on acceptability outside of Lima were not found.[72]

However, maternal knowledge of ORS did not improve over the study period. In 2015, 69.5% of mothers knew about the use of oral rehydration solution for diarrhea in children under 5, compared with 78.2% in 2000. This varied widely by education level, wealth quintile, and geographic location.[29,71]

SUSTAINMENT

ORS and zinc continue to be used as treatment for diarrhea in Peru, incorporated into the IMCI program. Knowledge of ORS remaining high among mothers in Peru, but uptake as reported by the DHS remained much lower.

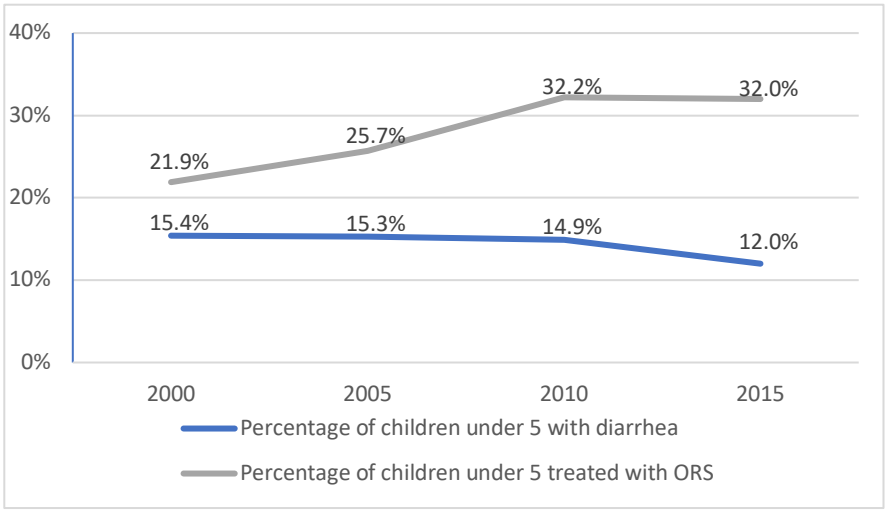

Figure 16. Diarrhea in Children Under 5 With Diarrhea in the Prior 2 Weeks in Peru and Treatment with ORS, 2000-2015 (Source: DHS)

Table 12. ORS and Zinc Implementation Strategies and Outcomes

Implementation Outcome	Implementation Strategy	Evidence
Appropriateness	Data use for decision-making and adaptation Following international recommendations	Low coverage at start of study period - 22% of children with diarrhea in 2000 were given ORS Diarrhea caused 5.4% of U5 deaths in 2000 (IHME GBD) Zinc added to treatment guidelines based on effectiveness data
Acceptability	Community engagement and education promoting ORS use	(+) High acceptability of ORS reported in 2012 study in Lima (though data not found for other areas of the country)
Feasibility	Incorporation into FB-IMCI program Development and updating of national treatment guidelines Leveraging partner support	Not found
Effectiveness and Coverage (Reach)		(-) Treatment of diarrhea with ORS improved but still remained very low – 32% per 2015 DHS, with regional disparities in coverage (see Equity below) Coverage data for zinc were not available
Fidelity	HR strengthening – training for zinc	(+) New ORS formulas only considered for approval in Peru if following the new WHO-recommended formula
Cost		Not found
Sustainability	Integration into FB-IMCI	Not found
Equity		(-) Regional differences in coverage persisted in 2015 – from 14% in Tacna to 45% in Madre de Dios and Cajamarca (DHS)[29]

4.1.3.2 Rotavirus Vaccination

Table 13. Rotavirus Vaccination Key Implementation Strategies

Implementation Strategies
• Data use   ○ For decision-making • Integration into existing systems • Focus on equity • Policy • Integration into existing vaccine and malnutrition systems • Surveillance • National commitment (funding) • Data systems strengthening • Phased scale-up

EXPLORATION

The first vaccine for rotavirus was licensed and available on the market on 1998. However, it was withdrawn in 1999 due to safety concerns and a rotavirus vaccine was not again available until 2006.[73]

In 2001, a review of existing reports and national data was conducted to estimate the burden of rotavirus in Peru, later informing of the rotavirus vaccine. It estimated that by the age of 5 years, more than 63% of children would experience an episode of rotavirus diarrhea. Rotavirus was also estimated to result in death of one in 375 children in the first five years of life. A study performed in 2008-2009 reported that Peruvian hospitals lacked rapid diagnostic tests for rotavirus in feces, limiting the ability to correctly identify rotavirus in patients, and furthering the need for rotavirus vaccination, especially to decrease unnecessary antibiotic prescription for children under 5.[74] Another study estimated that approximately 384,000 cases of rotavirus were estimated to occur each year, resulting in 64,000 clinic visits, 30,000 hospitalizations, and 1,600 deaths. The medical care for these rotavirus cases was found to cost approximately $2.6 million per year, excluding indirect or societal costs.[58]

A KI explained that Peru also began prioritizing the rotavirus vaccine purchase and distribution after evidence demonstrated that infections such as rotavirus contributed to persisting rates of childhood malnutrition in the country:

> *"Up until 2009 the country did not vaccinate against rotavirus… however the evidence told us that to reduce malnutrition, we needed to reduce acute respiratory infections and diarrhea in children, which has a much more direct effect on malnutrition than the issue of delivering food… So, malnutrition rates did not move, malnutrition remained in 28-30% of children. When they realized that the evidence tells us that the main reason for the reduction of malnutrition is in infections and that is the issue to focus on, it was then decided that we needed to invest 400 million for the purchase of rotavirus and pneumococcal vaccines."*

PREPARATION

Due to the impact of infections such as rotavirus on malnutrition in Peru discussed above, malnutrition surveillance was an important part of rotavirus vaccine roll-out. The government set targets for reducing malnutrition, measuring the districts that had the highest prevalence. Through the Control of Growth and Development (CRED), the government monitored vaccine compliance in addition to child growth.

A KI said that after recognition of the need to prioritize rotavirus, Peru invested $400 million in the purchase of rotavirus vaccines: "*…it was then decided that we needed to invest 400 million for the purchase of rotavirus and pneumococcal vaccines*."

IMPLEMENTATION

Between 2008 and 2009, the MOH introduced the rotavirus vaccine into the National Immunity Scheme. Following integration into the immunization schedule, the rotavirus vaccine was intended to be administered

at 2 and 4 months of age, **prioritizing implementation first in poorer regions**. The MOH reported that in 2009, national coverage for receiving both doses of the vaccine was 41%. Coverage quickly climbed, reaching **91% in 2012**.[75]

Surveillance implementation in sentinel hospitals in Peru with the highest numbers of cases of diarrheal disease in under-5 populations, was implemented in 2009, with diarrheal diseases due to rotavirus investigated through surveillance to determine epidemiologic characteristics, estimatives of the cost, impact, and effectiveness of the vaccine.[76] The study focused on patients with acute diarrheal episodes requiring ORT or intravenous rehydration therapy.

From this study, a **Surveillance Guide** was created for standardized hospital surveillance for improved implementation, vaccine effectiveness and consequent antibiotic resistance. Committees were created at the national, regional, and sentinel hospitals to be involved in surveillance implementation.

ADAPTATION

Not found

SUSTAINMENT

After rotavirus vaccination implementation, a 2009 study found that the vaccine was a highly cost-effective intervention in Peru, resulting in 77% government savings. The study further estimated that once integrated into the Expanded Program on Immunization (EPI) program, the rotavirus vaccination could reduce U5M by 1%, and avert 66% of rotavirus deaths, though as much as 69% if given on time.[77]

Since its implementation, Peru has reached 87% national coverage of rotavirus vaccination as of 2015. Challenges remain in distribution of vaccines at the regional level, as the related costs fell to the regions, some of which did not have the appropriate allocated funding for distribution. Further, with Peru's diverse, heterogenous population, administering the vaccine across urban and rural settings provided different challenges. However, coverage estimates by residence type and region were not available for review.

Table 14. Rotavirus Vaccination Implementation Strategies and Outcomes

Implementation Outcome	Implementation Strategy	Evidence
Appropriateness	Data use to understand disease burden and make decisions	(+) Review of existing literature and national data conducted in 2001 to estimate the burden of rotavirus diarrhea in Peru and inform introduction • By age 5, more than 63% of children would experience an episode of rotavirus diarrhea • Estimated 1,600 deaths due to rotavirus per year
Acceptability		No acceptance/refusal data found
Feasibility	Rotavirus vaccination integrated into EPI program	(+): committees created at national, regional and sentinel hospitals to be involved in surveillance implementation

	Phased scale-up Government funding for vaccine introduction and scale-up	
Effectiveness and Coverage (Reach)		(+): National coverage increased to 91% in 2012 from 41% in 2009
Fidelity	Creation of surveillance guide for improved implementation	Not found
Cost		(+) Found to be highly cost-effective, resulting in 77% government savings per 2009 study[77]
Sustainability	Decentralization of vaccine program to regions to pay for and distribute National budget for continued implementation secured	(+/-): Regions had varying success with implementing, with some regions struggling to pay for the costs of distribution (-) Slight decline in coverage from 91% in 2012 to 87% in 2015
Equity	Equity-focused implementation	(+) Introduced first in poorest areas of the country

4.1.4 Other Pneumonia Interventions

4.1.4.1 Pneumococcal Vaccination

Table 15. Pneumococcal Vaccination Key Implementation Strategies

Implementation Strategies
• Data use   ○ For decision-making • Leveraging partner support • Integration into existing systems • Policy • Phased introduction • Focus on equity

EXPLORATION

In 2000, there were 6,174 deaths in children under 5 related to pneumonia in Peru, which made up about 20% of mortalities in children of this age. Of these pneumonia-related deaths, an estimated 30% to 50% were attributed to pneumococcus. An estimated five to eight children under 5 died in Peru each day due to pneumococcal disease.[78]

The MOH estimated that the cost of treating a case of mild infant pneumonia was $104-$156. However, the investment for the government to vaccinate a child against pneumococcus was much lower at $69 for two doses of PCV.[79]

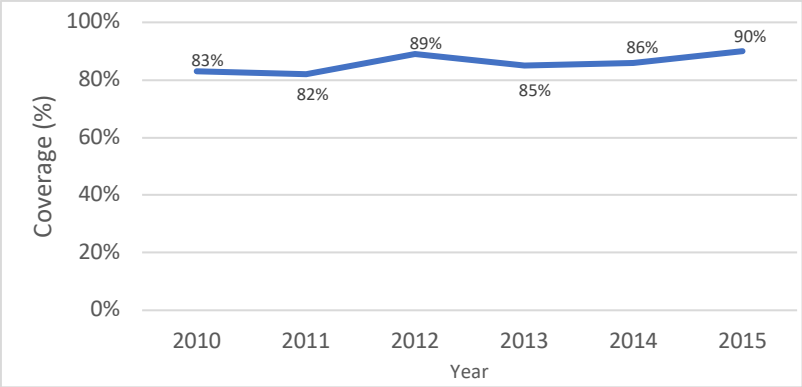

Figure 17. PCV3 vaccination coverage among 1-year-olds (%)83

PREPARATION

PCV7 was licensed for use in Peru in 2000 in preparation for its later introduction in the country.

Beginning in 2000, the MOH partnered with PAHO to conduct a sentinel surveillance study for *Haemophilus influenzae* type b (Hib) and *Streptococcus pneumoniae* in children under 5. The surveillance phase of this work was conducted in Lima, Cusco, Puno, and Arequipa. Hospitals participating in the study were selected based on 1) high incidence of pneumonia and meningitis cases, with high case fatality rate for these diseases, 2) having certified laboratory departments, and 3) high levels of organization for surveillance and monitoring activities. It found that children under 1 year of age were most vulnerable to *S. pneumoniae*. Serotypes 14 (29%), 5 (5%), and 6B (5%) were the most commonly isolated serotypes associated with hospitalized cases of pneumonia.[80]

IMPLEMENTATION

Despite this early interest in and preparation for the pneumococcal vaccine, the National Vaccination Scheme did not introduce the vaccine until 2008. A KI mentioned that this was due to "*lack of funding, conflicts of interest, inefficiencies of the government, conflicts of priorities.*" In 2009, the MOH added PCV to the national immunization schedule, with administration in the 3rd, 5th, and 12th months of life.

Similar to other vaccines such as Hib, PCV was introduced in the poorest areas of the country with higher burden of pneumonia first to ensure access in these populations and improve economic feasibility of introduction. A KI explained that while the MOH intended from the start to implement PCV nationally, introducing the vaccine in a priority area first allowed it to build evidence and gain support for country-wide implementation. After initial introduction, PCV was rolled out in the remaining parts of Peru to reach national scale.

ADAPTATION

In 2011, PCV7 was taken off the global market and replaced with PCV10 and PCV13, covering additional serotypes. The Peru National Institute of Health conducted two studies to inform the MOH's decision of which presentation to introduce. The first study, conducted in 2011, found that both PCV10 and PCV13 were anticipated to be more cost-effective than PCV7 in preventing pneumonia in children under 5. PCV10 was estimated to cover 71% of pneumococcal isolates, while PCV13 would cover 82%. The evaluation estimated that PCV13 would be more cost-effective than PCV10 in reducing hospitalizations due to pneumonia, despite the lower cost of implementing PCV10.[81]

However, PCV10 was ultimately introduced in Peru. The presentation was licensed in Peru the same year and introduced in the country in late 2011. Use of PCV10 first began in only Lima and Callao and the vaccine was administered to children at 2, 4, and 12 months of age. It was scaled up to a national level in **2013.** The MOH utilized a catch-up campaign with two doses of the vaccine for unvaccinated children between 12 and 24 months of age and one dose for children 2-5 years of age with a comorbidity.[82] As shown in Figure 17, Peru achieved high coverage of PCV. Coverage of PCV3 reached 89% by 2012, just one year after the country's transition to PCV10.

SUSTAINMENT

The country maintained high coverage and 2015, PCV3 coverage reached 90%. One year later, the MOH incorporated PCV13 into the national immunization schedule to protect against additional serotypes that are prominent in the country.

Table 16. PCV Implementation Strategies and Outcomes

Implementation Outcome	Implementation Strategy	Evidence
Appropriateness	Data use for decision-making	(+) Surveillance study conducted to identify most common serotypes[80] (+) LRI highest cause of U5M during study period (20% of all U5 deaths in 2000)[8]
Acceptability	Phased introduction to gain support for national scale	Acceptance/refusal data not found, but high coverage as described below
Feasibility	Introduction in priority areas prior to national scale (phased approach) Integration into national immunization schedule	(+) Implementation in all regions
Effectiveness and Coverage (Reach)	Use of catch-up campaign	(+) High PCV3 coverage (90% in 2015)
Fidelity		Not found
Cost		(+) Estimated investment of $69 per child vaccinated[79]
Sustainability	Integration into national immunization schedule National budget secured for ongoing activities	Not found
Equity	Prioritization of introduction of PCV7 in the poorest areas first	Regional coverage not found

4.1.4.2 Haemophilus Influenzae B (Hib) Vaccination

Table 17. Hib Vaccination Key Implementation Strategies

Implementation Strategies
• Data use   ○ For decision-making • Integration into existing systems • Phased introduction and national scale • Focus on equity • Following international standards

EXPLORATION

IHME estimates that in 2000, meningitis caused by *Haemophilus influenzae* type b (Hib) caused only 0.39% of under-5 deaths in Peru. Despite this small contribution to the country's total U5M, lower respiratory infections, which are also sometimes caused by Hib, contributed an estimated 20% of all under-5 deaths in the country the same year.[8]

PREPARATION

The Peruvian MOH decided to implement the Hib vaccine based on knowledge of Hib's role in causing a substantial proportion of pneumonia and the good results seen in other countries. In 1998, the MOH incorporated the Hib vaccine into National Scheme for Vaccination as a routine vaccine for children under 5 in the poorest areas of the country, reflecting a focus on equity in utilizing limited resources.[84]

IMPLEMENTATION

During its initial use in Peru, the Hib vaccine was introduced only in selected geographical areas of the country due to limited resources. The Hib vaccine became part of routine vaccination for children living in priority areas of extreme poverty, with doses given at 2, 3, and 4 months of age.[85–87] In 2005, the vaccine was introduced scaled nationally.[88] Peru was able to quickly achieve high coverage of the Hib vaccine at a national level – just one year later after national implementation, had a coverage of 94% (Figure 18).

ADAPTATION

In alignment with new international standards, Peru first introduced the pentavalent vaccine containing Hib in selected areas of the country in 2005. By 2007, the pentavalent vaccine was scaled to the entire country and provided at 2, 4, and 6 months.

The Government of Peru released an updated version of its National Scheme for Vaccination in 2010, for which it guaranteed application of the scheme across the country. Under this policy, the federal government supplied vaccines and syringes, while regional governments were required to cover operational costs of the vaccination plan. In addition to the pentavalent vaccine, the standalone Hib vaccine was included in the

immunization plan to be administered to children with adverse reactions to the pentavalent or diphtheria, pertussis, and tetanus (DPT) vaccines.[89]

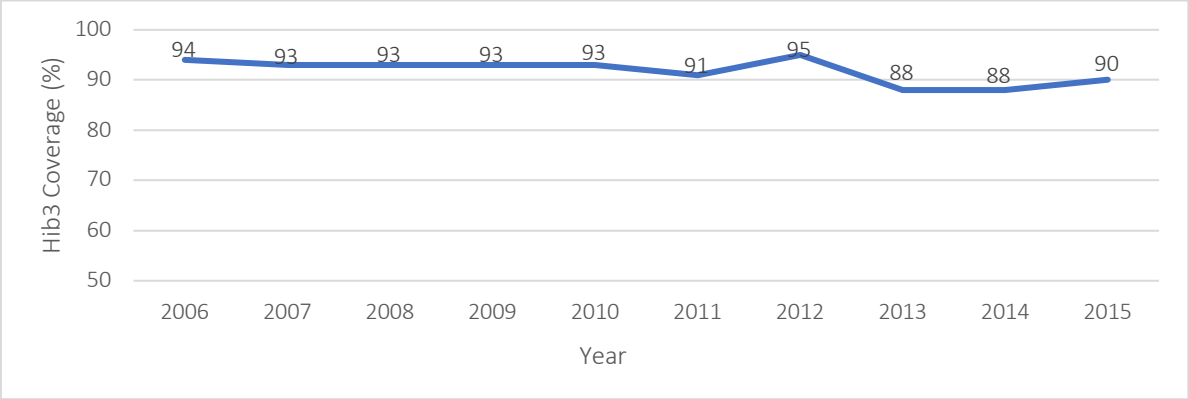

Figure 18. WHO/UNICEF Estimated Hib3 Vaccine Coverage, 2006-2015

SUSTAINMENT

As shown in Figure 18, national coverage of a Hib-containing vaccine remained high across the study period. However, the 2014 DHS did show geographic differences in coverage of the DPT (pentavalent) vaccine in children under 36 months of age. While DPT3 coverage was nearly identical in urban (77.8%) and rural (77.9%) areas, it did differ by region, ranging from 61.2% in Madre de Dios to 86.5% in Tumbes.[29] Meanwhile, disparities in DPT3 coverage by wealth quintile narrowed significantly over the study period, nearly disappearing by 2016 (Figure 19).

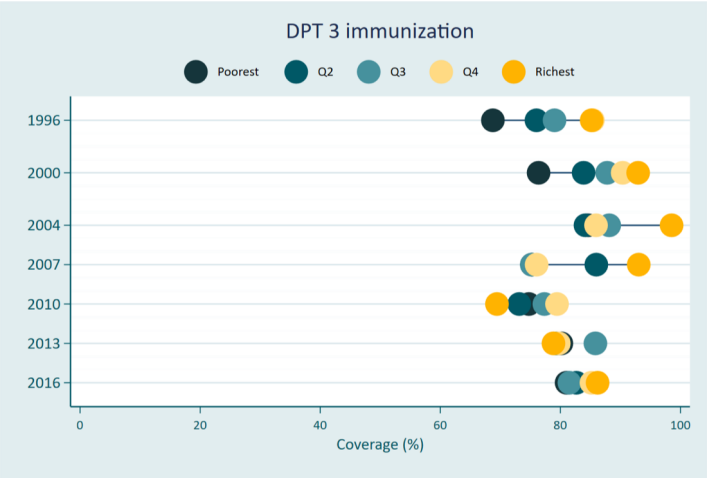

Figure 19. Equity Plot of Care-Seeking for Fever by Wealth Quintile, 1996-2016

Table 18. Hib Vaccine Implementation Strategies and Outcomes

Implementation Outcome	Implementation Strategy	Evidence
Appropriateness	Data use for decision-making Following international recommendations for pentavalent vaccine	(+) Introduction of Hib based on results of introduction in other countries and burden of Hib disease (+) Introduction of pentavalent vaccine, replacing standalone vaccine

		(+)Lower Respiratory Infections (LRIs) contributed an estimated 20% of all under-5 deaths in 2000[8]
Acceptability		Acceptance data not found, but high coverage as described below-suggesting low/no refusal
Feasibility	Integration into national immunization schedule Introduction first in prioritized areas, followed by national scale	(+) Scaled to entire country in 2007 following phased introduction
Effectiveness and Coverage (Reach)	Continuation of standalone vaccine after introduction of pentavalent vaccine for children with adverse reactions to DPT	(+/-) High coverage achieved, with equivalent coverage in urban and rural areas, but remaining regional differences (ranging from 61% to 87% per 2014 DHS)
Fidelity		Not found
Cost		Not found
Sustainability	Inclusion in national immunization plan National Scheme for Vaccination ensured budgeting for vaccine	(+) Coverage sustained nationally– 90% in 2015.
Equity	Introduction prioritized areas of poverty	(+) Urban and rural coverage nearly identical (+) Narrowing of equity gap in DPT3 coverage between wealth quintiles over study period (-) Remaining differences in regional coverage – ranging from 61% in Madre de Dios to 87% in Tumbes (2014)

4.1.5 Other Malaria Interventions

4.1.5.1 Insecticide-Treated Nets (ITNs)

Table 19. ITN Key Implementation Strategies

Implementation Strategies
• Free distribution • Data use   ○ Prioritization • Leveraging donor and partner support • Equity • Community engagement and education

EXPLORATION

The MOH began advocating for the use of long-lasting insecticidal-treated nets (LLINs) rather than the traditional, untreated nets typically utilized in Peru in 1995. Over the next five years, it distributed 200,000

LLINs in endemic areas of the country, though the coverage of this activity is unknown.[90] During this period, Peru reported its highest annual malaria incidence of over 200,000 cases in 1998, most of which occurred in the Amazon and northern coast. Incidence decreased to 57,712 cases in 2000.[91]

A 2000 study conducted in Loreto found that use of traditional mosquito nets was nearly universal. However, traditional nets do not offer the same protective insecticidal benefits as LLINs or standard ITNs.

PREPARATION

Beginning in 2006, the Global Fund's Malaria Control Program in Andean-Country Border Regions (PAMAFRO) project provided funds to 11 countries, including Peru, for malaria control activities, aiming for malaria reduction of at least 50%. In Peru, these funds were primarily used to distribute LLINs to communities at high risk for malaria incidence as described below.[92]

IMPLEMENTATION

The largest public distribution campaign of LLINs and conventional ITNs in Peru took place starting in 2006 with support from the PAMAFRO project, which was supported by the Global Fund. The MOH and PAMAFRO conducted the campaign in high-risk malaria areas of the Amazon Jungle (Amazonas, Loreto, and Cajamarca). Distribution areas were selected based on 1) disease burden (high numbers of malaria cases and high annual parasite incidence), 2) limited access to health services, 3) low coverage of conventional mosquito nets, non-polyester nets, or nets in poor condition, and 4) previous impregnation history. It prioritized free distribution in certain population groups of these areas, including children between 3 and 10 years of age, parents with children under 3, and pregnant women. By 2007, 85% of households in priority distribution areas owned an ITN, with an ITN per household ratio of three. However, the majority of ITNS were actually acquired by the households themselves and were in poor condition.

Distribution continued until 2010. By that time, the campaign had distributed over 242,000 LLINs in 194 targeted communities in the region, aiming to replace use of traditional nets in these areas.[93] A study conducted in 60 of these communities found that shortly after distribution, 99% of children under 5 and 96% of pregnant women slept under a LLIN the night prior to data collection. However, lower utilization was reported approximately one year after distribution – only 77% of children under 5 and 66% of pregnant women slept under a LLIN.

A separate study conducted in 10 communities from 2007 to 2008 explored household members' views on LLINs, particularly compared to the still-popular untreated traditional nets. Overall, it found that 63% of households did not use any of the LLINs that had been previously distributed. Preference for traditional nets likely affected this coverage of LLINs. The majority of survey respondents reported that mosquitoes had entered their LLIN since the beginning of its use or after the net's first wash (93%) and that mosquitoes did not die after entering the net (90%). Overall, 94% believed that traditional nets offered better protection than LLINs. In addition, traditional nets also provided privacy in open-style homes, a function that was limited for the more transparent LLINs.[93]

ADAPTATION

Not found

SUSTAINMENT

Despite challenges in acceptability and subsequent utilization, annual reported cases of malaria in Peru steadily declined over the period of implementation of PAMAFRO's activities in Peru from 2005 to 2010, by 95% for *P. falciparum* and 63% for *P. vivax*.[93] However, PAMAFRO's last procurement was in 2007 and malaria had highly declined; but since there was no follow-up plan or funding, malaria incidence climbed after 2011. Though many environmental factors influence malaria transmission, this increase in malaria cases followed the conclusion of the Global Fund's assistance to Peru through the PAMAFRO project. By 2016, Peru contributed an estimated 14% of all reported cases of malaria in the Americas.[91]

In 2016, PAHO announced a plan for elimination of malaria in the Americas. This plan specifically targeted the Amazon basin and included use of LLINs as a key intervention for vector control. In addition, in the same year, Peru launched the program to eliminate malaria throughout the country as a KI said: "*In 2016 Peru launched the Program Malaria Zero, which now is showing good results.*"

Table 20. ITN Implementation Strategies and Outcomes

Implementation Outcome	Implementation Strategy	Evidence
Appropriateness	Data use for decision-making	(+) Targeted distribution in high-risk areas (+) Use of known epidemiologic data
Acceptability	Free distribution Community education campaign in high-risk areas of the Amazon (Amazonas, Loreto, and Cajamarca)	(-) In 2007-2008 study, nearly all respondents (94%) believed traditional nets provided better protection than LLINs[93] (+/-) Utilization very high shortly after distribution, but decreased after one year – 77% of children under 5 slept under an ITN one year after distribution (-) Low usage of distributed LLINs (-) preference for traditional nets due to decreased transparency
Feasibility	Leveraging partner and donor support Targeted distribution	(+) Distribution of 242,000 LLINs in 194 targeted communities
Coverage and Effectiveness (Reach)		(+/-) By 2007, 85% of households in priority distribution areas owned an ITN, however, many households had actually purchased their own

		(+/-) Reduction in malaria cases in Peru during 2005-2010, though not sustained (relationship to ITN distribution and use unknown)
Fidelity		(+/-) Utilization very high shortly after distribution, but decreased after one year – 77% of children under 5 slept under an ITN one year after distribution (-) 2007-08 study found that majority (63%) of households did not use previously distributed LLINs, often preferring to use traditional nets instead
Cost		Not found
Sustainability	PAMAFRO elimination plan utilizing LLINs as a key intervention began in 2016	(-) Progress in malaria case reduction from 2005-2010 not sustained, with incidence beginning in 2011)
Equity	Free distribution in areas selected based on vulnerability	Coverage data by region and socioeconomic group not found

4.1.5.2 Indoor Residual Spraying (IRS)

Table 21. IRS Key Implementation Strategies

Implementation Strategies

• Policy
• Following international recommendations
• Data use
  ○ Prioritization
  ○ Adaptation

IMPLEMENTATION PRE-2000

Indoor residual spraying (IRS) has been recommended as a method to prevent malaria spread since the 1950s.[94] IRS with Dichlorodiphenyltrichloroethane (DDT) was used extensively as the main vector control method of the National Malaria Eradication Campaign in Peru from 1957-1980. In particular, a large campaign conducted about 600,000 sprayings per year from 1959 to 1962. By 1965, several areas of the country (coastal Piura, Tumbes, La Libertad, Ica, Callao, Arequipa, and Huancavelica) experienced interrupted transmission of malaria for three years. Following conclusion of the National Malaria Eradication Campaign and shifting of resources and funds for malaria control to the district level, spraying coverage across Peru began to decrease. Despite past progress in reduced malaria transmission, DDT spraying activities in Loreto stopped in 1988 (no data found for why) and malaria cases subsequently increased with causes including climate and growing resistance.[94,95]

IMPLEMENTATION AND ADAPTATION POST-2000

The Government of Peru banned DDT use in the country in 2001 in accordance with the Stockholm Convention on Persistent Organic Pollutants. Though the WHO continued to recommend the use of DDT to

fumigate internal environments in areas of intensified malaria transmission, the chemical's use in Peru ceased.[96]

During the study period, IRS in Peru was limited and utilized deltamethrin rather than DDT. In early 2011, 6,000 houses in Aguas Verdes in Tumbes were sprayed with deltamethrin. However, IRS was discontinued in Tumbes shortly after since susceptibility tests indicated possible vector resistance to deltamethrin.
IRS use did continue in Loreto, though prior to 2011 spraying was inconsistent and would result in some districts receiving four rounds of spraying in a year while others received fewer. Beginning in 2011 after initiation of results-based budgeting in Peru, spraying with deltamethrin was conducted twice a year by the vector control unit of the Loreto Regional Health Directorate beginning in 2011. Spraying targeted nine districts, which were selected on the basis of having an annual parasitic incidence greater than 10 or high risk of malaria transmission. These sprayings typically achieved high coverage of around 95%. Though they achieved high coverage, the frequency of sprayings conducted in Loreto was likely inadequate since deltamethrin is most effective for three-month periods.[95]

Information on IRS implementation in other areas of Peru or national IRS campaigns was not available for review.

SUSTAINMENT

Not found

Table 22. IRS Implementation Strategies and Outcomes

Implementation Outcome	Implementation Strategy	Evidence
Appropriateness	Data use for decision-making Following international recommendations	(+) Spraying in Loreto in areas with the highest annual parasitic incidence or risk of malaria transmission
Acceptability		Resistance to spraying was not noted by KIs or found
Feasibility	Targeted spraying conducted in Loreto	(-) Decline of IRS use following conclusion of the National Malaria Eradication Campaign and shifting of resources and funds for malaria control to the district level
Effectiveness and Coverage (Reach)		(-) Limited use in Peru during the study period, primarily in 9 districts in Loreto (+) High coverage achieved by spraying activities in Loreto (-) Twice-yearly spraying in Loreto likely inadequate due to period of effectiveness of deltamethrin
Fidelity	Inclusion in results-based budget	(+) High coverage of target areas sprayed in Loreto (around 95% in 2011)

Cost		Not found
Sustainability		Spraying was discontinued in high risk areas, but underlying causes not found
Equity		Not found

4.1.5.3 Rapid Diagnostic Testing (RDT) for Malaria

Table 23. RDT for Malaria Implementation Strategies

Implementation Strategies

• Pilot testing
• Leveraging partner and donor support
• Stakeholder engagement
• Data use
  ○ For decision-making
  ○ For prioritization
• Focus on equity
• HR strengthening
  ○ Training
  ○ Supervision

EXPLORATION

Peru's health system long relied on microscopy for diagnosis of malaria. In the mid-1990s, the MOH began using volunteer community health agents called *promotores de salud* to facilitate diagnosis of suspected malaria cases. *Promotores*, who received training in malaria prevention and control, collected blood samples from individuals with possible malaria and delivered them to nearby health facilities for testing. However, challenges in timely diagnosis via microscopy remained due to the remote location of some villages and lack of working microscopes or trained microscopists at health facilities. A 2001 study conducted by the MOH and USAID found that in the eight of the communities in Loreto with the highest malaria incidence, the average length of time between preparation of the blood slide by a promotore and receipt of diagnosis was three days.

The MOH's reported only 247,229 confirmed cases of malaria out of approximately 2 million total patients tested in 1998. The same year, only 18% of patients with fever in the region of Loreto were confirmed to have malaria, indicating that while there were challenges in diagnosis via microscopy, presumptive treatment would lead to significant overuse of antimalarial drugs.[97]

PREPARATION

Compared to most countries, the government of Peru took a **very early interest in RDTs** for malaria, reflecting the culture of **early adoption**. By the late 1990s, the MOH and National Institute of Health began conducting studies of RDTs just a few years after publication of initial field test results of one of the first commercially available RDTs. They carried out a series of studies over the next five years with the support of USAID, the US Naval Medical Research Center Detachment, Walter Reed Army Medical Center, and United

States Center for Disease Control and Prevention (US CDC). Research partners built support for RDTs research and eventual use by involving key MOH decision-makers in the planning phase of a series of studies and providing them with early access to study results.

The first study, an efficacy trial conducted in 1999, equipped 20 *promotores* with RDTs. *Promotores* performed rapid tests and also prepared blood smear sides for microscopy for approximately 400 febrile patients. The study found that the RDTs administered by *promotores* achieved high sensitivity and specificity. A later study conducted from September 2001 to May 2003 that also equipped *promotores* with RDTs found that the median time between a patient's initial visit to a *promotor* and receipt of diagnosis decreased from 68 hours before the use of RDTs to only 20 minutes, with improvement in the proportion of confirmed cases treated within two days of symptom onset from only 16% to 55%.[97] A modeling study found that implementation of RDTs at the community level could also result in financial savings by reducing overtreatment and reduction in the number of complicated cases in Peru due to more timely and species-specific diagnosis. Specifically, RDT implementation was estimated to save the MOH $191 USD per case of *P. falciparum* and $31 USD for each case of *P. vivax* malaria.[98]

During a workshop held in July 2003, local health workers involved in the trial of RDT use by *promotores* discussed facilitators and barriers to effective RDT use in the community. While RDTs reduced time between a patient's initial visit and diagnosis, barriers included stock-outs and quality control problems with tests, community distrust generated by false negative results, an RDT's inability to detect low levels of parasitemia, and *promotores'* limited skills at taking finger stick samples and reading RDTs correctly. Despite these challenges, participants recommended continued and expanded use or RDTs. However, they recommended additional attention to training and supervision activities, supply chain challenges, and building community awareness and confidence in community-based use of RDTs to ensure the program's success.

IMPLEMENTATION

Based on the results of these studies, the MOH decided to implement community-based RDTs in areas with limited access to microscopy. To support this decision, the National Institute of Health conducted trainings for health workers and *promotores*, followed by supervision.

Despite extensive preparation, implementation was challenged by supply chain issues. In 2004 and 2005, the MOH purchased 40,000 RDTs for use in six regions of the country. However, challenges in procurement and subsequent distribution caused delays in the RDTs reaching their target communities. Since the selected RDT was made to order, Peru's order was not shipped until three to six months after the order was placed. After entering Peru, being cleared through customs, undergoing quality testing, and being transported from Lima to other areas of the country via air or water, tests typically reached communities within six to 12 months.

Availability at the community level was variable even after the initial procurement and distribution of RDTs. Allocation of the correct quantity of tests by the MOH to different communities was a challenge, with some communities receiving an excess and others not receiving adequate supply. This issue of RDT availability at the community was exacerbated by lack of acceptance among professional, facility-based health workers.

Some health workers did not trust *promotores* to provide these services and were sometimes reluctant to keep them stocked with RDTs and ACTs for treatment.

ADAPTATION

Shortly after widespread introduction of RDTs, the MOH began exploring more affordable alternatives to the OptiMAL® test being used in Peru. Regional experts convened at a meeting in Guayaquil in 2005 and established guidelines for evaluating potential tests. They decided that a test should meet the following criteria to be considered for implementation: 1) ability to distinguish *P. falciparum* from *P. vivax* infections, 2) cost below $1.50 USD per unit, 3) sensitivity and specificity as high as tests previously evaluated in the region, and 4) availability in individual packing.

PAMAFRO, a Global Fund project to control malaria in four countries, including Peru, launched in October 2005. A project procurement committee selected a lower cost test Parascreen® that had not been previously tested or used in Latin America. A multicenter study found that sensitivity of Parascreen® for *P. falciparum* and non-*P. falciparum* was lower than that of OptiMAL®. PAMAFRO expanded RDT implementation in 2007 with the acquisition of both – Parascreen® was to be used in areas with primarily *P. vivax* transmission; OptiMAL® remained in use in areas with a high amount of *P. falciparum* cases.

SUSTAINMENT

Despite Peru's early adoption, large-scale sustainment of RDT use remained a challenge in Peru. The MOH and PAMAFRO did not procure or distribute any RDTs in Peru following the large procurement of tests in 2007. Though UNICEF has since donated a small amount of RDTs in Amazonas, large-scale national or even regional distribution has not occurred.[97]

Table 24. RDT for Malaria Implementation Strategies and Outcomes

Implementation Outcome	Implementation Strategy	Evidence
Appropriateness	Data use for decision-making	(+) Multiple studies utilized to decide to introduce RDTs (+) Previous delays in diagnosis via microscopy in remote areas
Acceptability	Use of multiple research studies to gain support of stakeholders during preparation phase	(-) Community-based RDT use not accepted and supported by some professional health workers (-) False negatives resulted in distrust in some communities
Feasibility	National training for health workers and *promotores* Leveraging donor and partner support	(-) Supply chain issues, including delayed procurement and distribution
Effectiveness and Coverage (Reach)	Implementation in communities with limited access to microscopy	Not found

Fidelity	Training and supervision of health workers	Not found but supply chain challenges challenged fidelity of the implementation
Cost		Not found
Sustainability		(-) No large-scale procurement and distribution since 2007
Equity	Implementation in communities with limited access to microscopy	Not found

4.1.5.4 Antimalaria Artemisinin-Based Combination Therapies (ACTs)

Table 25. ACT Implementation Strategies

Implementation Strategies

• Data use for decision-making
  ○ Understand resistance/surveillance
  ○ Understand effectiveness and safety prior to implementation
  ○ To target treatment regimens based on subnational resistance data
• Ongoing surveillance
• Local production
• Stakeholder engagement (broad)
• Adaptation based on global recommendations
• HR Strengthening
  ○ Training (cascade)
• Development of protocols and guidelines
• Leveraging donor and partner support
• Policy use

EXPLORATION

Malaria in Peru has been historically caused primarily by *P. vivax,* with *P. falciparum* causing less than 1% of all cases in the country. However, cases of *P. falciparum* began to rise starting in 1990 and chloroquine was used as the first-line treatment.[99] The majority of malaria cases and specifically those caused by *P. falciparum* occurred in the Loreto Department, which makes up nearly a third of Peruvian territory and has a population of about 1 million people.[100]

Reduced efficacy of treatment of malaria with chloroquine in Peru was first noted in Loreto as early as 1991. In 1994, the Peruvian National Malaria Control Program (NMCP) established a monitoring system for drug resistance. As part of this system, health facilities began offering directly observed therapy for malaria as well as 28-day follow-up for all patients diagnosed with malaria. Data from the system soon indicated that chloroquine treatment failure rates were as high as 30%. However, these data were met with skepticism due to perceived low data quality.[99]

Nonetheless, beginning in 1994, standard treatment of malaria in Peru was modified to include three lines of combination treatment. Following this change, chloroquine-primaquine was considered first line treatment for both *P. vivax* and *P. falciparum*, followed by sulfadoxine-pyrimethamine and quinine-tetracycline or quinine-clindamycin-primaquine for resistant *P. falciparum*.[101]

The MOH and partnering institutions began conducting a series of efficacy trials in 1998 due to growing concerns about the role of drug resistance in the occurrence of major malaria epidemics in the Amazon Basin and northern Pacific Coast between 1991 and 1998, which notably resulted in increasing burden of *P. falciparum*.[101] These studies reported high levels of resistance in *P. falciparum* to chloroquine in several areas of the country, as well as high resistance to sulfadoxine-pyrimethamine in areas of the Amazon Basin (Figure 20).[102]

PREPARATION

In August 1999, the MOH held a national malaria treatment policy meeting in Lima to present results of drug efficacy studies and discuss the monitoring system for drug resistance in Peru. This meeting was attended by stakeholders from different regions, universities, and local and international research organizations. Discussions held at this meeting led to several major recommendations to address malaria treatment and emerging resistance in Peru. First, stakeholders agreed on the need to change first-line treatment for uncomplicated malaria caused by *P. falciparum* in the Amazon region and on the Pacific coastal plain (though sulfadoxine-pyrimethamine alone continued to be effective on the north coast). In light of the WHO's recommendation to use artemisinin-based combination therapy (ACT), stakeholders recommended changing the treatment policy to sulfadoxine-pyrimethamine plus artesunate on the north coast and mefloquine plus artesunate in the Amazon Basin. However, they also recommended conducting studies to assess the efficacy and safety of these treatment regimens since the MOH had not previously implemented mefloquine or artemisinin drugs in the country. To engage and educate additional stakeholders in this decision-making process, the meeting also included an evening session with private physicians and members of the public. During this session, the MOH and other stakeholders shared information about drug resistance in Peru as well as the rationale for the proposed treatment policy changes.[103]

Figure 20. Map of Peru (Source: CIA)

One month later, the National Standard for Prevention and Control of Malaria in Peru was updated accordingly. Specifically, curative care specified in this document was modified based on the ACT recommendations above. The National Policy on Antimalaria Drugs for Malaria Control was also approved, establishing ACT use in the North Coast and Amazonian macro regions due to high resistance to previous treatments. These changes were intended to establish effective standard treatments, delay further drug resistance in Peru, and prolong the lifespan of antimalarials in the country.

Since evidence on efficacy and tolerance of sulfadoxine-pyrimethamine-artesunate was limited at the time of these policy changes, the Peru National Health Institute and Regional Health Directorates of Tumbes and

Loreto carried out a study in two health centers in Piura from March to July 2000. It found that the combination therapy was effective and did not cause significant adverse effects. Similarly, a study carried out the same year at two health facilities in the Amazon basin studied efficacy and tolerance of mefloquine and mefloquine-artesunate. The study demonstrated that both treatments were 100% effective and did not cause any serious adverse reactions.

The MOH convened a meeting in December 2000 to present results. It decided to finally implement the combinations of sulfadoxine-pyrimethamine-artesunate and mefloquine-artesunate for treatment of *P. falciparum* malaria in Peru. In preparation, the MOH began to address technical and administrative requirements for changing the national malaria treatment scheme. Mefloquine and artesunate soon became approved and registered antimalarials in Peru following their incorporation into the National Petition for Medicines and the National Registry of Drugs.

This change required an initial investment of US$35,507 by the MOH to acquire the new antimalarial drugs. Overall, the MOH estimated that 66,330 sulfadoxine-pyrimethamine-artesunate treatments and 35,925 mefloquine-artesunate treatments would be required for the years 2000 and 2001. The large initial order of supply of drugs was purchased internationally as well as through laboratories in Peru that supplied these drugs. These administrative and logistical issues related to changes in procurement policies resulted in a six- to eight-month delay in acquiring the drug supply.

IMPLEMENTATION

In August 2001, the MOH approved a national directive updating combination therapy schemes and ordering implementation of these new ACTs in Peru. Peru became the first country in Latin America to implement ACTs for treatment of malaria, even prior to WHO recommendations for use of ACTs in treatment of uncomplicated *P. falciparum* malaria issued in 2006.[104] In addition, it was the first country to simultaneously use two ACT schemes as first line treatment in different areas based on subnational resistance data.

Six regional training seminars conducted by PCMOEM staff and members of scientific institutions and funded by the MOH and USAID took place beginning September 2001. These seminars addressed topics such as drug resistance, the new drug policy, side effects, diagnosis and treatment of malaria, and surveillance. Trainings first targeted professionals at the regional level, then were cascaded down to the local level in the following months.[105] At the local level, regional health authorities trained physicians, nurses, promotores, and laboratory specialists at health centers and health posts.[102] ACTs were subsequently provided as treatment for *P. falciparum* malaria at health facilities as well as at the community level by *promotores*, trained community health volunteers.

ADAPTATION

The PAMAFRO project, a multi-country program funded by the Global Fund which was implemented from October 2005 to March 2008, implemented an acquisition strategy for antimalarial drugs for participating countries (Peru, Venezuela, Bolivia, and Colombia). During the project's first two years of implementation,

unit prices for these drugs, including ACTs, steadily dropped, including 90% for artesunate due to these efforts.[106]

Supply chain issues continued to challenge Peru's efforts to achieve widespread coverage of ACTs. Acquisition of drugs was centralized and drugs were stored in MOH warehouses in Lima prior to distribution. As explained by a key informant: *"The warehouse worker becomes the owner of the medicine and does not let go. He would tell each promoter to bring the prescription or bring the empty blister pack of a completed treatment and he would replenish it."* These restrictions enforced by warehouse workers led to delays in community-based treatment of malaria cases and restricted *promotores'* ability to treat multiple cases at once. In response to this challenge, PAMAFRO hired suppliers to distribute ACTs directly to all health centers in the rural jungle area. Though this approach was more expensive than distribution from central warehouses, it limited corruption and helped ensure availability of ACTs at the community level.

SUSTAINMENT

Activities implemented through or supported by PAMAFRO faced sustainment challenges following conclusion of the project in 2008. Though the program's activities aided a decline in malaria cases in Peru, with annual incidence dropping to <1 case/1,000 population in 2010 and 2011.[100] Attempts to integrate PAMAFRO into the MOH's activities were not successful and progress was not sustained following conclusion of this external funding.

Table 26. ACT Implementation Strategies and Outcomes

Implementation Outcome	Implementation Strategy	Evidence
Appropriateness	Data use for decision-making	(+) ACTs introduced in certain areas of the country selected based on emerging resistance data and effectiveness data of ACT regimens
Acceptability	Engagement of stakeholders and public during preparation phase	Not found
Feasibility	Data use to determine resistance and subsequent treatment change where needed (with no change in areas with no resistance) National treatment policy updated to include ACTs Training health care workers Procurement facilitated by PAMAFRO project	Not found
Effectiveness and Coverage (Reach)	Provision of ACT at the community level by *promotores*	Coverage data not available for review
Fidelity	Cascaded training and supervision	(-) Supply chain challenges to timely acquisition and treatment
Cost	Investment by MOH to purchase new ACTs	Not found

Sustainability	Incorporation into national policy Negotiations to reduce price	Not found
Equity	Community-level provision to improve access	Not found

4.2 Other Vaccine-Preventable Diseases

4.2.1 Measles Vaccination

Table 27. Measles Vaccination Unique Implementation Strategies

Additional Implementation Strategies
• Integration into existing system • Use of immunization campaigns including catch-up • Surveillance and response • Stakeholder engagement • Adoption of global guidelines and protocols • Community engagement and education • Leveraging partner and donor support • Free immunization services • HR strengthening   ○ Training

EXPLORATION

Peru's national immunization program was established in 1976. The measles vaccine was one of the immunizations initially included in the program's vaccine schedule and a single dose was given at 9 months.[85]

PREPARATION AND IMPLEMENTATION PRE-2000

The last measles epidemic in Peru took place in 1992, killing 347 people.[107] The same year, the MOH carried out a large measles campaign in Peru. This campaign targeted children from 6 months to 14 years of age and achieved 71% coverage. Two additional national-level follow-up campaigns were implemented in 1995 and 1997, with coverage of 96% and 97%, respectively.[108] In addition, the MOH responded to measles outbreaks using outbreak response immunization campaigns. These campaigns were used to successfully interrupt transmission during outbreaks and limited morbidity and mortality, particularly in areas with low measles vaccination coverage following national campaigns.[109]

The MOH aimed to eliminate measles and rubella by 2000, an effort that was supported by a strengthened surveillance program. This program's activities included 1) investigating and classifying suspected cases, 2) monitoring prevention and control measures against notified cases, and 3) avoiding introduction of imported cases. [108]

By 2000, coverage in children under 5 had dropped to 84% but the country had its last reported indigenous case of measles.[9]

IMPLEMENTATION POST-2000

Despite the last indigenous case of measles in Peru taking place in 2000, measles remained present in neighboring countries and movement of people between countries threatened to bring new outbreaks to Peru. Therefore, the MOH continued to aim for high vaccination coverage.[107]

In 2003, Peru replaced the measles vaccine with the measles, mumps, and rubella (MMR) vaccine into the routine immunization schedule after being urged by PAHO to eliminate rubella by 2003. The National Center for Epidemiology, Prevention, and Control of Diseases (NCEPCD) adopted PAHO's three-tiered vaccination strategy for measles in 2005. This strategy included:

1. Rapid interruption of measles virus circulation in a community through a one-time "catch-up" vaccination campaign targeting a wide age range of infants, children, and adolescents
2. Regular vaccination programs with a minimum coverage of 95% of each new birth cohort before the age of 2 in every district of the country
3. Use of follow-up campaigns for preschool-aged children every four years to address buildup of susceptible children.[110]

The following year, the FMOH launched the National Campaign to Eliminate Rubella and Congenital Rubella Syndrome (CRS). Though this campaign concentrated on elimination of rubella, it utilized the MMR vaccine and therefore improved protection against measles as well. This initiative aimed to vaccinate the entire susceptible population of the country in an ambitious period of five weeks (October and November 2006). It targeted 19.2 million people between the ages of 2 and 39 years living in 1,833 districts to receive the MMR vaccine. This large campaign cost $21.4 million, most of which was paid for by the MOH to purchase most of the vaccines and syringes. It was supported by many partners from local and international NGOs. Organizations such as PAHO/WHO, UNICEF, and the US CDC provided financial support and donated vaccines or syringes. Prior to the campaign's launch, the MOH worked with the National Immunization Health Strategy and its Technical Operating Committee to organize several training sessions. These sessions were intended to onboard all stakeholders involved in the campaign.

The campaign was officially launched in October 2006 and was divided into three phases. The first phase, which lasted four weeks, focused on vaccination using fixed vaccination locations. This phase also consisted of activities for campaign advertising and building partnerships with public and private institutions to build community acceptability and sustainability. The second phase was National Vaccination Day on October 29, 2006. A national decree required all Peruvians to stay in their homes to receive the vaccine. At the local level, immunization activities on this day were supervised by Regional Health Offices. These offices provided extensive support for activities, including guidance, logistical support, monitoring, and surveillance. The third and final phase of the campaign was referred to as "another opportunity" or "last opportunity." In this phase, strategies previously given less attention were changed and reinforced to meet the 95% target. Phase three ended on November 15th, concluding the entire campaign.[111]

The campaign's monitoring and evaluation was conducted by PAHO to ensure full impartiality and transparency over results. It found that over the course of the campaign, 20.1 million Peruvians between the

ages of 2 and 39 years received the vaccine. Since the vaccine was administered to over 800,000 more people than originally expected, the campaign achieved a coverage rate of 105.5%. The final process of verification, which allowed the country to be certified for elimination of rubella, found a final coverage of 98.2% and high coverage across the country – 96% of Regional Health Offices achieved a coverage rate over 95%.[111]

ADAPTATION

In addition to during campaigns, the MMR vaccine continued to be provided as part of Peru's routine immunization schedule for children under 5. In an important adaptation, Peru introduced the second dose of MMR into its immunization schedule in 2007. Following this change, children received the vaccine at 12 months then between 4 to 6 years. The timing of the second dose of MMR was changed to 18 months in 2013.[85]

A study conducted between 2011 and 2012 assessed national prevalence of antibodies against measles, rubella, and hepatitis B in Peruvian children between the ages of 1 and 4 years. It found a prevalence of antibodies against measles of 91.6%, reflecting high immunity in this age group nationally.[112]

In addition to Peru's ongoing immunization program featuring the MMR vaccine, it also used campaigns to prevent spread of possible measles cases brought into the country by travelers and to increase population demand and acceptability after a decline in coverage to 85% in 2013. Reflecting the strategy of surveillance followed by targeted campaign, in 2015, the MOH launched a prevention immunization campaign after three travelers to Lima were suspected of carrying measles. Immunization activities specifically targeted children under 5. Vaccination was available at all health facilities and the MOH also provided door-to-door services with free vaccination at home for a period of three weeks. A variety of community engagement and communication activities were used to raise public awareness of the campaign's efforts.

To address this slight drop in coverage, the MOH aired special radio and television broadcasts and health officials additionally visited public venues such as sports arena and markets to promote immunization services. In addition, the MOH used social media platforms to share information about measles prevention through infographics on Facebook and hashtags on Twitter.[113] Peru's coverage in measles vaccination recovered to 92% in 2015 following these activities.

SUSTAINMENT

Following the high measles vaccine coverage of 92% reported in 2015, Peru experienced challenges in maintaining this high coverage. Though coverage still remained fairly high after the study period, it declined to 88% in 2016, then to 83% in 2017.[114]

Table 28. Measles Vaccine Implementation Strategies and Outcomes

Implementation Outcome	Implementation Strategy	Evidence
Appropriateness		Measles outbreaks in nearby countries necessitated continued high coverage
Acceptability	Campaign promotion and community education, including through social media, television, and radio Free services	(+) High coverage achieved by campaigns
Feasibility	Partner and donor support to conduct large-scale campaigns Decentralization of campaign activities and across a broad range of vaccination sites National decree requiring residents to stay at home to receive immunizations Donor support	(+) Over 20 million people vaccinated over 4 weeks, surpassing target number (+) Ongoing vaccination coverage hovering around 90%
Effectiveness and Coverage (Reach)	Use of "catch up" campaigns Decentralization of campaign activities and across a broad range of vaccination sites and approaches 9schools, events, door-to-door) Integration of surveillance followed by targeted campaign	(+) Campaign coverage of 98%, with high coverage across regions (+) National coverage of 92% in 2015 (+) High national presence of antibodies against measles (92%) in 2011-12 study of children 1-4 years
Fidelity	Trainings prior to starting campaigns Supervision of local-level activities by regional health offices	Between 2009 and 2014, less than 30% of children in Loreto received the vaccine on time[115]
Cost		Not found
Sustainability	Ongoing immunization as part of routine services and follow-up campaigns for children every 4 years Building of partnerships with public and private institutions to improve sustainability	(-) Coverage dropped from 92% in 2015 to 83% in 2017
Equity	Immunizations provided free of charge	NA as coverage was >90%

4.3 HIV

4.3.1 Prevention of Mother to Child Transmission (PMTCT) of HIV and Antiretroviral Treatment for Infants and Children

Table 29. PMTCT and Antiretroviral Treatment Unique Implementation Strategies

Implementation Strategies
• Leveraging donor and partner support • Stakeholder engagement • Decentralization of PMTCT and antiretroviral (ART) services • Development of protocols and guidelines • Community engagement and education • Policy • Free service delivery

EXPLORATION

Prior to the study period, efforts to prevent vertical transmission of HIV in Peru were limited. Beginning in 1996, the MOH implemented prophylactic therapy with zidovudine in HIV-positive pregnant women. However, coverage was not widespread – the MOH estimated that only 100 women received prophylaxis each year. Implementation was particularly limited by poor coverage of timely diagnosis of HIV in pregnant women.[116]

The Peruvian MOH estimated that prior to large-scale national efforts in the area of prevention of mother-to-child transmission (PMTCT), the likelihood of transmission of HIV from an infected mother to her child was 30%.[117] In 2002, the MOH estimated that 0.3% of pregnant women in Peru were HIV-positive.

PREPARATION

The MOH formed a technical commission in May 2002 to explore the possibility of submitting a second proposal to the Global Fund following rejection of the country's first submission. The commission recommended that the proposal process be carried out with participation from multisectoral organizations already addressing HIV, tuberculosis (TB), and malaria. It held a series of meetings attended by various stakeholders, including civil society groups, related to the proposal.

In September 2002, the Government of Peru submitted the proposal for HIV/AIDS and TB. As part of this proposal, the MOH established a goal of maintaining and/or decreasing the prevalence of HIV by 2007. In particular, decreasing vertical transmission of HIV to less than 8% was a specific objective provided by the MOH. It anticipated that within the five-year period of implementation of the proposed activities, 400,000 pregnant women attending ANC would access voluntary screening for HIV. This planned expansion of HIV testing during pregnancy was anticipated to improve coverage from 30% to 85% of pregnant women attending ANC. In addition, it planned to introduce testing at the time of delivery for women who did not attend any ANC visits. To achieve increased coverage of testing, the MOH intended to introduce rapid tests in health facilities. Pregnant women diagnosed with HIV during pregnancy would receive ART and would be

provided with artificial milk by the MOH for the child's first six months of life. These activities were to be supported by the government's partners such as CARE Peru.[116] As a result of this proposal, the Global Fund granted Peru $6.5 million in support for HIV and TB activities in 2003.[118]

IMPLEMENTATION

Beginning in 2004, the government began to focus increasingly on implementation of activities for PMTCT with support from the Global Fund.

The government passed law 28243 in 2004, making HIV testing obligatory for pregnant women in Peru.[117] The MOH soon began to offer rapid on-site testing as part of ANC. Prior to introduction of rapid tests, access to screening was limited and delays in confirming diagnoses and initiating treatment were common. A KI explained that introduction of rapid tests was a key step in scaling up PMTCT efforts in Peru, stating that it *"marked a milestone in terms of being able to improve access to the screening of pregnant women, which was the first step in being able to intervene."*

In 2005, the MOH began to provide **free ART** with support from the Global Fund. Implementation of free ART in Peru included ART prophylaxis for infected pregnant women as well as treatment for children. ART in Peru was initially only offered at well-equipped hospitals in large cities, restricting access to these services. Access to treatment improved due to decentralization of treatment beginning in 2002.[118] Following this change, treatment was also offered at maternal and child health facilities free of charge.

Peru also began distribution of formula for infants to decrease breastfeeding. Through Comprehensive Health Insurance (Seguro Integral de Salud – SIS), the government supplied formula free of charge to infants born to HIV-positive mothers for the first six months of life. However, implementation of formula was challenging in some areas such as the Amazon due to strong cultural preferences for breastfeeding and limited access to clean and safe water for formula preparation.

Delivery via Caesarean section was also implemented in Peru to prevent vertical transmission. A KI noted that this aspect of PMTCT was particularly difficult to implement as some health care providers were *"unlikely to intervene with pregnant women living with HIV"* and referral to facilities offering surgical services was required for access to C-sections. In addition, acceptability of this intervention was low in indigenous communities.

In 2005, the MOH developed and enacted new guidelines to guide these activities – including testing of HIV in pregnant women, ART prophylaxis, and clinical management of HIV-exposed newborns and their mothers.

In 2010, the MOH worked with UNICEF Peru and UNAIDS to create the National Plan for the Elimination of Mother-to-Child Transmission (MTCT) of HIV/AIDS. It collaborated with UNICEF to first implement the plan in two regions (Latin America and Caribbean). As part of this effort, the MOH established two laboratory services in the Amazon region to facilitate timely diagnosis and treatment of pregnant women to prevent MTCT.[119]

A communication strategy developed by UNICEF Peru and financed by the MOH supported PMTCT activities. This strategy aimed to improve HIV-related knowledge of indigenous populations and reduce the discrimination against pregnant women and other people infected with HIV. Implementation of the strategy included behavior change communication on water, hygiene, how to prepare meals, and communicable disease prevention.[120]

ADAPTATION

In 2007, Peru began using Polymerase Chain Reaction (PCR) tests for early diagnosis of infants. Following introduction of testing, infants exposed to HIV were to be tested within their first 18 months of life.[117] While use of dry blood spots for PCR and processing at the central level allows samples to be taken in remote areas, a KI explained that difficulties in sample collection remain a challenge to achieving coverage of timely infant diagnosis.

Beginning in 2008, the MOH adapted its HIV screening approach to target women of childbearing age prior to pregnancy as part of national family planning initiatives. This approach facilitated testing of over 2 million women in Peru, increasing the coverage of HIV testing in of childbearing age women from only 12% in 2000 to 50% in 2012.

Screening of pregnant women also improved impressively, likely due to the introduction and scale of rapid tests in Peru, from 23% of pregnant women in 2000 to 80% by 2011. However, coverage varied over the study period as well as at the regional level due to recurring shortages in rapid testing kits and reagents used for PCR testing.[117]

This improvement in coverage of screening was accompanied by progress in ARV coverage for pregnant women. The proportion of HIV-positive pregnant women who received ARV for prophylaxis or treatment in MOH-run facilities reached 92% by 2010. Coverage of ARV treatment in pregnant women increased from 20% in 2000 to 59% in 2012. By 2015, UNAIDS estimated 65% of pregnant HIV-positive women received ARVs (increased to 85% by 2018), although MTCT rates remained high at 15.9% in 2015 with a drop to 10.9% by 2018, after the study period.[117]

Despite progress in coverage of screening and ART in pregnant women and subsequent reduction of MTCT, both testing of children born to HIV-positive mothers and treatment of HIV-positive children lagged far behind. In 2011, five years after introduction of PCR testing for infants, only 10% of exposed infants were tested within two months of birth. Treatment of diagnosed children also remained low at about 18% in 2013. The total number of infected children in the country reported by diagnostic and laboratory services dropped from 5,600 in 2000 to 3,200 in 2012. However, this decline may be at least partially related to reduced screening coverage during this period rather than solely a drop in pediatric cases.

SUSTAINABILITY

Though screening of pregnant women improved drastically during the study period, sustainment of this progress was a challenge beginning in 2012 due to issues with reimbursement of labs. Regional labs are available for processing of tests, but have little incentive to do this since SIS reimburses the hospitals these labs are part of rather than the labs themselves.[118]

Table 30. PMTCT Implementation Strategies and Outcomes

Implementation Outcome	Implementation Strategy	Evidence
Appropriateness		Low coverage of prophylaxis in pregnant women prior to study period
Acceptability	Communication strategy to improve knowledge and decrease stigma and discrimination in pregnant women.	(-) Remaining acceptability challenges for some PMTCT interventions like C-sections and formula feeding
Feasibility	Leveraging Global Fund and partner support Decentralization of services to scale PMTCT Introduction of rapid tests for screening	(+) Expansion of PMTCT services
Effectiveness and Coverage (Reach)	Decentralization of testing and treatment services Policy making testing of pregnant women obligatory Adaptation of screening approach to include all women of childbearing age	(+/-) Improved coverage of screening and treatment of pregnant women, but low coverage of testing for exposed infants and pediatric antiretroviral therapy (ART) UNAIDS estimated 65% of pregnant HIV women received ARVs in 2015 (increased to 85% by 2018) (+) Estimated MTCT from UNAIDS was 19% in 2009, declining to 15.9% in 2015 and 10.9% by 2018[121]
Fidelity		(-) Stock-outs of rapid tests and PCR reagents affect testing coverage
Cost		Not found
Sustainability		(-) Challenges maintaining coverage of testing
Equity	Free ART	Not found

4.5 Nutrition

4.5.1 Vitamin A

Table 31.Vitamin A Implementation Strategies and Outcomes

Implementation Strategies
• Leveraging partner support • Stakeholder engagement • Pilot testing

- Integration into and leveraging of existing systems
- Development of protocols and guidelines
- Community engagement and education
- Data use
- For prioritization
- Focus on equity
- Free service delivery

EXPLORATION

The Good Start in Life program, a collaboration between the government, USAID, and UNICEF, began in 1999 and was implemented until 2004 in four regions of Peru (Cusco, Cajamarca, Apurimac, and Loreto). This broad program, which aimed to address chronic malnutrition in children under 3, also monitored vitamin A deficiency and provided supplementation for children under 5 twice a year. The program reached 75,000 children under 3 by 2004. A program evaluation found that the rate of vitamin A deficiency decreased from 30.4% in 2000 to 5.3% in 2005.[122]

UNICEF estimated that between 2001 and 2003, only 6% of children in Peru received at least one high-dose vitamin A supplement per year. An estimated 17% of children under 6 had a sub-clinical vitamin A deficiency.[123]

PREPARATION

Beginning in 2009, the MOH and Ministry of Women and Vulnerable Populations worked with UNICEF and the World Food Programme to pilot a program of multi-micronutrient supplementation called *chispitas* ("sparkles") in order to prevent and control micronutrient deficiencies in young children. They implemented a small-scale study of administration of *chispitas* in three regions (Apurimac, Ayacucho, and Huancavelica). The *Chispitas* Pilot Project of Supplementation of Multi-Micronutrients was introduced in December 2009 and targeted children between the ages of 6 and 35 months. In alignment with international recommendations, children receiving care at MOH and Social Security facilities were provided with 15 sachets of *chispitas* each month for a period of two six-months cycles with a six-month resting period between cycles. This formula, which was intended to be consumed daily, contained:

- 12.5 mg iron as ferrous fumarate
- 5 mg zinc
- 9999 IU vitamin A
- 0.16 mg folic acid

Sachets were distributed through the Control of Growth & Development (CRED) program. Health workers who provided the sachets to families were trained to advise on correct consumption of *chispitas*.

The program initially reached around 100,000 children in the three regions of implementation. A surveillance study of 759 children who received *chispitas* in the three regions, which focused primarily on the program's effect on anemia, found adherence to supplementation to be more than 90%.[124]

Another study was conducted in 2010 to assess implementation in the Apurimac region and identified adherence issues. This study found that almost half of children consumed *chispitas* adequately and the taste of the powder led many children to not finish their meals and therefore not consume enough micronutrient powder.[125]

IMPLEMENTATION

Chispitas was soon scaled by the MOH as an area of focus of the Nutriwawa program. In addition to capacity building for health professionals, Nutriwawa implemented communication strategies to support reduction of chronic malnutrition and prevention of anemia in children under 3 years of age across Peru. Communication activities included community education, which advised families on how to prepare *chispitas* micronutrients. By 2014, Nutriwawa was implemented in all regions of the country, with scale-up prioritizing areas with high rates of anemia and chronic childhood malnutrition.[126]

Though *chispitas* scaled across Peru as part of the Nutriwawa program, a study conducted from 2013 to 2015 in the district of Nuñoa in Puno found challenges with utilization of the multi-micronutrient powder. It reported that *chispitas* were unpopular among mothers since infants often have diarrhea upon introduction. While staff at health centers instructed mothers that this is normal and *chispitas* should be continued in spite of diarrhea episodes, mothers often discontinued administration of the powder following incidence of diarrhea. Mothers participating in the study also reported that their children did not like the taste of the powder and refused to eat food containing it.[127]

The *Juntos* ("Together") national program, another national program related to vitamin A supplementation, was launched by the government in 2005 as the first conditional transfer or direct subsidy program implemented in Peru, described in further detail in the Introduction. For children under 5, vitamin A supplementation was included as a condition for receiving payment. In cases of noncompliance with the various requirements of the transfer, transfers would be suspended for three months or indefinitely for repeated non-compliance.[51] *Juntos* was first implemented in 70 districts of the country in 2005 and expanded the following year with broadened scope in previous implementation areas as well as 251 new districts. An additional expansion in 2007 covered another 247 districts.[128] A 2009 study found that intensity of use of health services increased for children under 5 from beneficiary households. These children were 37 percentage points more likely to receive health checks, at which vitamin A supplementation was provided.[129] By 2016, after the study period, *Juntos* covered 663,000 households in 1,247 of Peru's 1,828 districts. At the time, this coverage included over 1.6 million children and adolescents.[128]

In 2014, the MOH released a national plan for reduction of chronic malnutrition for the period of 2014 to 2016, which included supplementation with multi-micronutrients in children under 36 months of age. It established that all children in this age range attending public health facilities would receive multi-micronutrient supplements free of charge. Specifically, the directive instructed that children older than 6 months of age receive one envelope of multi-micronutrients per day for 12 consecutive months. It aimed to improve coverage of children between 6 and 35 months receiving supplementation with multi-micronutrients to reach 95% by 2016.

DHS surveys conducted between 2004 and 2016 showed fluctuating coverage of children under 5 receiving vitamin A supplementation in the six months preceding the survey. Coverage was low but varying in each survey, ranging from 9.1% in 2010 to 3.1% in 2012. Overall, these surveys did not indicate significant or sustained improvement in coverage over the study period. The 2014 DHS reported that children under 5 years living in rural areas (7.4%) were more likely than those in urban areas (3.7%) to receive vitamin A supplementation.[9]

Reflecting the low coverage of supplementation in Peru, a 2009 WHO assessment of global prevalence of vitamin A deficiency in at-risk populations categorized vitamin A deficiency of preschool-aged children in Peru as a moderate public health problem. It estimated that between 1995 and 2005, 15% of children in this age group had serum retinol levels of less than 0.70 μmol/L, indicating vitamin A deficiency.[130]

ADAPTATION

Not found

SUSTAINMENT

A KI expressed that consistently low coverage of vitamin A supplementation in Peru reflects low levels of prioritization and attention given to the intervention:

> *"[It] has always been part of the interventions that should be implemented, but it has never been given the level of importance that it should have at the Ministry of Health or at the local level, and the coverages so are ridiculous. For example, that is an intervention that I can consider to be substantial to reduce mortality but in Peru you realize that it has always had minimal coverage."*

Table 32. Vitamin A Implementation Strategies and Outcomes

Implementation Outcome	Implementation Strategy	Evidence
Appropriateness		Estimated 17% of children under 6 in Peru had sub-clinical vitamin deficiency in early part of study period[123]
Acceptability	Community engagement and education activities Free provision	(-) Acceptability issues of *chispitas* powder due to diarrhea incidence and poor taste affected adherence
Feasibility	Integration of vitamin A supplementation into *chispitas* powder, Nutriwawa, and Juntos programs, with administration at facilities through existing CRED program	(+) Scaled to all regions
Effectiveness and Coverage (Reach)	National scale up of Nutriwawa and Juntos programs facilitating supplementation Distribution of *chispitas* at health facilities	(-) Low coverage of vitamin A supplementation throughout study period
Fidelity		(-) Challenges in adherence to *chispitas*

Cost		Not found
Sustainability		Not found
Equity	Free provision Focus on equity	(+) Scale-up of Nutriwawa and *chispitas* prioritized areas with high rates of childhood anemia and chronic malnutrition

4.6 Neonatal Interventions

4.6.1 Improving Antenatal Care Services, Access, and Uptake

4.6.1.1 Improving Access to Antenatal Care (ANC)

Table 33. ANC Key Implementation Strategies

Implementation Strategies
• Development of protocols and guidelines • Pilot testing and rapid scale (Juntos program) • HR strengthening (training) • Free services, with focus on equity • Integration into poverty reduction scheme • Community-based monitoring and support

EXPLORATION

In 2002, the WHO recommended a "focused" approach to ANC in order to improve quality of ANC and increase coverage of ANC. This model featured four ANC visits during pregnancy.[131] At that time, about two-thirds of mothers attended at least four ANC visits (ANC4+) in Peru (DHS). The 2000 DHS reported that 69% of women who had a live birth in the previous five years attended at least four visits and 84% attended at least one. However, 16% of women did not receive any antenatal visits during pregnancy. Women living in rural areas were more likely to have no ANC – 27% compared to only 7% in urban areas. They were also much less likely (54%) than those in urban areas (81%) to attend at least four visits. Of women that did receive ANC as reported in 2000, the majority received key components of ANC such as education about signs of complications (76%), weight measured (97%), blood pressure measured (97%), urine sample taken (69%), and blood sample taken (67%).[9]

PREPARATION

Though the WHO recommends the focused approach to ANC including at least four visits, Peru utilized a model of at least six visits during the study period. The MOH released its Protocol for Attention to Maternal and Newborn Health in 2004. These guidelines recommend pregnant women attend at least six ANC visits. At each visit, they should be examined by either a physician or obstetrician at specialized facilities or a nurse, sanitary inspector, or *laborist* at health posts. Low-risk pregnant women were to receive six ANC visits, while those considered to be a high risk would receive eight.[132]

After considering international evidence showing the effectiveness of a four-visit schedule, Peru began to explore modifying the national standard to include fewer visits. The MOH conducted a survey across all regions of Peru and found that "*professionals thought that with more prenatal care it justified their work, they thought that they were going to give better care*." A national technical meeting attended by representatives from all regions determined that switching to a schedule to only four visits would not be successful in Peru and therefore the standard of six visits for most pregnancies remained.

IMPLEMENTATION

The MOH began implementing its national sexual and reproductive health strategy in 2004. It conducted national-level training on three areas – the prenatal care model including the six (or eight) visits, facility-based delivery, and emergency obstetric care (EmOC). Community strategies were also utilized, including monitoring and follow-up of pregnant women, to ensure women attended all recommended ANC visits.

The Juntos program, formally known as the National Program of Direct Support to the Poorest, was created in April 2005 by the Supreme Decree No 032-2005-PCM.[133] The program was created to distribute direct conditional cash transfers to the poorest families in Peru to reduce poverty in the country. As a long-term goal, it also aimed to interrupt intergenerational transmission of poverty through improved access to education and health services. Law No 28562 was passed in 2005 to provide 120 million Peruvian nuevo soles (nearly US$37 million) for implementation of the program's initial pilot phase.

Juntos was first piloted in 110 districts of the Huancavelica, Ayacucho, Apurimac, and Huanuco regions beginning in September 2005. Pregnant women participating in Juntos specifically were required to attend ANC visits in alignment with the national protocol – at least six visits. Compliance with Juntos requirements was directly verified by health care providers and monitored by the program's field staff at bimonthly health center visits. Households who did not meet their specific requirements for cash transfer, including attending ANC as applicable, were considered ineligible to receive the transfer for three months. Juntos entered an expansion stage in 2006, increasing its coverage to 210 new districts in the original four regions and five additional ones (Puno, Cajamarca, La Libertad, Junin, and Ancash).[51] Only one year later, the MOH approved another significant expansion to another 247 districts.[128] The Juntos program continued to expand rapidly. By 2013, Juntos was implemented in more than 1,000 municipalities comprising about 60% of Peru's total area.[134] It reached all municipalities classified as poor by 2015.[129]

The MOH created a national intervention plan for maternal health care, which guided efforts to implement six or more Antenatal Care Visits (ANC6+) in Peru from 2009 to 2015. In addition to encouraging Juntos beneficiaries to attend ANC visits as a condition of the cash transfer, the government also included ANC services in the national health insurance system (SIS). This system covered six or more ANC visits (including home visits) for those covered by SIS. In addition, it covered services received as part of ANC, including complete laboratory screenings, two ultrasounds, and preventive treatment with iron sulfate. To ensure women attended ANC with qualified staff, SIS did not cover ANC performed by providers not considered to be qualified by the program.[135]

An independent evaluation of the Juntos program conducted in 2017 utilizing DHS data from 2000 to 2014 found that eligible women exposed to the Juntos program during their most recent pregnancy were 7.7% more likely to attending ANC within their first trimester, 2.9% more likely to attend an ANC visit and 3.8 % more likely to attend ANC4+ visits. In addition, women exposed to Juntos attended on average 0.31 more ANC visits and were 7.7 percentage points more likely to attend ANC within the first trimester.[134]

The 2012 DHS reported improvement of ANC in Peru. Overall an impressive 94% of women attended at least four visits and only 2% did not attend any antenatal visits. Seventy-four percent attended their first antenatal visit within the first trimester (versus 57% in 2000). Equity plots (Figures 21 and 22) show that the equity gap between wealth quintiles dramatically decreased over the study period. By 2016, very little difference in equity between quintiles 2, 3, 4, and 5 persisted, though coverage of receiving any ANC in the poorest wealth quintile in Peru did continue to lag behind all others. Other disparities also remained. Overall, women in urban areas (99%) were more likely to receive ANC from a skilled provider than those in rural areas (90%). Similarly, they were more likely to attend at least four ANC visits (96% versus 91% of those in rural areas). Regional coverage of ANC from a skilled provider was even more variable – women in Amazonas and Loreto (79%) were least likely to receive ANC while coverage was highest in Huanuco and Arequipa (100%).[9]

Though coverage of ANC is high in Peru, a KI expressed concerns over the quality of care being provided at these visits, stating *"prenatal checks, for example, are not good quality. There has been an effort to improve this, but it has not yet been achieved. Just because you have eight prenatal checkups doesn't necessarily mean you've solved the maternal health problem."*

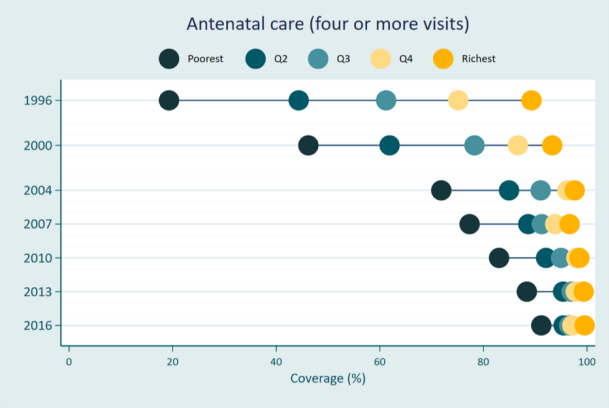

Figure 21. Equity of Coverage of ANC4+ in Peru by Wealth Quintile, 1996-2016 (Source: Victora et al, 2018)

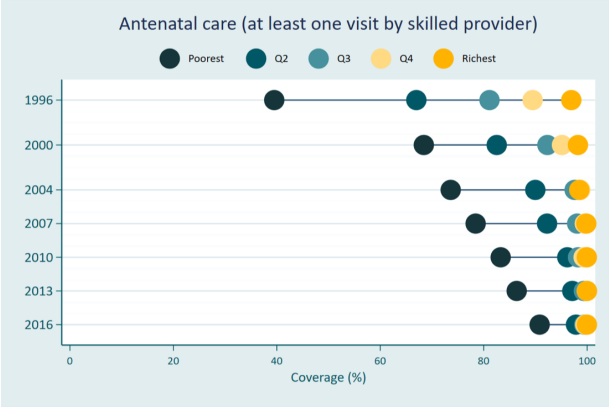

Figure 22. Equity of Coverage of Any ANC in Peru by Wealth

ADAPTATION

Not found

SUSTAINMENT

Peru's national implementation plan guiding maternal health activities ended in 2015. However, a new implementation plan covering post-2015 had not been released at the time of case study development in 2019.

Table 34. ANC Implementation Strategies and Outcomes

Implementation Outcome	Implementation Strategy	Evidence
Appropriateness		16% of mothers did not receive any ANC per 2000 DHS
Acceptability	Inclusion as a condition of receiving Juntos transfers for pregnant women Coverage of 6 ANC visits under SIS	Not found
Feasibility	Integration of ANC into Juntos as a condition for cash transfers	Not found
Effectiveness and Coverage (Reach)	Free ANC services	(+) Per DHS, ANC4+ coverage increased from 69% in 2000 to 94% in 2014 (-) Lower coverage of ANC in some regions (+) High coverage of Juntos program, reaching all municipalities classified by poor by 2015
Fidelity	Training health care providers Juntos program monitoring to ensure ANC was received from skilled providers	(-) Quality issues expressed by KIs despite high coverage
Cost		Not found
Sustainability		Not found
Equity	Coverage under programs (Juntos and SIS) covering low-income populations	(+) Decline in equity gap in coverage of ANC

4.6.1.2 Maternal Tetanus Toxoid Vaccination

Table 35. Maternal Tetanus Vaccination Key Implementation Strategies

Implementation Strategies

• Policy
• Community engagement
• Other stakeholder engagement
• Community education and PSAs
• Cultural adaptation of services
• Focus on quality
• Ensuring financial access
  ○ Free service provision
  ○ Insurance targeting U5 children and women

- HR strengthening
    - Training
- Improved geographic access to facilities
- Leveraging partner support
- Data use for planning and adaptation
    - Formative evaluation before implementing
- Adaptation
- Focus on equity

EXPLORATION

In 1988, the WHO estimated that 787,000 newborns globally died due to neonatal tetanus. The following year, the World Health Assembly (WHA) first called for elimination of neonatal tetanus by 1995.

PREPARATION AND IMPLEMENTATION PRE-2000

Maternal tetanus toxoid (TT) immunization in Peru began before 1990 under the National Plan for Children. Pregnant women received free immunization services provided by obstetric providers in the second and third trimesters of pregnancy, though compliance in pregnant women was below 50%.[136] Despite available services, coverage remained low in the early 1990s. High-risk areas of the country (about 205 of 1,812 districts) were identified and targeted for immunization activities between 1993 to 1995. As a result of these successful efforts, TT2 coverage in pregnant women increased from 16.6% in 1994 to 52% in 1995.[137]

The Peruvian government aimed to eliminate neonatal tetanus by 2000 and the number of tetanus cases in neonates steadily decreased in the 1990s. In 1992, 140 cases of neonatal tetanus were reported in Peru. Though the goal to eliminate neonatal tetanus by 2000 was not reached, the number of reported cases dramatically decreased to 10 by that same year.[138]

IHME estimated that in 2000, there were 7.14 neonatal deaths due to tetanus per 100,000 newborns born in Peru.[139] The same year, the DHS reported that a quarter (25%) of women who had given birth in the previous three years did not receive any TT injections during pregnancy. Women living in in Ica (87%) were most likely to receive at least one injection, while those in La Libertad (62%) were least likely.[9]

IMPLEMENTATION POST-2000

The 2011 National Vaccination Scheme included the provision of free TT immunization for both pregnant women and women of childbearing age. This was a change in strategy to target women before they became pregnant and under this plan, women of childbearing age would receive three doses of the vaccine, at first contact with health services following turning 10 years old, then two months and six months after receiving the first dose. Pregnant women also received two doses, which were given at the first contact with health services during pregnancy and then two months later. This plan also set targets for coverage of TT immunization of at least 15% of the population of women of childbearing age between 10 and 15 years and 5% of those between 15 and 49 years. Meanwhile, it established a target of 100% coverage of pregnant women.[140] In addition to TT during pregnancy, targets and tracking of tetanus protection at birth for infants

(defined as the mother receiving TT2+ during pregnancy, TT3+ within five years of birth, or TT4+) were prioritized.[141] The percentage of tetanus protection at birth increased from 70% in 2004 to 75% in 2012 as shown in Figure 23.[9]

The DHS reported that in 2012, TT2+ coverage during pregnancy remained basically unchanged from 2000 at 56%. While urban vs rural coverage was quite similar at 55% and 49%, respectively, the survey found notable regional differences. TT2+ coverage ranged from 25% in Tacna to 71% in Tumbes. However, tetanus protection at birth was much higher at 73%. Regional differences for protection at birth still existed between 55% in Madre de Dios and 89% in Tumbes.[9]

Despite the inclusion of the TT vaccine for women of childbearing age and pregnant women in the National Immunization Scheme, the Civic Voices NGO estimated incomplete coverage of both target populations. For women of childbearing age, it estimated that 1,000,582 women were protected, but an estimated 4,753,839 women in this population group were not vaccinated against tetanus from 2012 to 2015. During the same time period, 657,598 pregnant women were protected with two doses of the vaccine and 1,077,928 remained unvaccinated.[142]

ADAPTATION

Due to efforts to improve centralization of all immunization activities, TT injections were no longer provided at obstetric offices. As a result, coverage of the vaccine declined as pregnant women were forced to seek the vaccine outside of ANC visits. To address this challenge, the MOH began to implement TT immunization campaigns on a yearly basis to ensure coverage of all pregnant women. In addition, some health facilities began to offer the vaccine in obstetric consultancy rooms to improve uptake, though this practice occurred only at individual facilities rather than at the national level.

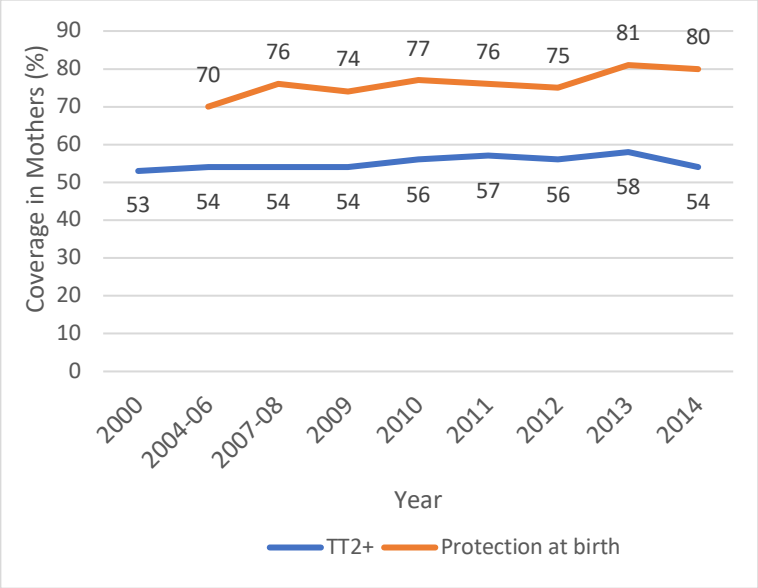

Figure 23. Coverage of 2+ Tetanus Toxoid Injections During Pregnancy and Protection at Birth, 2000-2014 (Source: DHS)

SUSTAINMENT

The 2014 DHS reported that although just over half (54%) of mothers received at least two TT injections during their last pregnancy, 80% of mothers' last birth were protected against tetanus due to immunization prior to pregnancy. Though the proportion of mothers whose last birth was protected against tetanus increased from 70% in 2004-06, little to no change in the coverage of receiving at least two tetanus toxoid injections during pregnancy was reported (see Figure 23). This low coverage of TT2+ during pregnancy and

fairly high coverage of protection at birth is likely a result of TT provision outside of ANC for women of childbearing age prior to pregnancy and continued focus on immunization of this population group.

Despite challenges in uptake of TT during ANC related to the change in provision but potentially reflecting the increase in protection, neonatal tetanus outcomes continued to improve in Peru across the study period. As shown in Figure 24, neonatal mortality caused by tetanus dropped impressively from 7.14/100,000 newborns in 2000 to 0.85/100,000 newborns in 2015. However, this drop may also be due to other efforts such as clean delivery practices and facility-based delivery.

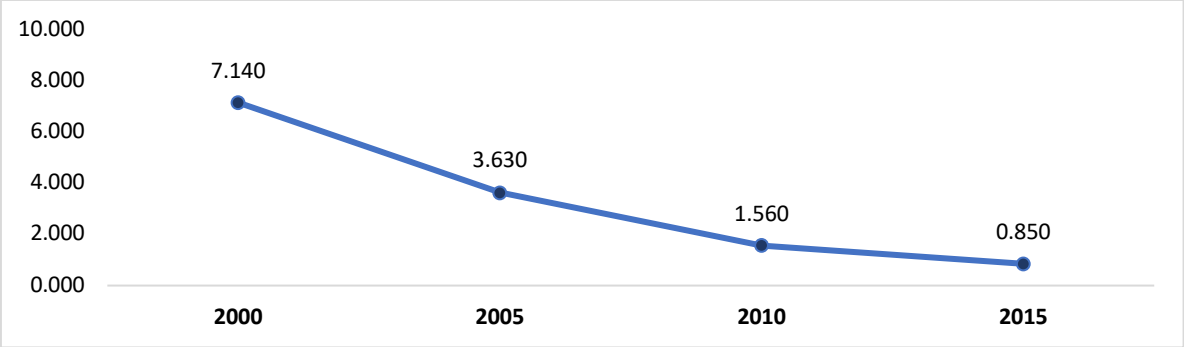

Figure 24. Neonatal mortality due to tetanus in Peru (per 100,000 newborns), Source: IHME

Table 36. Maternal Tetanus Vaccination Implementation Strategies and Outcomes

Implementation Outcome	Implementation Strategy	Evidence
Appropriateness	Ongoing cases of neonatal tetanus and gaps in coverage and protection at birth	Low coverage at start of study period (53%)
Acceptability	Free immunization services	(-) Challenges in uptake due adaptation requiring women to seek immunization services outside standard ANC. A KI said: *"… the coverage rates have always been very low…. it was … administered in the obstetrics office … as time passed, everything … relating to immunization should rather be centralized, so they no longer allowed the vaccine to be administered in the obstetrics office… when we have done an analysis … the coverage rates … reduced because the pregnant woman simply does not want to go to queue … for the vaccinations and she leaves. And so, they didn't get the vaccine anymore."*
Feasibility	TT immunization campaigns	Provision to women of childbearing age as well as pregnant women
Effectiveness and Coverage (Reach)	Immunization targeting both pregnant women and those of childbearing age Integrated into routine health care visits for young girls and women of childbearing age	(+/-) High coverage of protection at birth per DHS (80% in 2014), but lower coverage of TT2+ during pregnancy (54% in 2014) with static rates throughout the study period (+) Decline in neonatal mortality due to tetanus over the study period – from 7.14/100,000 newborns to 0.85/100,000 newborns (though

	Yearly TT campaigns in response to low coverage	this can also be due to clean cord care and better childbirth practices)
Fidelity		Not found
Cost		Not found
Sustainability	Inclusion in National Vaccination Scheme	Not found
Equity	Free immunization services in public sector	Remaining regional differences in protection at birth

4.6.1.3 Folic Acid Supplementation

Table 37. Folic Acid Supplementation Implementation Strategies

Implementation Strategies
• Data use • Policy

EXPLORATION

Inadequate folic acid intake may lead to neural tube defects, a cause of neonatal mortality. Though supplementation with iron and folic acid during pregnancy is recommended, neural tube defects often occur within the first month of pregnancy, during which many pregnancies are still undetected. Therefore, some countries opt to fortify foods such as flour with folic acid.

In 2000, congenital birth defects led to 12.5% of deaths among neonates within seven days of birth in Peru.[139] A study conducted in at the National Institute of Maternal and Perinatal Care in Lima between 2001 and 2005 found that the incidence rate of neural tube defects was 13.6/10,000.

PREPARATION

In order to decrease micronutrient deficiencies in the population of Peru and reduce prevalence of neural tube defects, the MOH and Peruvian National Institutes of Health promoted establishing a policy to fortify wheat flour with folic acid as well as other micronutrients. In August 2005, legislators ratified Law 28314 which required fortification of flour with 1.2 mg of folic acid, iron, and other micronutrients per kilogram. The government expected that fortification would reach 100% coverage within one year and lead to a 25% decrease in neural tube defects in Peru.[143]

IMPLEMENTATION

A continuation of the earlier study of neural tube defects at the National Institute of Maternal and Perinatal Care found that in the period of 2006 to 2010, the incidence of neural tube defects decreased to 8.7/10,000. This change represented a decrease of 4.9/10,000.[144]

However, a study evaluating the impact of fortification in three cities in Peru's natural regions (jungle, highlands, and coast) found different results. Using data from three hospitals during periods before (2001-

2005) and after (2006-2010) implementation of Law 28314, the study found the prevalence of neural tube defects decreased from 12.1/10,000 to 10.1/10,000. Unlike the study in Lima, it did not report any statistically significant differences before and after fortification.[145]

Though policy required flour to be fortified with 1.2 mg of folic acid per kilogram, a 2012 study found that fortification levels were typically higher in bread purchased in Peru. All six bread samples tested with folic acid assays met the legally required levels of folic acid. Folic acid levels ranged from 1.21 mg/kg to 2.19 mg/kg, with an average of 1.78 mg/kg. Though the samples showed compliance with Law 28314, all were still below the WHO recommended fortification level of 2.6 mg/kg. Again, this study estimated the impact of the fortification program on neural tube defects in Lima and unlike the other studies found no significant difference in prevalence when comparing the periods before and after fortification.[143]

ADAPTATION

Not found

SUSTAINMENT

Law 28314 remains in place in Peru, resulting in ongoing, compulsory fortification of all wheat flour in the country.

Table 38. Folic Acid Supplementation Implementation Strategies and Outcomes

Implementation Outcome	Implementation Strategy	Evidence
Appropriateness	Data use for decision-making	Study conducted 2001-2005 found that the incidence rate of neural tube defects was 13.6/10,000 Flour fortification anticipated to lead to 25% decrease in neural tube defects
Feasibility	Law required fortification of all flour with folic acid and other micronutrients	Not found
Effectiveness and Coverage (Reach)	Compulsory fortification	(+) Decrease in incidence of neural tube defects in Peru by 4.9/10,000 following fortification, though reduction not reported by all studies
Fidelity		(+) Study of folic acid levels in bread purchased in Peru found all bread had levels higher than legally required
Cost		Not found
Sustainability	Fortification law remains in place, resulting in ongoing fortification	Not found
Equity		Not found

4.6.2 Improving Facility-Based Childbirth Delivery Services and Skilled Birth Attendance, Access, and Uptake

4.6.2.1 Facility-Based Delivery

Table 39. Facility-Based Delivery Implementation Strategies

Implementation Strategies

• Policy
• Community engagement
  ○ Other stakeholder engagement
• Community education and PSAs
• Cultural adaptation of services
• Focus on quality
• Ensuring financial access
  ○ Free service provision
  ○ Insurance targeting U5 children and women
• HR strengthening
  ○ Training
• Improved geographic access to facilities
• Leveraging partner support
• Data use for planning and adaptation
  ○ Formative evaluation before implementing
• Adaptation
• Focus on equity

EXPLORATION

The 1996 DHS found that just half of live births in the previous five years in Peru occurred at a health facility. The survey reported notable differences based on residence type and region. While nearly three-quarters (73%) of deliveries in urban areas took place at a facility, only 15% of those in rural areas did. Regional proportions of deliveries taking place at a facility also ranged very widely from only 7% in Huancavelica to 87% in Ica and Lima. Women who completed higher level education were more than three times as likely (87%) as those with only primary level education to delivery at a facility.[9]

PREPARATION

To address the above low rates of institutional delivery in Peru, the MOH implemented new policies and programs targeting supply and demand to improve access to facilities and encourage women to deliver at health facilities.

The MOH launched the USAID-funded Proyecto 2000 program in 1996. This program implemented by a group of MOH experts and external consultants sought to increase rates of delivery in public EmOC facilities by making services offered at the facilities more culturally acceptable, high quality, and "woman-friendly." Health facilities were considered woman-friendly if they 1) were easily accessible and convenient to use, 2)

offered high-quality services, 3) incorporated local cultural beliefs and social norms into treatment protocols, and 4) guaranteed confidentiality, shared information, and respected patient choices.

To inform implementation of the Proyecto 2000 program, members of the implementation team and regional MOH educators conducted a qualitative baseline study on mothers' perceptions and preferences related to childbirth.

IMPLEMENTATION

Utilizing data from the above baseline study, Proyecto 2000 launched a Safe Motherhood multimedia campaign to increase demand. This campaign used mass media, health education, and social mobilization activities to encourage women to deliver in the nearest public EmOC facility. To support these activities, the program trained nearly 3,700 community-based traditional birth attendants known as promotoras. Staff at EmOC facilities also formally engaged with community health committees to promote institutional delivery. Following the campaign, Proyecto 2000 further focused on improving both the proportion of births taking place by improving quality of services at public EmOC facilities. It began in 1996, targeting facilities in the 12 of the country's 25 departments with the highest rates of maternal mortality. Program inputs at these 89 facilities included physical improvements, training of over 400 health care providers, incorporation of local birthing practices into facilities' clinical protocols, and introduction of a continuous quality of care model. In 1998, the program conducted a mid-line evaluation, which found that mothers receiving care at intervention facilities were more knowledgeable about pregnancy, more satisfied with their care experience, and also more likely to deliver in that same facility than mothers who received at non-Proyecto 2000 facilities. However, by 2000, only 60 of the original 89 facilities were actively participating in the program and its next phase conducted from 2001 to 2002 focused on the 31 highest performers from that group. During Phase II, project supervisors visited facilities on a regular basis to ensure quality of care evaluations were conducted on a quarterly basis. Data from these evaluations suggested that program interventions were implemented and may have been strong enough to improve the quality of EmOC services. However, a study conducted in 2006 found that while Proyecto 2000 likely improved quality of care offered at health facilities, it did not directly impact probability of delivery in public EmOC facilities.[146]

To address financial barriers and increase equity, The Maternal and Child Health Insurance (SMI) program was launched by the government in 1998 as its first attempt to subsidize maternal care as well as preventive care for low-income mothers and children under 5. This program was intended to cover most costs of maternal and child health, including delivery in public EmOC facilities for households in the poorest quintile. The program was first launched in two pilot regions and by 2000, it reached about half of all eligible households in these two regions. The MOH expanded SMI nationwide the following year. Also, in 2001, the MOH released the national Integral Health Insurance Plan, which combined the SMI and school health insurance programs into a single program expanding coverage to a wider target group including all ages.

The national sexual and reproductive health strategy in Peru was implemented by the MOH beginning in 2004. Per a KI, facility-based delivery soon became an important area of focus in Peru as one of the country's

main strategies to reduce maternal mortality. Implementation of this strategy included national-level training which focused heavily on facility-based delivery.

ADAPTATION

In addition to **addressing financial barriers** and improving quality, the MOH focused on alleviating challenging geographic barriers to facility-based delivery, particularly in rural areas. In many areas, women faced difficulties in reaching health facilities while in labor, challenging efforts to expand facility-based delivery. In response, UNICEF and USAID first created maternal waiting homes at health facilities, which were in 2004 were adopted as part of the MOH's strategy to encourage pregnant women to give birth in facilities, particularly in rural areas. Initially these were designed only to accommodate the women but these were not culturally acceptable. With input from the community, they were redesigned to accommodate the family and be more culturally responsive in style and design. Women nearing delivery stayed at these houses with their families until giving birth at the facility. By 2006, there were 337 maternal waiting houses in the high Andean areas alone. When discussing the expansion of maternal waiting homes, a KI explained that "*the investment that has been made is enormous; however, this has only been able to happen because of economic growth."* Initially, maternal waiting homes were established by communities. Health facilities allocated space with construction supported by the communities served by the homes. These communities found these acceptable and often advocated for the homes as part of local governments' participatory budgeting mechanism. Implementation of some homes was also supported by partners such as NGOs. Later in 2010, Peru Health Reform Program **(Programa de Apoyo a la Reforma del Sector Salud –** PARSALUD) began to support construction and implementation of maternal waiting homes through a budget specifically allocated towards maternal and child health. By 2008, Peru had 390 established maternal waiting homes.

Other adaptations were implemented in Peru to make facility-based delivery more widely acceptable in response to data showing inequities in coverage, particular in rural areas. In 2005, the MOH adopted a technical standard allowing for vertical delivery, which was the position more acceptable to many of the women in Peru who were not previously delivering in facilities. Following this change, facilities set up birthing rooms where women could deliver in a standing or squatting position with their husbands and other family members present.[147] However, a KI noted that not all health care providers adopted this change and "this attitude of helping women give birth in the way she wants was not something all professionals did," particularly in large cities. Therefore, sensitization activities such as workshops and courses for health professionals became common in Peru.

As a result of many of these implementation strategies, Peru achieved impressive improvements in facility-based delivery rates during the study period. The 2012 DHS reported that 87% of deliveries in the preceding three years took place at a health facility.[9]

SUSTAINMENT

Sustainment of maternal waiting homes varied as it often depended on resource allocation by local governments. Local governments have budgets specifically allocated to improve maternal and child health and utilize a participatory budgeting mechanism in which communities influence spending priorities. In some

areas, communities lobbied local governments for establishment and continued operation of maternal waiting homes, resulting in resources allocated to that cause at the local level.

Peru's progress in increasing facility-based delivery was well-sustained – the 2014 DHS reported that 90% of women gave birth at a health facility. Increases in coverage were achieved across all regions of the country. Despite this success, equity differences persisted. Regional differences were still reported, with coverage of institutional delivery was highest in Ica and Tumbes at 100% and lowest in Loreto at only 67% of deliveries.

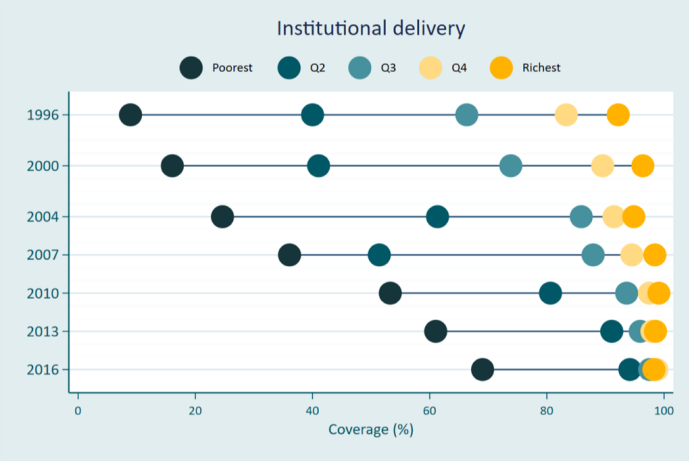

Figure 25. Equity of Coverage of Institutional Delivery in Peru by Wealth Quintile, 1996-2016 (Source: Victora et al, 2018)

Equity plots additionally show that rates of institutional delivery increased remarkably cross all wealth quintiles in Peru during the study period (Figure 25). The equity gap between coverage of the different wealth quintiles also narrowed over the study period. However, a notable disparity between the poorest and all other wealth quintile remained even in 2016 despite the financial access strategies implemented in Peru.

Table 40. FBD Implementation Strategies and Outcomes

Implementation Outcome	Implementation Strategy	Evidence
Appropriateness		Low rates of FBD – only 50% per 1996 DHS
Acceptability	Adaptation of facility delivery services to accommodate traditional birthing practices (ex: vertical delivery) Coverage of facility-based delivery under SIS Safe Motherhood campaign	(+) Improved coverage across all regions
Feasibility	Use of maternal waiting homes to improve access prior to time of delivery National focus on FBD following implementation of the national sexual and reproductive health strategy in 2004	(+) Establishment of 390 maternal waiting homes by 2008
Effectiveness and Coverage (Reach)	Establishment of maternal waiting homes	(+) Improvement in coverage – 90% coverage of facility-based deliveries in 2014 (-) Remaining regional differences in coverage as described below
Fidelity	HR strengthening - training	Not found

Cost	Maternal waiting homes established and supported by communities, NGOs, and PARSALUD	Not found
Sustainability		(+/-) Sustainability of maternal waiting homes is variable due to reliance on local prioritization and resources (+) Sustained progress in coverage improvement reported by DHS
Equity	Free delivery services Maternal waiting homes to improve access for women in rural areas Services adapted to be more culturally sensitive and appropriate	(+) Regional differences still reported in 2014, ranging from 67% in Loreto to 100% in Ica and Tumbes (DHS)

4.6.2.2 Skilled Birth Attendance (SBA)

Table 41. SBA Key Implementation Strategies

Implementation Strategies
• Development of protocols and guidelines • Leveraging on existing community health agents • Integration into existing systems • Health system strengthening • Focus on equity • HR strengthening   ○ Training

EXPLORATION

In 2000, 62% of live births in Peru in the preceding three years were assisted by a skilled provider (defined as a doctor, nurse, midwife and auxiliary nurse, or midwife). However, the DHS reported large geographic differences in assistance. A large majority (87%) of deliveries in urban areas but less than one-third (29%) of those in rural areas were assisted by a skilled provider. Notable regional differences were also reported, with assistance from a skilled provider ranging from 93% in Tacna to 29% in Puno. In several regions, the majority of assistance was instead provided by traditional birth attendants, relatives, or other non-trained individuals.[9]

PREPARATION

The Peruvian MOH launched its Maternal and Perinatal Program in 2000. This new program aimed to promote and increase coverage of institutional delivery or home delivery attended by trained health personnel. The MOH recognized the need for traditional midwives to become allies of trained health personnel in order to achieve this goal. It released a set of guidelines in 2000 which aimed to therefore train

traditional midwives to more efficiently recognize complications related to pregnancy, delivery, the puerperium period, and in newborns. Specifically, the program established the following objectives:[148]

1. Integrating traditional midwives into the care networks of pregnant and newly delivered mothers and their newborns for greater efficiency in recognition of complications, timely referral to health facilities, and midwife-assisted deliveries when institutional delivery is not possible.
2. Strengthening the work of traditional midwives to promote maternal and perinatal care by families and communities and community participation in solving maternal health problems.
3. Integrating health facility personnel into training of traditional midwives.
4. Promoting participation of traditional midwives in promotion of Maternal and Child Insurance and maternal waiting houses.

IMPLEMENTATION

Beginning in 2000, the organization Health Unlimited taught communities in Peru about ANC, family planning, reproductive health, and delivery complications. The same information was also communicated through radio emissions and distribution of posters in local language (Quechua). The number of training days and coverage of trained traditional birth attendants (TBAs) through this program were not found for the team to review.[149]

The NGO DB Peru began implementing a midwife education program in the Amazon, with classes utilizing a curriculum based on MOH guidelines. Every year, professional obstetricians and midwives led classes for traditional midwives typically providing home delivery focused on safe delivery, first aid, early recognition of problems, and prenatal and post-delivery care. Following completion of the class, midwives received training certificates and delivery kits with items for promoting safe birth.[150,151] The training of the TBAs (traditional midwives) allowed them to improve their home delivery services and prevent some prenatal and postnatal complications.

ADAPTATION

A comparative study on a project of delivery services according to local cultural context found that while in 1999, 58% of deliveries occurred at home and 6% at health centers, the percentage of skilled birth delivery rose to 95% in 2007. In addition, the study found that the project improved the relationship between the TBAs, other community health agents, and health center professionals as TBAs sought expert help and even referred women and newborns to the health centers.[149]

The 2014 DHS also showed improvement in coverage of skilled birth attendance during the study period. It reported that 91% of women who gave birth in the previous three years received assistance from a skilled provider during delivery, an impressive increase from only 63% in 2000. In addition to national-level improvement, dramatic increases in coverage were reported for many regions with previously very low coverage. For example, skilled birth attendance in Huancavelica improved from 31% in 2000 to 92% in 2014. However, disparities were still reported and coverage of skilled birth attendance ranged widely by region, from 67% in Loreto to 100% in Ica and Tumbes.[9]

A study published in 2013 demonstrated an ongoing preference for traditional birth attendance in some populations of the country. It found that just half of Quechua mothers preferred to be supported by health care providers during delivery while other half chose to be assisted by traditional midwives.[151]

SUSTAINMENT

Not found

Table 42. SBA Implementation Strategies and Outcomes

Implementation Outcome	Implementation Strategy	Evidence
Appropriateness	Identification of cultural barriers and preferences leading to inequities in skilled birth attendance	In 2000, 62% of mothers received assistance from a skilled provider during delivery. However, coverage was only 29% in rural areas and regional coverage was as low as 29% in Puno (DHS)
Acceptability	Adaptation of facility-based delivery to improve acceptability	(+/-) Increased uptake of facility-based delivery and skilled birth attendance, though 2013 study found that 50% of Quechua mothers still preferred to be assisted by a TBA
Feasibility	Training for traditional midwives	Data on training coverage not available
Effectiveness and Coverage (Reach)		Not found
Fidelity		Not found
Cost		Not found
Sustainability		Not found
Equity		(-) 2014 DHS reported large differences in skilled birth attendance between regions - from 67% in Loreto to 100% in Ica and Tumbes

4.6.2.3 Emergency Obstetric and Newborn Care (EmONC)

Table 43. EmONC Key Implementation Strategies

Implementation Strategies
• Development of protocols and guidelines • Policy • Leveraging donor and partner support • Stakeholder engagement • HR strengthening   ○ Training • Focus on equity

EXPLORATION

Emergency obstetric and newborn care (EmONC) was first introduced by the WHO, UNICEF, and United Nations Population Fund (UNFPA) in 1997 as a strategy to reduce maternal and newborn mortality,

especially in low resource settings. Basic emergency obstetric and newborn care (BEmONC) consists of seven key services known as "signal functions":

5. Administration of parenteral antibiotics
6. Administration of parenteral anticonvulsants
7. Administration of parenteral uterotonics
8. Removal of retained products
9. Assisted vaginal delivery
10. Manual removal of the placenta
11. Newborn resuscitation

Comprehensive emergency obstetric and newborn care (CEmONC) includes the seven signal functions listed above, as well as surgical capability, primarily for provision of Caesarean sections, and blood transfusion.[152]

Availability and utilization of high-quality EmONC services has been estimated to prevent between 40 and 62% of neonatal deaths.[146] However, utilization of these services in Peru was less than ideal – a 2000 survey conducted in the Ayacucho Department found that only about a quarter of pregnant women with complications gave birth at EmONC facilities that were considered "adequate."[153] At a national level, the 2000 DHS found that approximately 83% of women faced at least one barrier to accessing local maternal health services. Common barriers to access included cost of treatment, lack of female caregivers, cultural and language barriers, lack of support from health providers, inefficient management of obstetric emergencies, and emotional mistreatment by health providers.[28]

PREPARATION

[Not found following extensive review of available resources and key informant interviews]

IMPLEMENTATION

In 2000, CARE Peru began implementing the Foundations to Enhance Management of Maternal Emergencies (FEMME) project with support from BMGF and the Averting Maternal Death and Disability (AMDD) program at Columbia University. The project aimed to increase access, availability, and utilization of EmOC services for about 48,000 pregnant women in the northern provinces of Ayacucho. The project targeted five facilities (three hospitals and two health centers) in the region, which were chosen based on their geographic locations.

FEMME used three primary building blocks to establish EmOC services in the five facilities: 1) Infrastructure and facility setup improvement, 2) data collection and information systems, and 3) staff development and placement, quality improvement, and supervision. The project also addressed additional areas such community mobilization and improving the referral and communication systems. Though infrastructure improvement project varied to fit the needs of each facility, FEMME also worked with the MOH to ensure emergency drugs, basic equipment, and supplies essential for EmOC were available at facilities. To improve the technical capacity of providers at the facilities, the project provided advanced clinical training in emergency obstetric interventions and use of standardized protocols. It trained 42 clinicians in an intensive

two-week program held at the Maternal Perinatal Institute between 2001 and 2002. All facilities received monthly supportive supervision visits from FEMME staff following conclusion of training.

FEMME also worked with hospital staff to address barriers limiting service utilization of women in the facilities' communities. This work included efforts to provide non-discriminatory services that were more sensitive to local cultures, patient-centered, and acceptable. Examples of these activities in intervention facilities included adoption of birthing chairs to accommodate vertical delivery positions, use of new signs that provide information on services in local languages, and allowing family members to be present during delivery.

An assessment conducted following the conclusion of FEMME found that the project positively impacted EmOC services in northern Ayacucho. The project's baseline survey of 31 facilities in 2000 found that the area only had three fully-functioning EmOC facilities for a population of 500,000, below the UN recommendation of five facilities for this population size. By 2005, the number of EmOC facilities in northern Ayacucho doubled to exceed this recommendation. In addition, met need for EmOC increased impressively from only 30% to 84% by the end of the project. Rates of Caesarean section slightly increased (from 4% to 6%) and case fatality rates declined (from 1.7% to 0.1%). However, the proportion of births occurring in EmOC facilities did not change over the study period.

The project's impacts in Ayacucho also went beyond the intervention five hospitals. FEMME recognized that Ayacucho struggled with high turnover of trained health personnel and sought to address this challenge by working with the Maternal Perinatal Institute and the DIRESA to develop a regional training center at one of the intervention hospitals. The training program was accredited by the Maternal Perinatal Institute in 2003 and consisted of 15 days of training with on-call duty for health care providers. All facilities received supportive supervision following the training to ensure service delivery followed international standards and guidelines. Between 2002 and 2003, the PARSALUD project's significant investments in training providers from the DIRESA resulted in training of an additional 204 providers (including physicians, midwives, and nurses).

The FEMME project also developed treatment protocols to encourage adherence to evidence-based care in facilities. Working with the DIRESA, it gathered providers from facilities in Ayacucho, the referral hospital, and national-level staff from the Maternal Perinatal Institute to collaboratively develop EmOC protocols. Participants based development of protocols on three criteria: 1) they were evidence-based, 2) they specified the competencies and functions by staff cadre and facility level, and 3) they outlined the management of obstetric problems with step-by-step processes. After reviewing national and international standards and guidelines, participants designed protocols which were then tested in different health facilities for acceptability. The regional government passed a law recognizing the third edition of these guidelines as the official EmOC protocols and promoting EmOC as a key component of any safe motherhood intervention in the region of Ayacucho.[153] These guidelines were later used in other regions and CARE worked with the MOH to develop guidelines to implement the project's core strategies throughout Peru. The national "Intervention Model to Improve the Availability, Quality and Use of Establishments Providing Emergency Obstetric and Newborn Care (EmONC)" guidelines were approved for use throughout Peru in

March 2009. Following release of these guidelines, CARE continued to work with the Peruvian government to implement the project on a national level.

An assessment released by the Instituto Nacional De Estadistica eInformatica (INEI) evaluated EmOC capacity at facilities across Peru. This assessment determined the level of capacity as measured by proportion of basic obstetric and neonatal functions in over 250 facilities in 13 departments. In order to reduce maternal morbidity and mortality, facilities were expected to need to obtain capacity of at least 80% of these functions. The assessment instead found that in 2010, only 0.4% of facilities had a capacity of more than 80%. The same year, the majority of facilities (59%) actually had a capacity of less than 50%. An assessment conducted in 2015 found that by the same methodology and definition of resolutive capacity, there was no improvement in capacity of facilities.[154]

Rates of Caesarean section delivery, a component of CEmONC, increased across every region of Peru over the study period, likely reflecting increased access in the numerous regions of the country that in 2000 had rates far below the 10-15% recommended by the WHO during the study period for reduction of maternal and newborn mortality. While several regions achieved optimal rates by 2014, many had rates that far surpassed the recommended range, indicating that unnecessary Caesarean sections are likely being performed at a national level (29%) and in many regions (with rates as high as 51% in Tumbes).[9]

ADAPTATION

[Not found following extensive review of available resources and key informant interviews]

SUSTAINMENT

[Not found following extensive review of available resources and key informant interviews]

Table 44. EmONC Implementation Strategies and Outcomes

Implementation Outcome	Implementation Strategy	Evidence
Appropriateness		Limited access to adequate EmONC services found in 2000 study in Ayacucho[153]
Acceptability		Not found
Feasibility		(-) Low facility capacity found in assessments conducted in 2010 and 2015
Effectiveness and Coverage (Reach)		(+) Increased C-section rates to reach optimal coverage in many regions
Fidelity	Development of protocols	(-) Excessive rates of C-section at national level and in many regions suggests unnecessary C-sections are being performed
Cost		Not found
Sustainability		Not found
Equity		Not found

4.6.2.4 Clean Delivery Practices

Table 45. Clean Delivery Practices Key Implementation Strategies

Implementation Strategies
• Development of protocols and guidelines • Stakeholder engagement • Following international recommendations

EXPLORATION

UNICEF estimates that in 2000, 12% of neonatal deaths in Peru were due to sepsis and 2% were due to tetanus.[155] Clean delivery and postnatal practices are associated with decreases in mortality due to both of these causes in neonates. The "six cleans" of childbirth practices established by the WHO include:[156]

1. Clean hands
2. Clean perineum
3. Clean delivery surface
4. Clean cord cutting
5. Clean cord tying
6. Clean cord care

Just prior to the study period, enemas were widely used during delivery in Peru to reduce risk of infections in mothers and infants. However, a KI noted that this practice widely fell out of use by 2000 as its use was associated with "*so many big mistake*s."

PREPARATION

In 2000, the MOH launched the Maternal and Perinatal Program (*Programa Materno Perinatal*), which aimed to promote and increase coverage of institutional delivery or home delivery attended by health personnel. It established guidelines for clean delivery practices provided by traditional midwives in Peru. These guidelines were based on existing experience of Peru's traditional midwives and both international (WHO, NGOs) and local (MOH) recommendations. They established standards for a minimum delivery kit as well as minimal practice requirements for clean delivery. In order to assist a delivery, midwives should at possess a kit including at a minimum soap, paper towels, a polyethylene sheet, two cotton tapes, and a razor blade. Midwives were to be supplied with sterile instruments for cutting and protecting the umbilical cord. The guidelines set the following requirements for clean delivery:[148]

1. Proper environment conditions
2. Assessment of the mother
3. Experience of the midwife
4. Usage of the minimum delivery kit
5. Recognition of any signs of concern and timely referral

IMPLEMENTATION

[Not found following extensive review of available resources and key informant interviews]

ADAPTATION

[Not found following extensive review of available resources and key informant interviews]

SUSTAINMENT

[Not found following extensive review of available resources and key informant interviews]

Table 46. Clean Delivery Implementation Strategies and Outcomes

Implementation Outcome	Implementation Strategy	Evidence
Appropriateness	Guidelines reflected experience of traditional midwives and international and local recommendations	Not found
Acceptability		Not found
Feasibility	Establishment of guidelines	Not found
Effectiveness and Coverage (Reach)		Not found
Fidelity		Not found
Cost		Not found
Sustainability		Not found
Equity		Not found

4.6.3 Improving Post-Partum Care

4.6.3.1 Neonatal Resuscitation

Table 47. Neonatal Resuscitation Key Implementation Strategies

Implementation Strategies

• Pilot testing
• HR strengthening
  ○ Training and TOT
• Development of protocols and guidelines
• Leveraging partner support
• Data use
  ○ Decision-making
  ○ Monitoring and evaluation (M&E)
• Adoption of globally established training guidelines
• Infrastructure strengthening (Neonatal Intensive Care Units – NICUs)

EXPLORATION

IHME estimates that in 2000, birth asphyxia led to 1,558 neonatal deaths in Peru, accounting for 22% of all deaths that occurred in neonates less than seven days old. It also contributed to 12% of deaths in neonates aged 7 to 28 days.[139]

PREPARATION

New forms were designed to collect data on births and rates of both asphyxia and resuscitation at hospitals in Peru. The collected data were used to educate hospital administrators and health personnel, as well as to keep track of improvements.

IMPLEMENTATION

Peru's Neonatal Resuscitation Initiative was implemented nationally by the Social Security System (EsSalud) beginning in 1999. The project trained 1,272 health providers from 54 hospitals on neonatal resuscitation techniques using the American Academy of Pediatrics' Neonatal Resuscitation Program (NRP). Training also included instruction on equipment acquisition, organization, and placement. Participating hospitals also implemented a protocol to reduce mortality from birth asphyxia. This protocol required all deliveries to be attended by NRP-trained personnel and that all complicated deliveries be attended by NRP-trained neonatologists.

Efficacy of the program was assessed based on data from one of the 54 intervention hospitals. This hospital, Rebagliati, was the largest EnSalud hospital and had both accessible and reliable data. In 1998, prior to initiation of the program, the hospital had a neonatal asphyxia rate of 13.8 per 10,000 births. During the program's implementation period from 1999 to 2004, the hospital's neonatal asphyxia rate decreased to 3.39 per 10,000 births. This decline in birth asphyxia was sustained even after conclusion of the study (2.33/10,000 from 2005 to 2010).[157]

Beginning in 2004, Peru recognized the need to better train health care workers to properly care for neonates with asphyxiation by creating a document which guidelines on sexual and reproductive health, including guidelines on neonatal mortality.

The same year, the government organized neonatal trainings by neonatologists and people with other neonatal intensive care experience throughout the country. to increase pediatricians' and neonatologists' knowledge and competency, focusing on neonatal asphyxiation. A KI from the MOH said:

> *"… we are working towards improving neonatal health, to prevent neonatal mortality and morbidity… we have trained at the national level and there has been a good response. The first level was formed with doctors, obstetricians, nurses, and technical staff, who had already been prepared and were prepared to respond to any of these emergencies should they arise."*

This strengthening of the human resource was credited with helping with maternal and neonatal morbidity and mortality.

The MOH released the Clinical Practice Guidelines for Newborn Care (*Guías De Práctica Clínica Para La Atención Del Recién Nacido*) in 2007. Care of newborns with birth asphyxia was one of the many neonatal management topics included in these guidelines. The guidelines defined birth asphyxia and associated risk factors and offered guidance on diagnosis and management.[158]

In 2009 to 2010, in preparation for the H1N1 influenza outbreak, Peru began implementing neonatal ICUs across the country, including incubators and neonatal resuscitators. Though initially for influenza management, these supplies were continued to use for care for neonates.

In July 2015, the international Helping Babies Breathe (HBB) project was introduced in the Loreto region of Peru by the regional MOH. A training-of-trainers model was used in eight districts surrounding the regional capital city, Iquitos. Two master trainers for the HBB project trained 16 district master trainers (two for each district of implementation). District trainers then trained over 200 health care providers in newborn resuscitation techniques. The project was monitored using quarterly skills checks for both master trainers and providers as well as ongoing collection of skills practice and birth logs at facilities.[159]

ADAPTATION

Training methods had to be adapted before national scale-up due to the limited number of trained specialists in Lima (two gynecologists, three obstetricians, and one neonatologist). Twenty-five health professionals were trained, but the program was slowed due to the time required to evaluate competency individually, and the lack of dissemination of knowledge gained.

SUSTAINMENT

Neonatal and maternal health budgets were initially not effective as they were used to pay facility staff and not for specific neonatal and maternal activities. According to one KI, the original results-based budget introduced in Peru only included chronic childhood malnutrition, but eventually incorporated neonatal and maternal health, improving sustainability of activities such as neonatal resuscitation.

Table 48. Neonatal Resuscitation Implementation Strategies and Outcomes

Implementation Outcome	Implementation Strategy	Evidence
Appropriateness	Data use for decision-making	In 2000, an estimated 22% of deaths within the first 7 days were due to birth asphyxia
Acceptability		Not found
Feasibility	Training of health professionals Increased resources	(+): 1,272 health providers from 54 hospitals trained on neonatal resuscitation techniques as part of the National Resuscitation Initiative

		(+/-): 6 specialists trained 25 people to obtain competency profile. Once the training was decentralized, there lacked specialists to provide and evaluate competency, resulting in poorer quality training (+): Additional neonatal incubators and resuscitators were added to hospitals in preparation for H1N1, but routinely used (+) National scale-up of HBB training took longer than anticipated
Effectiveness and Coverage (Reach)	Improved emergency response Widespread training of providers (+): National government provided assistance for purchasing of regional ambulances and improve timely referrals for neonatal emergencies	(+) Reduction in birth asphyxia mortality demonstrated in hospital participating in the National Resuscitation Initiative
Fidelity	Quarterly skills checks as part of HBB program Establishment of clinical guidelines featuring resuscitation	(+): 1,272 health providers from 54 hospitals trained on neonatal resuscitation techniques as part of the National Resuscitation Initiative
Cost		Not found
Sustainability	Inclusion of maternal and child health activities in results-based budget	Not found
Equity		Not found

4.6.3.2 Neonatal Intensive Care Units (NICUs)

Table 49. NICUs Key Implementation Strategies

Implementation Strategies
• Policy • Development of protocols and guidelines • Integration into existing systems • Ensuring budget • Procurement of required materials • National leadership

EXPLORATION

The Ministry of Economy and Finances estimated that in 2009, 58.8% of neonates with health complications were being treated in NICUs in Peru, with the lowest coverage in Ayacucho (44.6%) and the highest in Cusco (66.7%). Importantly, at this time only data was available in Ancash, Ayacucho, Cusco, and La Libertad.[160] Data on NICUs for previous years was not found.

In 2005, the MOH passed the Policy for Intensive and Intermediate Care Services, which aimed to improve care to patients in critical condition at public and private hospitals in the health sector, and which established administrative procedures to improve the quality of care services received in intensive care services.[161]

In 2006, the MOH established a directive for evaluating neonatal care in health establishments, and listed human resources requirements (including 24 hour availability), along with the instruments and equipment necessary for intensive obstetric and neonatal care.[162]

PREPARATION

[Not found following extensive review of available resources and key informant interviews]

IMPLEMENTATION

The Strategic Maternal and Neonatal Health Program was one of the first results-based budget initiatives put forward by the Ministry of Economy and Finances. The program was developed in 2007 and scaled up in 2009 and included access to neonatal services in the NICU is listed as a key indicator. In this program, the MOH, the Comprehensive Health Insurance program (SIS), and the regional governments all appropriated financial resources to improve access to neonatal services in NICUs.[160]

To implement this and other maternal and child health initiatives under the umbrella of the results-based budget program for maternal and child health, there was a clear logic model,[163] which improving operational and organizational systems and increasing availability of basic, essential, and intensive obstetric and neonatal care services when implementing programs such as the NICU access.[163] Apart from the MOH-funded programs to improve neonatal health, the global H1N1 health crisis was said to have played a role in improving health facilities in Peru. One KI noted that NICUs were created to prevent severe complications from H1N1, and as a result, there were more incubators and resuscitators for adults and children alike. These resources could then be leveraged to address existing and persistent health needs within the population. Because of this global epidemic, resources were allocated to address a potential crisis, and neonates in Peru benefitted in the long term once the threat dissipated. One KI added, *"they have also made not only neonatology units but also pediatric intensive care units [PICUs] that also receive neonates with respiratory problems when neonatal intensive care units are at capacity. The PICUs have also fulfilled a purpose to reduce the deaths and complications or aftermath of these problems."*

ADAPTATION

Not found

SUSTAINMENT

When asked what measures have contributed to the decrease in neonatal mortality between 2000 and 2015, one KI mentioned human resources strengthening and procurement of NICUs as key contributors,

saying, *"I think the NICU has been better prepared, both in terms of the equipment they have and the clinical competency of the hospital staff who care for the children."* In some ways, NICUs still need to be prioritized in Peru. In a recent analysis of neonatal health through an equity lens in Peru, NICUs were one example of the Peruvian government's increasing emphasis on neonatal care, but the implementation and access of NICUs is still "largely an ongoing effort" at the national level.[164] When writing about the epidemiology of neonatal mortality in Peru from 2011-2012, key leaders at the MOH, UNICEF, and a regional hospital in Cusco attributed high mortality in the first seven days of life in part to the lack of NICUs available across the country. These leaders urged the prioritization of NICUs and perinatal networks that take into consideration the level of care (basic, intermediate, or intensive) that the neonate requires.[165] We were not able to locate data on the percent of neonates with complications that sought care in NICUs, or any national-level data on how many NICUs there are in the country by the end of 2015 or later.

Table 50. NICUs Implementation Strategies and Outcomes

Implementation Outcome	Implementation Strategy	Evidence
Appropriateness	Data use for decision-making	Low coverage of NICU services – in 2009, only 59% of neonates with health complications received care in a NICU
Acceptability		Not found
Feasibility		Not found
Effectiveness and Coverage (Reach)		(+) Per a KI, establishment and strengthening of NICUs
Fidelity		Not found
Cost		Not found
Sustainability		Not found
Equity		Not found

4.6.3.3 Kangaroo Mother Care

Table 51. KMC Key Implementation Strategies

Implementation Strategies
• Pilot testing • Leveraging donor and partner support • Development of protocols and guidelines

EXPLORATION

Prematurity and low birth weight (LBW) are important predictive factors to infant mortality because of their association to higher risk of infections and potential neurological sequelae. Newborns with a birth weight below 2500g have a mortality rate 40 times higher than a newborn with normal weight. In addition to this, they are 10 times more likely to develop infant cerebral palsy and five times more likely to develop other cerebral deficiencies.[166]

The kangaroo mother care program (KMC) was created in Colombia in 1979, as a tool to decrease the high perinatal mortality rates they were experiencing. It involves skin-to-skin contact with the mother (or the primary caregiver if the mother is not available) and infant, with the infant between the mother's breasts 24 hours per day so that she can provide warmth.

PREPARATION

KMC program was first introduced in Peru as a pilot program in the San Bartolomé Hospital in 1987, coordinated by Dr. Raúl Urquizo Aréstegui, with funding from UNICEF and trainings organized by UNICEF and the MOH. The pilot was widely acceptable. According to one KI, it was easier to get the family on board with KMC, but more challenging to convince doctors. Once they started seeing results, they accepted the program. The KI added, *"The key has been to involve the family, the dad, the grandparents, everyone; when everyone gets involved, the rest is easy."* The pilot was also largely effective in terms of the overall goal of reducing neonatal mortality. Neonatal mortality decreased at the hospital, and as a result it was implemented over the next years in several hospitals: Cayetano Heredia National hospital in 1988, Santa Rosa hospital and Iquitos Support Hospital in 1990.

IMPLEMENTATION

In 1994, the KMC program reached nationwide scale, although some institutions did not include this as a general practice at first. To further increase its acceptance, in 1996 it was included in the national program to reduce maternal mortality. Other major hospitals that included KMC in their guidelines were Guillermo Almenara EsSalud hospital in 2000, Belen Hospital (Trujillo) in 2007 and the Maternal-Perinatal National Institute in 2010.

In 2006, 13 guidelines for management of newborns were published, one of them being the guideline for neonatal management. In this guideline, KMC is included as the main method for prevention of hypothermia in premature infants, as well as a means for promoting breastfeeding. KMC was recommended in the health center, according to the complexity of the child´s condition. This guideline was the first one to mention KMC as an intervention for premature infants, even though the nationwide implementation had been implemented more than 10 years earlier.[167]

In the 2007 newborn care national guideline, KMC was included as one of the essential measures to prevent hypothermia for premature newborns or children under 2000g and as one of the specific activities every mother should be taught before hospital discharge. The mother is taught the KMC method, the importance of it, and how to identify danger signs when they are discharged. However, at that time not all institutions nationwide were implementing KMC, as there was no regulation on this.[158]

As of 2012, prematurity was still the first cause of perinatal death, with a rate of 320 for each 100,000 live births. This accounts for 25.1% of all perinatal deaths in that year.[168]

ADAPTATION

Not found

SUSTAINMENT

One of the key factors of success of the intervention that has led to the sustainability of KMC in Peru has been the **acceptability** of the program by health workers and families alike. One KI commented: "*I believe that success is more due to the fact that since 1987, we have continued to maintain the programs, both exclusive breastfeeding and kangaroo care for premature babies is standard. The results speak for themselves: less mortality. And the mother feels like she receives more humanized care*."

One of the challenges to the success of this intervention has been the slow uptake of the program by the MOH. KMC was first brought to Peru in 1987 and reached national scale in 1994, but the MOH didn't incorporate it into national guidelines until 2006. Nonetheless, the program has been maintained for premature and low birth weight babies across the country.

The overall impact of the KMC program was evaluated in a 2015 systematic review and included data from three studies during the years 2001, 2005, and 2008. None of these studies showed an association between KMC and a decrease in neonatal mortality; however, no newborns with prematurity or LBW were enrolled in this review, both populations for which kangaroo care has shown to be effective.[169]

Table 52. KMC Implementation Strategies and Outcomes

Implementation Outcome	Implementation Strategy	Evidence
Appropriateness		Not found
Acceptability	Education for mothers	(+) Per one KI, high acceptability for mothers and families, initially lower but later high acceptability among providers after seeing impact
Feasibility	Leveraging donor and partner support to conduct pilot study Incorporation into national guidelines (although several years after scale)	(+/-) KMC scaled nationally, but still not provided at all facilities in Peru
Effectiveness and Coverage (Reach)		(+/-) Decrease in neonatal mortality demonstrated by pilot study, but no effect found by 2015 systematic review (possibly a result of the population of newborns enrolled in this review) (+) Per KI, resulted in reduced mortality
Fidelity	National guidelines	Not found
Cost		Not found
Sustainability	Incorporation into national newborn care guidelines	(+) Per KI, high acceptability aids sustainability
Equity		Not found

4.6.3.4 Post-Partum Visits

Table 53. Post-Partum Visits Key Implementation Strategies

Implementation Strategies
• Development of protocols and guidelines • Policy • Community engagement

EXPLORATION

The 2000 DHS found that 72% of women who gave birth in a facility and only 33% of women in Peru who gave birth outside of a health facility received postnatal care (PNC) from a medical professional. There were also large differences in coverage by residence type and region. While almost half of women (46%) living in urban areas received PNC, only 28% in rural areas did. Regional coverage varied greatly from only 10% in Loreto to 76% in Tacna. Likelihood of receiving of PNC also increased with a mother's level of education.[28]

PREPARATION

From 1995-2000, the MOH led an initiative called Proyecto 2000, which aimed to improve the quality of maternal and child health services across the country, with the overall goal of reducing maternal and infant mortality.[170,171]

IMPLEMENTATION

In 2007, the MOH published clinical guidelines for newborn care, which include a set of clinical recommendations to care for neonates.[172] In 2013, the MOH published a policy promoting integrated health care for neonatal health at the national level. This policy detailed clinical guidelines that recommended follow-up on the mother and infant within 48 hours of the birth, and then once per week, either in health facilities or at home. The guidelines highlighted the importance of training professional health care staff to promote key practices with the newborn, such as immediate breastfeeding, handwashing, good hygiene practices, immunizations, and identifying danger signs in the mother and the infant.[173]

Another policy in 2013 published by the MOH highlighted the importance of postnatal care for the mother, recommending that she receive care within the first week to identify potential danger signs, including: monitoring for signs of hemorrhage or infection, informing the mother on clean hygienic practices, prevention of HIV transmission, how to stimulate a strong bond between mother and child, screening for inter-familiar violence of any kind, and promoting immediate and continued breastfeeding.[173]

Postnatal care improved steadily in Peru from 2000 to 2015, which can be attributed to a series of national guidelines published specifically to provide guidance on the care of newborns and post-natal care of infants and mothers. Within those clinical guidelines, national, regional, and local-level health professionals were called on to conduct monitoring and evaluation efforts over time to ensure that health indicators are being reached at their respective levels.[174] Another technique utilized to ensure sustainability of this program was

to implement practices that engaged the community members, and specifically family members, to ensure that proper postnatal care was followed in the home after leaving the health facility.

ADAPTATION

Not found

SUSTAINMENT

The 2015 DHS reported sustained improvement in coverage of PNC. It found that 97% of women received a postnatal checkup, and 76% of those were within four hours of delivery. Improvement was seen for women in both urban and rural areas, though women living in urban areas were still slightly more likely (77%) than those in rural areas (72%) to receive PNC within four hours. An even higher 96% of women received PNC within the first two days following delivery. While this coverage was very high, some regions still struggled to achieve high PNC coverage. In the Loreto and Amazonas regions, 21% and 19% of women, respectively, did not receive any postnatal care.[29]

Table 54. Post-Partum Visits Implementation Strategies and Outcomes

Implementation Outcome	Implementation Strategy	Evidence
Appropriateness		Low coverage of PNC per 2000 DHS – 72% of women who gave birth in facilities but only 33% of those who gave birth elsewhere received PNC from a health professional
Acceptability		Not found
Feasibility	Development of policy and guidelines Policy use	Not found
Effectiveness and Coverage (Reach)		(+) High coverage reported by 2015 DHS: 97% of women received a postnatal check up
Fidelity		(+) In 2015, 76% of women who received PNC (see above) did so within 4 hours of delivery and 96% of women received PNC within the first two days after delivery
Cost		Not found
Sustainability		Not found
Equity		(-) Remaining regional disparities in 2015 – 21% of women in Loreto and 19% in Amazonas did not receive any PNC (DHS)

GEOGRAPHIC EQUITY IN DISEASE RATES AND EBI

There was some relative reduction in incidence of ARIs, diarrhea, and fever (17%, 15%, and 21%, respectively) at the national level. At the subnational level, the incidence for the three conditions had a relative reduction for some regions (e.g. Cusco and Huánuco) while it increased for others (e.g. La Libertad and Madre de Dios). The regional equity gap for the incidence of the three conditions also had modest drops (ARI: 24.8% points to 15 percentage points, Diarrhea: 23.2% to 17.8,% fever: 20.9% to 15%).[28,29]

There was more variability in the change in absolute gap between the highest and lowest EBI coverage regions depending on the EBI. Large drops were seen for facility-based delivery (FBD) (72.7 difference in percentage to 33%, largely due to increase in the lowest coverage region), while others were relatively unchanged (measles coverage: 23 to 25 percentage point difference along with an overall drop in coverage, ARI treatment (24.8 to 22.6), while some had a small increase (ORT from 29.8 to 35.8 difference in percentage points, associated with drop in coverage in both highest and lowest regions). There was overlap in the regions with lowest end coverage and highest remaining mortality and the contextual factors associated with barriers and increased risk of mortality overall (stunting 2.4% in lowest U5M versus 24 in highest region).[28,29]

4.7 Common Implementation Strategies

Peru was found to have utilized a range of strategies during implementation of EBIs. Many of these implementation strategies were shared across many or most EBIs.

Implementation strategies identified across multiple EBIs included:

1. Focus on equity
    - Planning and implementation of EBIs often utilized an equity-focused approach prioritizing areas with high poverty or disease burden
      Ex: Rotavirus, PCV, and Hib vaccines were first introduced in the poorest areas of Peru prior to roll-out in the rest of the country.
2. Data use for decision-making
    - Utilization of data from many sources throughout implementation of several EBIs, including:
        - Data use for prioritization
          Ex: Introduction of PCV prioritized the poorest areas of the country with higher burden of pneumonia
        - Data use to understand disease burden and ensure appropriateness of EBI
          Ex: Review of existing reports and national data to estimate the burden of rotavirus in Peru prior to introduction
        - Data use to inform implementation
          Ex: 1995 survey of ARI care for children used to identify target providers groups for FB-IMCI.
3. Stakeholder engagement
    - Involvement of local and international stakeholders throughout all stages of implementation
      Ex: Multi-stakeholder meeting conducted to present results of drug efficacy studies for new malaria treatment regimens shared information on drug resistance and rationale for proposed treatment policy changes prior to introduction of ACTs.
4. Leveraging donor and partner support

- Use of donor and partner resources (both technical and funding) to aid feasibility of introduction and widespread implementation of EBIs
  Ex: Partner engagement to prepare for introduction of FB-IMCI, including formation of an IMCI Coordinating Committee and adaptation of generic IMCI protocols with support from the WHO, World Bank, USAID, and Inter-American Development Bank.

5. HR strengthening, particularly training
   - Training and other HR strengthening activities such as supportive supervision facilitated implementation of new EBIs or expansion of coverage for existing ones.
6. Development and implementation of protocols and guidelines
   - MOH developed and implemented a number of protocols and guidelines, some based on international standards, to guide implementation of the majority of EBIs.
7. Integration into existing systems to reduce vertical programs and strengthen PHC
   - Peru built upon existing systems and programs for implementation of many new EBIs rather than using standalone approaches for implementation, improving feasibility and sustainability
     Ex: new vaccines integrated into the existing routine immunization schedule.
8. Community engagement
   - Community engagement and communication activities were utilized during implementation of many EBIs to improve public awareness, acceptability, and therefore uptake of services.
9. Policy
   - National policies accompanied implementation of key EBIs.
10. Following international recommendations and adapting as appropriate
    - MOH utilized international recommendations to guide implementation of many EBIs, adapting protocols and guidelines as needed based on the Peruvian context.
11. Phased introduction and scale-up, including pilot testing
    - Peru utilized a phased approach to introduction and scale of many EBIs, improving feasibility and informing large-scale implementation
      Ex: vaccines including rotavirus, PCV, Hib, and pentavalent were first introduced in priority areas, then scaled to the national level.
12. Free service delivery
    - Many key EBIs were delivered free of charge through waived fees or coverage in the national SIS insurance program.
13. Use of conditional cash transfer
    - *Juntos* program's cash transfers required receipt of services such as immunizations and ANC to increase uptake.
14. Adaptation driven by cultural sensitivity and review of gaps in coverage
    - Activities often accounted for cultural barriers to receive services
      Ex: Establishment of maternal waiting homes and adoption of vertical delivery standards.

5 Cross-Cutting Contextual Factors (Facilitators and Barriers)

Reflecting the theory of change and research framework (see appendix, contextual factors were identified at levels from global to the individual. We identified both implementation-relevant and outcome-relevant contextual factors. Implementation-relevant contextual factors acted as barriers or facilitators as the different EPIAS stages of EBI implementation. On the other hand, outcome-relevant contextual factors influenced implementation outcomes (like acceptability or feasibility) or EBI effectiveness. Many of the factors in Peru have also been identified in other Exemplars U5M case studies as facilitators or barriers to U5M reduction.

5.1 Effective and Consistent National Leadership and Commitment to Set Clear Goals and Priorities to Improve Health (National-level, facilitator)

During the study period, leadership at the national level prioritized maternal and child health programs through national strategies and policies. This leadership included political will and buy-in between sectors and recognition and commitment to reducing U5M, NMR, and malnutrition as an important source of morbidity. Sustained prioritization of the MCH agenda facilitated substantially improved MCH indicators such as the quality of health facilities and the rate of facility-based births.[175]

Key informants explained that coalescing around shared policy goals helped to direct resources toward MCH programs and interventions. One KI described how the process changed over time once government, civil society, and cooperation agencies began working together to address chronic child malnutrition. Another remarked on how easy it was to engender political will around child health issues, noting:

> *"when the political class talks about an issue as sensitive as childhood, it is something that is very difficult to find a negative response. Whenever there's talk that we're going to have or reduce child mortality or have HIV-exposed children born without HIV … politically that's going to always fit well in the political class and in the political decisions they make at that level."*

Another KI emphasized that improvements in U5M and NMR resulted from multi-lateral cooperation: "*mostly things have happened through the government, and funding from cooperation agencies and the participation of Peruvian academic research institutions and Peruvian researchers*."

Initiatives put into place during this period advanced the MCH agenda and exemplify the coordination of health sector to improve key child health indicators. The National Agreement (*Acuerdo Nacional*) was a national policy established in 2002 that aimed to strengthen democracy by promoting equity and social justice and called for improved access and quality of health care services. It is a framework for a national dialogue between government and civil society organizations to uphold democracy and address societal inequities and was essential to the sustainment of many MCH policies, because it ensured funding for those programs. Specific goals included poverty reduction and reduced maternal and child mortality. It also included mechanisms for monitoring progress toward achieving these goals, and ensured that maternal and child health was prioritized in the Peruvian national political agenda.[45]

Many KIs touted the National Agreement as a key strategy toward improving MCH outcomes because it set reducing infant mortality as a key part of the national agenda. One said that after the political crises of the 1990s, politicians began to be more forward-thinking in their political decision-making, explaining

> *"A transitional government was installed in 2001, which asked a question that I think is substantial: 'What is the Peru that we want in 20-30 years?' This is what the political leaders asked and they did not try to answer this question alone, they summoned many actors, and between them they created a national agreement."*

The Roundtable for the Fight Against Poverty is a multi-sectorial initiative that set an anti-poverty agenda at the national level. The Roundtable includes high-level leaders in civil society (business and the private sector, national societies, religious groups), the public sector (the Ministries of Health, Education, Women and Vulnerable Populations, Agriculture, Foreign Relations), and cooperation agencies. It was key to making MCH a national and regional priority, even throughout the change in government leadership.[45] The Roundtable's strong presence in national politics contributed to the development of policies and subsequent programs that addressed social inequities, and specifically targeted the improvement of MCH indicators.[176]

5.2 Anti-Poverty Political Agenda (Facilitator)

To address inequities by region and wealth and in indigenous populations, Peru developed a social policy framework to provide economic opportunities to these communities.[175] Specific programs like the National Strategy for Poverty Reduction and Economic Opportunities (CRECER) and National Program for Direct Support for the Poor (JUNTOS) programs directly addressed inequities in Peru. The CRECER program began in 2007 and aimed to reduce child stunting by 5% in five years. It specifically addressed the urban/rural gap by focusing on accessing the lowest-income families, which were concentrated primarily in the Andean and Amazon regions. The program, which bridged national, regional, and local governments in addition to civil society, included combined programs for health, education, WASH, and housing. The JUNTOS program was a cash transfer program which was contingent upon the participants' use and access to maternal and child health services and school attendance.[175]

5.3 Economic Growth (National-level, facilitator)

In 2000, Peru was just beginning to emerge from one of the most severe economic and political crises in its history. Peru's economy recovered during the study period, with its GDP growing at a rate of 6.1% annually from 2002 to 2013, and the poverty rate falling an impressive 26.1% from 2005 to 2013.[177]
From 2000 to 2015, Peru enjoyed a period of economic stability, which has been a key factor in facilitating the reduction of under-5 mortality in Peru. Many KIs attributed the reduction in U5M to the macroeconomic policies and economic success of the study period. One KI said, "*economic growth is what has improved the health indicators … the good economic situation has been sustained because the child mortality has been reduced.*" Another mentioned: "*it is no secret that if a country recovers financially, it has fewer diseases, the population becomes sick less often, and people can be better nourished.*"

Another KI remarked that the economic prosperity led to an increase in health care infrastructure, providing the example of health care establishments, saying, "*In the early 1990s, the Ministry of Health had 2500 health care establishments, and there are now 8500 … the economic growth here has greatly improved everything … roads began to reach the villages … there has been great growth here.*" One KI went so far as to say, *"There is almost a direct link between economic growth and reduced child mortality."*

5.4 Investment in Health (National-level, facilitator)

Economic growth was accompanied by substantial increases in health spending in Peru, which can be linked to improvements in health care access and quality across the country. The total public and private expenditure per capita increased from $194 to $496 from 1995 to 2011 (PPP, Int$).[175] As described in further detail in the Introduction, MCH expenditure increased substantially over the study period. The share of health care expenses contributed by the government also nearly doubled, reflecting economic growth as well as increased government commitment to improving health.[178]

In addition to increases in domestic health spending in Peru, alignment of government and external partner funding efforts led to more MCH programs and subsequently improved MCH outcomes.[175] One KI noted that as specific diseases reached international importance, external partners were more likely to enter and assist to address these health programs. Providing the example of malaria, the KI said, *"Until the end of the last century, malaria rates were continuously rising, and it was listed as one of the three most important diseases in the world by different governments…it makes governments invest, not only governments but also institutions like the Bill and Melinda Gates Foundation."* International sociopolitical factors such as prioritization of certain programs to address MCH indicators worked to increase international funding efforts in those areas, which increased health financing in Peru to reduce U5M.

Other investments that contributed to the reduction of U5M included PARSalud, which aimed to improve the health sector through infrastructure investments and the Neonatal Health Collective, which is an alliance between international organizations and NGOs that had the specific goal of meeting MDG 4.[175]

5.5 Ongoing Health Systems Strengthening Efforts (National-level, facilitator and barrier)

Peru's increasing investment in health during the study period was reflected in ongoing health systems strengthening efforts in the country. Between 2000 and 2015, these included health training at the regional level and infrastructure improvement such as establishment of new health facilities, which was found to be effective.[146] Health workforce statistics speak to the improvement: the number of nurses and midwives per 1,000 grew from 0.7 in 1999 to 1.3 in 2010, and the percentage of births attended by a skilled health professional increased form 59% in 2000 to 85% in 2011.[175]

Despite these efforts, Peru continues to face challenges in human resources investment for health care, and this issue still needs to be addressed. Though the national rural retention program, SERUMS, has aimed to distribute and retain health workers in rural and remote areas of Peru since 1985, regional differences in provider density persist.

5.6 Health Sector Reforms (MOH-level, facilitator)

One major reform implemented in the health sector during the study period was the results-based budgeting program beginning in 2009. This program improved monitoring of programs, with evaluations of the budgeted programs to ensure that they meet evidence-based design criteria, and summative evaluations which consider the programs' effectiveness and assesses the program's impact. One KI summarized the importance of the results-based budget, noting that "*the alignment between the resources and those effective interventions shows you where you have to put emphasis and move forward to improve the quality of spending.*"

Prior to the results-based budget, it was difficult to report on and evaluate health spending related to MCH initiatives. Beginning in 2009, programs needed to show that their intervention was based in scientific evidence, and clearly align resources with the intended outcome of the program. One KI noted that this was a more efficient way of spending government resources for programs aimed at reducing child mortality, saying,

> *"we believe that a major factor that has contributed to the reduction of malnutrition and child mortality has been to implement this resource alignment strategy to budget for effective interventions that lead to a clear outcome. The results-based budget aligns institutions and services, and establishes a series of elements that help you spend what needs to be spent, concentrating the resources on what we know is effective, and not wasting resources on other things."*

Since the results-based budget monitors outcomes based on evidences, it helped track Peru's progress toward achieving key MCH indicators. One KI commented on the importance of this program as it pertains to the reduction of U5M, saying, "*the idea was to identify which are the most effective interventions, and allocate resources to these most effective interventions, and from that year you can see how much the country is investing in all children being vaccinated, to avoid mortality, and morbidity, how many children are on target for growth and development.*" Inclusion in the program also improved the sustainment of evidence-based practices implemented by the government.

Other health sector design changes and investments between 2000 and 2015 also improved health care access for many and increased the availability of resources for health spending, which in turn improved key MCH indicators. Introduction of the SIS program had a major impact on health care access for women and children. Established in 2002, SIS built upon an existing insurance plan for mothers and children, and aimed to reduce or remove out-of-pocket costs for public health facilities and allay financial barriers to accessing health care.[175] A KI said, "*Comprehensive health insurance makes it so that a vulnerable population, children and pregnant women, are not excluded from receiving care, and I think that's also a factor that has improved access to health care.*"

5.7 Culture and Systems Ensuring Accountability (National-level, facilitator)

In addition to facilitating national leadership and prioritization, the Roundtable for the Fight Against Poverty increased accountability surrounding U5M efforts. The Roundtable provides accountability in leadership by establishing a dialogue between key institutions and actors and even provides details on resource prioritization and funding transparency. One of its key responsibilities is creating government agreements through calling upon political candidates to pledge commitments, including explicitly designating resources to reducing chronic child malnutrition and neonatal mortality. A KI noted,

> *"I think that helps a lot as a country to have that permanent dialogue, which is available not only when it is required, it but is a permanent interaction that helps fine-tune implementation models, and makes spending more transparent as well. The Roundtable is reviewing budget and implementation issues and looking at the problems that are in regions, and I think it also helps the same actors who execute to be able to feel observed and seen, and not just do what they want without accountability and transparency."*

During the study period, the Peruvian government increased its financial accountability to health programs and was found to have the greatest budget transparency for maternal health programs compared to other countries in Latin America.[179] Perhaps the most impactful of its financial reforms was the implementation of the results-based budgeted program, a tool used by all ministries to justify interventions prior to receiving funding allocation, beginning in 2009. This program requires cross-sectoral collaboration between ministries, and ensures that any ministry-funded program be tied to specific, measurable results that served the Peruvian population.[180]

5.8 Data Availability and Culture of Use (National and MOH-level, facilitator)

The Peruvian ENDES survey is an annual demographic and household survey (DHS) that is one of the most robust national-level data collection tools in the world. Commenting on the utility of the ENDES survey, one KI said, *"I think we've managed in the years to take advantage of a lot of administrative databases. First the ENDES survey, which gives you reports of coverage rates in the population every year. Semi-annually you have the national data and annually you have the departmental data, and you can disaggregate it by sierra, coast, and jungle regions."*

Results from the DHS (*Encuesta Demografica y de Salud Familiar* – ENDES) survey sparked the conversation around poverty in Peru at the beginning of the study period, leading to the Roundtable for the Fight Against Poverty and the development of the National Agreement in 2001 and 2002, respectively. It also allowed health officials to monitor both key health outcomes and the programs that attempted to address those problems, so that changes could be made if necessary. According to a KI,

> *"The ENDES became a very important tool of quality control of processes. Tools like this allowed us to discuss the quality of the policy. For example, we have seen resource allocation, if we*

allocate resources for the right programs, we have also been able to see what was going on with rural deliveries that had one of the most complicated areas of coverage, in fact introducing these tools looked at topics such as facility-based childbirth as part of the heart of the country."

5.9 Innovation in Research and Integration of Results into Policy (MOH-level, facilitator)

Creating a system of learning and continual improvement included innovating in research at the national level. For example, researchers and health professionals at the MOH and academic institutions developed culturally-sensitive strategies to approaching maternal and child health issues, including institutional childbirth. Protocols were developed and trainings were held on culturally-relevant birthing practices, which contributed to increased institutional delivery in rural areas.[175] According to an intergovernmental official commented on their work with culturally-relevant birthing practices: **"***The third element that we worked on was the issue of improving health care, which allowed mothers to give birth vertically; this is what was done historically, pre-Hispanic, and is physiologically better and right."*

The incorporation of research results and evidence-based practices into government initiatives led to the identification of effective interventions from the literature or global recommendations, which then prompted government officials to determine ways to implement in Peru's sociopolitical and cultural context. This incorporation of research and EBIs led to increases in intervention coverage such as ANC and delivery services.[45]

5.10 Cultural Practices and Preferences (Individual/community-level, barrier)

Peru is a culturally diverse country and in 2017, indigenous people made up about 26% of the country's total population.[181] Cultural differences and practices likely contributed to disparities in coverage and outcomes in some areas of the country (such as those in the Andes and Amazon basin), particularly those that are home to indigenous populations living in rural areas.

One area in which these differences are particularly evident is facility-based delivery. At the start of the study period in 2000, the national coverage of facility-based delivery was 58%. However, there was significant regional variation of coverage – while regional coverage was as high as 90% in Lima, it was below 30% in several regions, including Amazonas (27%), Cajamarca (22%), Huancavelica (20%), Huánuco (28%), and Puno (20%).[9] Using the mother tongue of women as a proxy for ethnicity, coverage of facility-based delivery was only 13% for Quechua speakers and 12% for Aymara speakers in 2000.[9]

For facility-based delivery, the MOH recognized disparities in coverage in some areas of the country and sought to alleviate them through culturally-based adaptation of maternity services. Beginning in 2004, it implemented new delivery standards in health facilities to provide more culturally-sensitive delivery. Facilities began to accommodate the traditional vertical birth position preferred by many indigenous women, allowed family members or traditional midwives to accompany women during delivery, and increased the temperature to be more comfortable and welcoming.

Though regional differences still persist in Peru, these cultural adaptations likely contributed to the substantial gains of coverage of EBIs such as facility-based delivery that were likely affected by cultural preferences. For example, facility-based delivery improved to 70% in Amazonas by 2014 (though remained lower than the national coverage of 90%).[9] Coverage in Quechua and Aymara-speaking women improved to 60% and 51%, respectively, by 2009.[182]

5.11 Improvements in Water, Sanitation, and Hygiene (WASH) (National-level, facilitator)

Previous research on child mortality reduction in Peru identified improvements in WASH as another key facilitator of the country's progress. During the study period, efforts to improve WASH included the National Strategy for Poverty Reduction and Economic Opportunities (CRECER), which launched in 2007 included WASH as a targeted area for improvement in order to close urban-rural gaps in stunting.

Progress in key WASH indicators over the study period was reported by DHS. The proportion of households in Peru with no access to improved water sources decreased from 20% in 2000 to 12% in 2012. This improvement in WASH likely contributed to reduced incidence of diarrhea in children, subsequently impacting mortality from this cause.[176] However, inequities in WASH remain in Peru – in 2012, 93% of urban households but only 76% of rural ones used an improved water source. Large regional differences also persisted, with coverage of an improved water source ranging very widely from only 60% in Loreto to 94% in Lima.[9]

5.12 Programs and Policies to Reduce Stunting

Peru also achieved significant progress in reducing stunting over the study period, from 31.3% of children under 5 in 2000 to 13.1% in 2016. This progress reflected a number of factors, including nutrition policies and programs enacted during the study period. Similar to U5M, stunting reduction was given priority at national and local levels. In 2005, all presidential candidates signed a commitment to reduce stunting in children under 5 years by 5 percentage points in a period of five years (Strategy 5x5x5). National prioritization was similarly facilitated by organizations such as the Roundtable and the Child Malnutrition Initiative.

Programs such as the Good Start in Life program (1998-2008) aimed to prevent stunting in young children, while the JUNTOS program required mothers receiving the cash transfer to bring children under 2 years of age to health centers for growth monitoring. In 2007, creation of the CRECER ("Grow") national strategy consolidated a number of programs, many of which aimed to address malnutrition. One year later, the Ministry of Finance created the Articulated Nutrition Program, which focused on addressing drivers of stunting. In addition, food security policies were implemented by the Ministry of Agriculture during the study period to reduce micronutrient deficiencies and malnutrition.[183]

This reduction in stunting and overall improvements in nutritional status likely improved the resilience of children in Peru, therefore impacting U5M reduction.

6 Cross-Cutting and Remaining Challenges

Despite the significant progress made, Peru has been challenged by a number of factors which impede U5M reduction efforts. These challenges include:

6.1 Inequity in coverage of EBIs and outcomes

Despite the strategy of focusing on equity, Peru has continued to experience challenges in achieving equity of coverage of key EBIs. For example, in 2014 care-seeking for ARI ranged from just 37% in Cajamarca to 72% in Tumbes. Coverage for treatment in children with symptoms of ARI was also lowest in Cajamarca at 28% and highest in Tumbes at 73%.

These inequities also extend to outcomes despite improvements in U5MR and NMR across all regions. In 2014, Loreto had the highest U5MR of 38 per 1,000 live births, compared to the national rate of 23 per 1,000. The same year, Ayacucho had the highest NMR of 18 per 1,000 live births, 50% higher than the national rate of 12 per 1,000.

6.2 Lack of data precision and quality

Peru commonly employed data use as a strategy during implementation of many key EBIs and the country's culture of leveraging surveys such as ENDES facilitated efforts to reduce U5M. However, ENDES had its limitations, especially in data fidelity at the regional level. One key official said,

> *"ENDES for me has been insufficient. It is an omnibus of a survey, which gives you big indicators, but then when you want to go in and look at the indicators in detail and with higher quality, the details aren't there, and there we have a big challenge in the information systems at the MOH because in Peru that is very poor quality."*

Challenges in data quality exist across other data sources. For example, fragmentation of Peru's health system limits the MOH's ability to collect high-quality, standardized data across all areas of the health system and monitor coverage across all regions and schemes of care, limiting utility of the data for decision-making. Due to this fragmentation, measuring quality of services across the entire health system also remains a challenge.[184]

6.3 Supply chain and distribution variability

Supply chain issues challenged achievement of high coverage and sustainment of coverage for some EBIs, particularly those addressing malaria. For example, the MOH purchased 40,000 RDTs upon introduction of the technology. However, challenges in procurement and distribution led to a six- to 12-month delay in these tests reaching target communities. Procurement also affected sustainment and despite significant preparation to introduce RDTs in six regions of the country as an early adopter, the MOH did not procure and distribute any RDTs in the country after 2007.

7 Transferable Knowledge for Other Countries

There were a number of replicable strategies from Peru that would be relevant for other countries aiming to accelerate decline in U5M, learning from Peru's successes and challenges. These include:

1. Embed the implementation strategies into broader efforts to address underlying causes of inequity including anti-poverty initiative and plan for equity in implementation (with improved focus on the most vulnerable populations) from the start

Over the study period, Peru's government prioritized improving recognized inequities in the country, including those seen in health outcomes such as U5M. This focus is reflected in Peru's national poverty reduction initiatives as well as in strategies used to implement key EBIs. For example, phased introduction of new vaccines often prioritized the poorest and highest-burden areas and the MOH implemented policies for culturally-based adaptation of facility delivery to improve coverage in indigenous and rural communities.

2. Ensure national commitment to U5M reduction that is resilient to changes in government and leadership through specific and binding policies

Peru's strong leadership and commitment to U5M played an important role in the country's impressive progress. This leadership and commitment were facilitated by binding policies as the National Agreement, which prioritized U5M reduction through the course of leadership changes in the country.

3. Identify the evidence/data needs and determine if it is possible to leverage available evidence (from country/region or globally) or if locally relevant evidence for decision-making needs to be developed to determine need and appropriateness of EBIs, where adaption is needed, and key implementation strategies based on global and local factors and results both in planning and during implementation

Peru commonly utilized data for decision-making throughout implementation of EBIs. The MOH used existing local and global evidence for decision-making when available and adequate. It also identified the need to generate new evidence to determine the need and appropriateness of new EBIs and inform introduction.

4. Integrate new initiatives into existing system capacity and combine vertical programs into a more primary care-focused model

Many new EBIs introduced in Peru were integrated into existing systems and programs, reflecting a shift in the country from use of many vertical programs towards a more comprehensive approach focused on primary care. This approach aided both feasibility and sustainability of implementation of key EBIs.

5. Engage the community to understand challenges before and during implementation and be willing to adapt to make service delivery culturally appropriate and acceptable

Peru recognized barriers to uptake of services and adapted interventions to make them more acceptable to groups with low coverage. For example, it established maternal waiting homes at health facilities and adapted facility-based delivery to permit practices such as vertical delivery in order to remove cultural and access-related barriers to facility-based delivery in rural and indigenous communities.

6. Engage and consult stakeholders and leverage their expertise during planning and throughout implementation, including within the MOH, donors, implementing partners, professional bodies, and communities

Throughout all stages of implementation of EBIs, the MOH engaged with and consulted stakeholders. It leveraged expertise of a diverse group of stakeholders both local and international stakeholders, particularly in planning and implementation of interventions. One example of such engagement was seen during the country's preparation to introduce ACTs for malaria. While very initial data of antimalarial drug resistance faced the skepticism of many stakeholders in Peru, the MOH held a national meeting with stakeholders, including private physicians and community members to present results of a series of efficacy trials for new drugs and the rationale for proposed treatment policy changes, improving acceptability of ACTs.

7. Invest in improving individual and community resilience to disease through poverty reduction and education and addressing other underlying causes

Peru's progress in U5M reduction was facilitated by its investment in improving areas such as poverty, WASH, and stunting through national-level policies and programs. Improvements in these areas improved resilience of children and their families, leading to decreased incidence of and mortality from common CODs in children under 5.

8 Conclusions

Peru has achieved remarkable drops in U5M and progress in reduction of neonatal mortality. Increasing coverage of many EBIs as well as facilitating contextual factors such as strong national leadership and prioritization of MCH initiatives, sustained economic growth, and efforts to reduce poverty were identified as key factors in Peru's progress. However, challenges such as ongoing inequities in both coverage and outcomes, data quality, and supply chain issues remain areas for future improvement in Peru.

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APPENDIX A

EXEMPLARS IN UNDER-5 MORTALITY METHODOLOGY AND FRAMEWORK

The University of Global Health Equity is working with the team at Gates Ventures to explore approaches to better understand the successes of countries in reducing under-5 mortality (U5M). This work was initially designed with two aims: 1. Developing and testing an implementation framework and mixed methods approach to understand the success of these countries, and 2. Extracting actionable knowledge focused on implementation strategies and key contextual factors to inform other countries working towards the same goal. The scope of mortality was limited to amenable CODs – those which are potentially preventable with a stronger and higher quality health care system. The work was divided into a number of activities. These included: 1. Identifying EBIs in use in LMICs; and 2. Understanding how the EBIs implemented by a country were able to achieve success beyond their regional neighbors and other comparable countries. The analysis and conclusions were designed to be data-driven and rigorous, but also to create knowledge that is transferable and accessible and has the potential to be used across a range of key stakeholders. Therefore, the content developed by the Exemplars Project is intended primarily for an audience of national policymakers, implementers, and funders – people with the potential to significantly impact global health policy and implementation at scale. The work was guided by the development of a framework which was informed by a number of existing frameworks in use for U5M (including Countdown 2015, WHO) and from existing implementation science frameworks (below).

Identifying evidence-based interventions to reduce U5M in LMICs

The initial work included identifying EBIs found to directly reduce U5M, dividing the work between those targeting the neonatal period (birth to 28 days) and the infant and child period (28 days through 4 years). This work included literature review, discussions with experts in the area, and revisions with them as the work progressed. We focused on those interventions that were relevant to resource-constrained settings, those that were directly related to preventing potential life-threatening conditions (such as vaccinations, safe birth practices, and ITNs), and those treating illness or other complications (such as antibiotics, antimalarial medication, and neonatal resuscitation). We included interventions that were at the individual process level (administering the right antibiotic at the right time) as well as those targeting inputs (development of neonatal intensive care units) and systems needed to deliver the EBIs meeting the definitions of quality including effectiveness, safety, timeliness, and equity (such as CHWs). For neonatal mortality we also expanded to a limited set of prenatal and intrapartum interventions proven to reduce neonatal death. We did not focus on those interventions that resulted in reductions in stillbirths, as those are not included in the assessment of U5M rates. This was driven in part by the changing epidemiology of neonatal CODs seen in some countries, with LBW and prematurity increasing in importance in causes of mortality.

Cause of Death	EBI	
Lower respiratory infections	Antibiotic treatment	
	Vaccination: PCV	
	Vaccination: Hib	
	Community-based management	
	Facility-based management	
Diarrheal diseases	Oral rehydration therapy	
	Zinc supplementation	
	Vaccination: Rotavirus	
	Community-based management	
	Facility-based management	
Malaria	Antimalarial combination therapy	
	Rapid diagnostic testing	
	Insecticide-treated nets	
	Indoor residual spray	
	Intermittent preventative therapy for high-risk groups	
	Community-based management	
	Facility-based management	
Measles	Vaccination: Measles	
	Vitamin A supplementation (prior to vaccination)	
Malnutrition	Exclusive breastfeeding for six months	
	Continued breastfeeding and complementary feeding after six months	
	Vitamin A supplementation	
	Management of severe acute malnutrition (ready-to-use food, rehydration, antibiotics)	
HIV	ARV treatment for infants and children	
	HIV testing of children born to HIV+ mothers	
	Prevention of mother-to-child transmission	Early diagnosis of pregnant women (or pre-pregnancy)
		PMTCT treatment for mothers* and post-partum to exposed infants
		Elective Caesarean section for untreated HIV+ mothers**; replacement feeding**
		ARV treatment for mother for life as prevention (started in 2012)
		Exclusive breastfeeding
Meningitis	Vaccination: PCV meningococcal	
	Vaccination: Hib	
	Vaccination: Meningococcal	
	Antibiotic treatment	
	Chemoprophylaxis during acute outbreaks	
Other vaccine preventable diseases	Vaccination: Tetanus	
	Vaccination: Diphtheria	
	Vaccination: Pertussis	
	Vaccination: Polio	

* No longer recommended (PMTCT versus ART for life)
** No longer recommended for women on ART with suppressed viral load

Period of Risk	EBI	
Preconception	Folic acid supplementation	
Antenatal	Tetanus vaccination	
	Malaria prevention and treatment	Intermittent presumptive treatment
		ITNs
	Iodine supplementation (in endemic iodine deficient settings)	
	4 or more antenatal visits (ANC4)	
	Prevention and treatment of preeclampsia and eclampsia	Calcium supplementation*
		Low-dose aspirin for high-risk women*
		Antihypertensive treatment for severe hypertension
		Magnesium sulfate
		Early delivery
Intrapartum	Antibiotics for PPROM	
	Corticosteroids for preterm labor	
	Caesarean section for breech or obstructed labor	
	Active management of delivery (including partograph)	
	Clean delivery practices (incl. clean cord-cutting)	
	Trained birth attendant	
	Facility-based delivery	
	Basic emergency obstetric and newborn care (BEmONC)	
	Comprehensive emergency obstetric and newborn care (CEmONC)	
	Timely transport for higher level care for mother	
Postnatal	Newborn resuscitation	
	Immediate breastfeeding	
	Prevention and management of hypothermia	Immediate drying and wrapping
		Delayed bathing
		Skin-to-skin
		Baby warming
	Kangaroo care for LBW/prematurity	
	Timely transport for higher level care for mother	
	Post-partum visits to identify danger signs and provide active referral	
	Antibiotics for suspected or confirmed infection	
	Surfactant therapy for respiratory distress syndrome and prematurity	
	Neonatal intensive care units (equipped, trained staff, standards and protocols established and followed)	

* Further assessment needed in literature review

Both the desk review and the primary research were informed by an implementation science framework that incorporates a number of existing frameworks and was designed specifically for this project. While we are often able to identify policies and EBIs chosen by a country to reduce U5M, the key lessons in how these were chosen, adapted, implemented, and sustained are often missing from available published or gray literature. Because the same policies and interventions brought different results in different countries, implementation science offers important tools for analyzing and understanding how to think more holistically about how and why countries were able to reduce U5M and from where lessons in replication can be drawn. To guide the overall work, we developed a framework to understand the contribution of contextual factors and the different levels of actors involved: global, national, ministry, subnational, facility, and community.

We reviewed existing implementation science frameworks and have combined a number of commonly applied ones as well as insights from work underway by Dr. Binagwaho to guide how we interpret existing evidence and to design tools for primary research.

The primary frameworks and implementation science resources we drew from include:

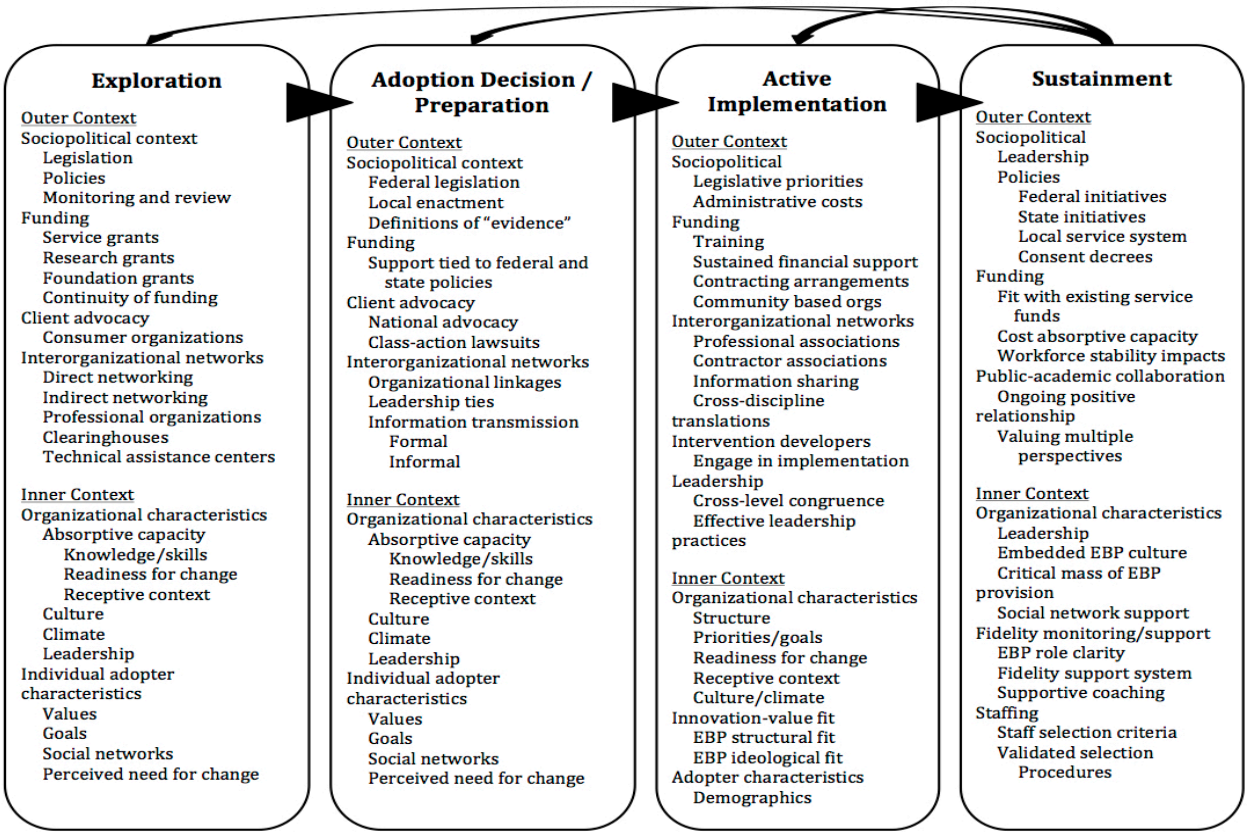

Figure 26. EPIS model of implementation (Source: Aarons, et al)

1. Exploration, Preparation, Implementation, and Sustainment (EPIS):[244] This framework walks through four key steps of the implementation process needed to achieve long-term change-starting. Within each phase there are important contextual factors which may influence success (Figure 26).

2. Re-AIM:[245] This evaluation framework breaks down implementation outcomes into Reach (coverage), Effectiveness, Adoption (range and proportion of individuals and organizations willing to participate), Implementation (fidelity, time, cost, and adaptations made) and Maintenance (institutionalization into routine care and policies, and long-term impact). It is designed to better understand the range of factors that influence success or failure at the individual and broader levels.

3. Consolidated Framework for Implementation Research (CFIR):[246] This framework serves as a guide to understand the contextual factors that influenced the success or failure of implementation of a specific intervention. These include the outer context, the inner (organizational) context, the characteristics of the intervention, the implementation approach, and the individual actors responsible for implementation.

4. Implementation Outcomes (Proctor et al):[247] This approach distinguishes implementation outcomes from the more traditionally measured intervention and system outcomes. It identifies and defines key areas that are critical to achieving overall effectiveness, core goals of initiatives targeting U5 mortality. Outcomes include acceptability, adoption, appropriateness, costs, fidelity, feasibility, penetration (reach), and sustainability (Figure 27).

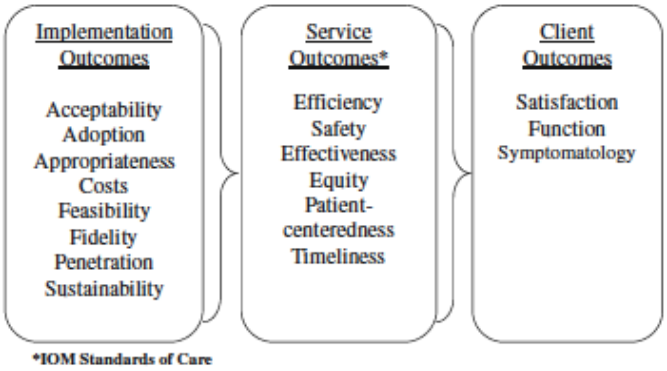

Figure 27. Types of outcomes in implementation research (Source: Proctor, et al)

5. **The implementation principles for managing all levels of a health sector as described in the book in progress by Dr. Binagwaho:** This book is written to share her experiences on what was successful, what failed, why, and how, when she served in technical and political positions in the health sector in Rwanda between 1996 and 2016.

None of the frameworks alone were felt to cover the complexity the implementation strategies and steps undertaken at the national, subnational, and care-delivery levels. By combining them we have developed a framework that will be used to guide how we prioritize areas for primary research, interpret the secondary research, and form the themes for synthesis of the entirety of our work (Figure 28).

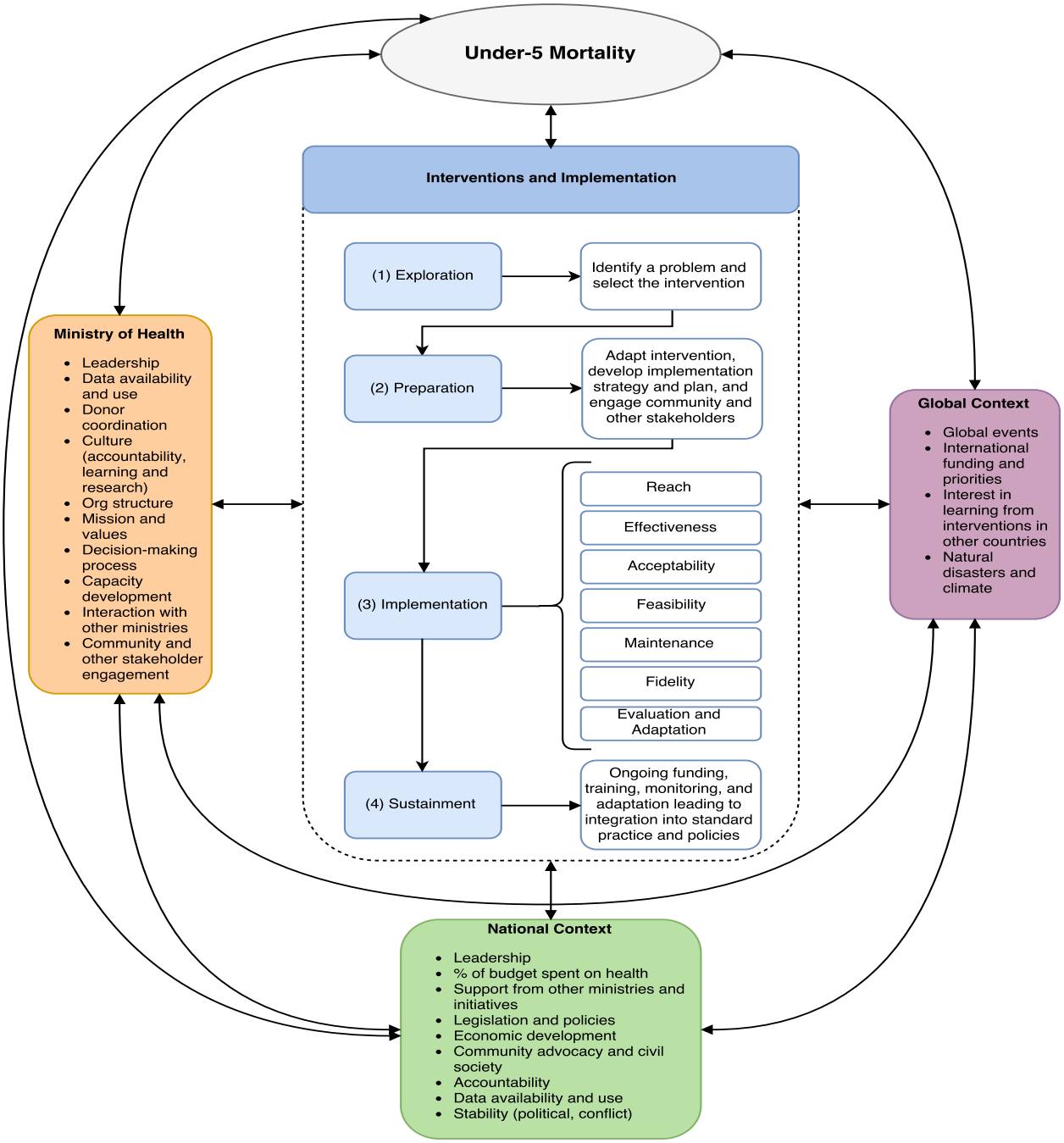

Figure 28. Framework for understanding interventions to reduce under-5 mortality (copyright UGHE)

Desk Review (Led by the Strategic Analysis, Research, and Training (START) Center at the University of Washington with in-depth support from UGHE team and Gates Ventures)

The team undertook an extensive review of available information and published data on the rates and progress of U5M, policies, strategies, specific EBIs available to potential exemplar countries, and the uptake and implementation of these EBIs in five exemplar countries defined as countries which have reduced U5M beyond expectations based on regional or resource comparators. Initial secondary research was performed through MEDLINE (PubMed) and Google Scholar, using the search terms "child mortality" or "under-5 mortality" and the country's name. Further searches included specific EBIs, CODs, or contextual factors as search terms (e.g. "insecticide-treated nets," "malaria," or "community health workers"). Initial desk research was synthesized and then reviewed by the UGHE team for accuracy and completeness. The desk review is an iterative process, with ongoing additions occurring throughout the primary research process. As noted, the initial review was limited to CODs felt to be "amenable" with effective interventions and targeted all U5M, from neonatal through infancy and early childhood. While maternal health is a critical determinant of child survival, given the extensive work already underway and the limited resources and time of the contract, we did not include an exhaustive review of these EBIs but focused on those more directly related to the childbirth period or primary data analysis. This will be supplemented by selected maternal interventions. We purposely did not include in-depth reviews of important broad interventions that contributed to U5M reduction including education, poverty reduction, water and sanitation, and programs designed to improve nutritional status. These will be captured as important contextual factors in the country case studies.

Primary Research

In collaboration with our in-country partner, Dr. Patricia Garcia, we identified KIs reflecting a broad range of experience and viewpoints. KIs were chosen based on the topics identified in the desk review and through other analyses in close collaboration with the in-country partner, prioritizing KIs able to provide information on the Exploration, Preparation, Implementation, Adaptation, and Sustainment (EPIAS) stages during the period of study. KIs included current and former MOH employees responsible for high-level strategic direction of the ministry or specific disease or intervention areas; implementing partners; and other multilateral organizations or donor organizations who had managed partner-supported or partner-led activities. Some informants represented more than one area or role based on their experience over the 16 years and were interviewed for each of their multiple viewpoints. We prioritized individuals active in the study period but were able to also capture some experiences from before 1995-2000 and after 2016.

Informed by the framework and review of relevant literature on contextual factors and implementation outcomes, we developed core interview guides for four main routes of inquiry.

1. Global and national level actors;
2. MOH actors;
3. Project managers and implementers for specific CODs or EBIs; and
4. Other partners

The interviews were designed to address the EBI implementation process, from exploration to preparation, implementation, adaptation, and sustainment. This included critical contextual factors at the relevant global, national, ministry, and local levels. The interviews also identified additional sources of data and information which could be added to the knowledge base and understanding already developed from the desk review. All interviews were led by study team members while operating recorders. Following the close of the interviews, tape recordings were transcribed. All interviews were conducted in Spanish with translation to English during transcription.

Human Subjects Review

The study was reviewed by the relevant IRBs in Rwanda and Peru. All key informants provided written informed consent before interviews were conducted and no data were identifiable in quotes.

Analysis and Synthesis

The UGHE team used a mixed methods explanatory approach, applying the framework to understand the progress (or lack thereof) for each COD and coverage of chosen EBIs, as well as facilitators and barriers at the local, national, and global levels. This approach aimed to create a better understanding of what, how, and why the Government of Peru was able to achieve success in decreasing U5M and what the challenges were. The analyses were also informed by the extensive work completed by other initiatives, including Countdown 2015, World Health Organization (WHO) maternal and child health initiatives, the International Center for Equity in Health, and others. Quantitative data sources used included Demographic and Health Survey (DHS), Global Burden of Disease (GBD) 2017, and Joint United Nations Programme on HIV/AIDS (UNAIDS).

Final Products

The work done by UGHE and Gates Ventures will result in new knowledge examining the implementation strategies for developing needed policies and identifying, adapting, and scaling EBIs, supporting and obstructing contextual factors from countries successful in reducing U5M using an implementation science approach. The final products will include (1) the generally-applicable implementation science framework shown here, (2) in-depth case studies of four exemplar countries using primary and secondary research, (3) case studies of three exemplar countries based on desk research and buttressed with light-touch primary research, and (4) a cross-country synthesis of insights from all seven exemplar countries. Although all countries deserve deeper research on and analysis of their successes in U5M reduction, limitations in resources and time bound the scope of this project. The work done related to these seven exemplar countries will serve as a proof of principle of the added value of applying implementation science to the research of U5M interventions and successes. The products from this work will be disseminated through a larger online platform created by Gates Ventures to highlight actionable lessons from exemplar countries on a variety of health topics.