Exemplars in Under-5 Mortality: Senegal Case Study

Dr. Agnes Binagwaho[1], Kelechi Udoh[1], Kateri Donahoe[1], Zaira Gasanova[2], Dr. Mohamadou Sall[3], Dr. Lisa R Hirschhorn[1,2]

[1] *University of Global Health Equity*
[2] *Feinberg School of Medicine, Northwestern University*
[3] *Université Cheikh Anta Diop de Dakar (UCAP), Institut de Population, Développement et Santé de la Reproduction*

20 May 2018

Table of Contents

List of Tables

List of Figures

Acknowledgements

We would like to acknowledge the following groups for their support throughout the research and development of this case study:

- Gates Ventures (formerly bgC3) and the Bill and Melinda Gates Foundation for oversight and funding support;
- The Institute for Health Metrics and Evaluation (IHME) and Simon Hay's team for creation of Local Burden of Disease under-5 and neonatal mortality rate maps;
- Cesar Victora and his team at the International Center for Equity in Health, Federal University of Pelotas, Brazil for equity analyses;
- Evaluserve for initial desk review development; and
- National and subnational level stakeholders, for providing valuable insight.

Abbreviations

ABCD	Atteindre les Bénéficiaires de la Communauté à travers les Districts [Reaching Community Beneficiaries across Districts]
ACT	Artemisinin-based combination therapy
AECID	The Spanish Agency for International Cooperation
AfDB	The African Development Bank
AGETIP	*Agence d'Exécution Travaux d'Intérêt Public* [Executing Agency for Public Interest Works]
AIDS	Acquired immune deficiency syndrome
ANC	Antenatal care
ANSD	L'Agence Nationale de la Statistique et de la Démographie [National Agency of Statistics and Demography]
AQ	Amodiaquine
ARI	Acute respiratory infection
ART	Antiretroviral therapy
ARV	Antiretroviral
BASICS	Basic Support for Institutionalizing Child Survival
BCG	Bacillus Calmette-Guérin
BEmONC	Basic emergency obstetric and newborn care
C4D	Communications for Development
CBHI	Community-based health insurance
CB-IMCI	Community-Based Integrated Management of Childhood Illness
CEmONC	Comprehensive emergency obstetric and newborn care
CFIR	Consolidated Framework for Implementation Research
CHW	Community health worker
CLM	Cellule de Lutte contre la Malnutrition [Malnutrition Control Cell]
CNP	Community Nutrition Program
CREN	*Centres de Récupération et d'Education Nutritionnelles* [Recovery and Nutritional Rehabilitation Centers]
CSO	Civil society organization
DHS	Demographic and Health Survey
DPT	Diphtheria-pertussis-tetanus
DSDOM	*Dispensateurs de santé à domicile* [home-based care providers]
EBI	Evidence-based intervention
eHIS	Electronic Health Information System
EPI	Expanded Program on Immunization
EPIS	Exploration, Preparation, Implementation, and Sustainment
FB-IMCI	Facility-Based Integrated Management of Childhood Illness
FDCP	Free Delivery and Caesarean Policy
GDP	Gross domestic product
HBB	Helping Babies Breathe
Hib	Haemophilus influenza type B vaccine
HIV	Human immunodeficiency virus
HMIS	Health Management Information System
IFA	Iron and folic acid

IHME	Institute for Health Metrics and Evaluation
IMCI	Integrated Management of Childhood Illness
IPT	Intermittent preventive treatment
IRS	Indoor residual spraying
ISAARV	The Senegalese Antiretroviral Drug Access Initiative
ITN	Insecticide-treated (mosquito) net
KI	Key informant
KII	Key informant interview
KMC	Kangaroo mother care
LBW	Low birth weight
LIC	Low-income country
LLINs	Long-lasting insecticide-treated nets
LMIC	Low- and middle-income country
M&E	Monitoring and evaluation
MDG	Millennium Development Goal
MNTE	Maternal and Neonatal Tetanus Elimination
MOH	Ministry of Health
MR	Measles-rubella
MTCT	Mother-to-child transmission (of HIV)
NGO	Non-governmental organization
ORS	Oral rehydration solution
ORT	Oral rehydration therapy
PAIN	*Paquet d'Activités Intégrées de Nutrition* [Package of Integrated Nutrition Activities]
PCV	Pneumococcal conjugate vaccine
PECADOM	*Prise en charge à domicile* [home-based management]
PEPFAR	President's Emergency Plan for AIDS Relief
PLWA	People living with AIDS
PMI	President's Malaria Initiative
PMTCT	Prevention of mother-to-child transmission
PNC	Postnatal care
PNDS	*Plan National de Développement Sanitaire* [National Plan for Health and Social Development]
PPP	Public-private partnership
PRN	*Programme de Renforcement de la Nutrition* [Nutrition Enhancement Program]
PRSP	Poverty Reduction Strategy Paper
RDT	Rapid diagnostic test
RHF	Recommended home fluids
RMNCH	Reproductive, Maternal, Newborn, and Child Health
SDG	Sustainable Development Goal
SIAs	Supplementary immunization activities
SOSEPED	*Societe Senegalaise de Pediatrie* [Senegalese Society of Pediatricians]
SP	Sulfadoxine/pyrimethamine
SPA	Service Provision Assessment
SUN	Scaling Up Nutrition
TOT	Training of trainers
TT	Tetanus toxoid

U5M	Under-5 mortality
UGHE	University of Global Health Equity
UN	United Nations
UNFPA	United Nations Population Fund
UNICEF	United Nations International Children's Emergency Fund
USAID	United States Agency for International Development
WASH	Water, sanitation, and hygiene
WHO	World Health Organization
ZACH	Zinc Alliance for Child Health

1 Executive Summary

1.1 Background

1.1.1 Exemplars in Global Health Under-5 Mortality Project

The Exemplars in Under-5 Mortality project aims to identify lessons from countries' successes in reducing under-5 mortality (U5M) to inform the decision-making of leaders, policymakers, and funders. The University of Global Health Equity (UGHE) is collaborating with Gates Ventures and the Bill & Melinda Gates Foundation to understand exemplar countries' successful reduction of U5M – a high priority issue within global health. The Exemplars in U5M project collaborated with the Institute of Population, Development and Reproductive Health at the Cheikh Anta Diop University Dakar to understand the reduction in U5M in Senegal. The project was 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 2016. We applied an implementation science lens and mixed methods to understand not just what was selected and quantitative outcomes, but also how and why the EBIs were implemented and the contextual factors which challenged or facilitated their impact and sustainability.

1.1.2 Senegal

Senegal is a country in West Africa bordered by Mali, Guinea, Guinea Bissau, the Republic of Mauritania, and the Atlantic Ocean to the west.[1] In 2016 most of Senegal's population identified as Muslim (94%), and the main ethnic groups included Wolof, Pular, Serer, Jola, Mandinka, and Soninke. The country's population was split almost equally between urban and rural areas with the urban population mainly residing in the Dakar area.[2] Senegal's population has grown steadily over time, doubling from 7.4 million in 1990 to 15.4 million in 2016.[3] Senegal's GDP per capita maintained an upward trend from US$877 in 2000, to US$1003 in 2010, and US$1092 in 2016. In 2016, Senegal had a significantly higher GDP per capita compared to its regional neighbors, such as Mali (US$746) and Guinea (US$780).[4] The Human Development Index in Senegal also increased from 0.380 in 2000 to 0.499 in 2016 with similar gradual improvements in the proportion of its population living below the poverty line, which dropped from 55.2% in 2001, to 48.3% in 2005, and 46.7% in 2011.[5]

During a significant portion of the study period (mainly until 2014, and sporadically afterwards), Senegal experienced separatist conflict in the predominantly Christian Casamance region in the south which resulted in loss of lives. Although these challenges may have slowed the uptake and scaling of some interventions within the region, the country experienced a sharp decrease in U5M across wealth quintiles, although inequity persists.[6] According to IHME estimates, U5M dropped from 115 per 1,000 live births in 2000 to 49 per 1,000 live births in 2016, a decline of 57%. Senegal's Demographic and Health Survey (DHS), however, showed that U5M dropped from 139 per 1,000 live births in 1997 (closest available date) to 51 per 1,000 live births in 2016, a decline of 63%.[2] This reduction in U5M greatly exceeded expectations based on GDP growth and U5M reduction rates regionally and globally. Although the

reduction in neonatal mortality was less dramatic, with a decline of 45% from 38 deaths per 1,000 live births in 2000 to 21 deaths per 1,000 live births in 2016 according to IHME estimates. Senegal's DHS showed that neonatal mortality dropped from 37 per 1,000 live births in 1997 (closest available date) to 21 per 1,000 live births in 2016, a decline of 43%. These figures surpass figures within sub-Saharan Africa and in low-income countries (LICs) more broadly, which experienced a decline in neonatal mortality from 2000 to 2016 of 32% (from 41 to 28 deaths per 1,000 live births) in sub-Saharan Africa and 34% (41 to 27 deaths per 1,000 live births) across LICs.[4]

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 Senegal's general political, cultural, and economic context as well as EBIs implemented to reduce U5M. The UGHE team partnered with an in-country consultant – the Institute of Population, Development, and Reproductive Health at the Cheikh Anta Diop University – to conduct and analyze 23 key informant interviews (KIIs) with policymakers, implementers at the national and subnational level, and partners in Senegal, to understand the implementation strategies, policies, and contextual factors most relevant to the success in reducing U5M in Senegal. 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 (University of Washington) were used to understand changes in equity for mortality and EBI coverage.

1.2 Key Findings

1.2.1 Coverage and Equity of Selected Under-5 Mortality Interventions

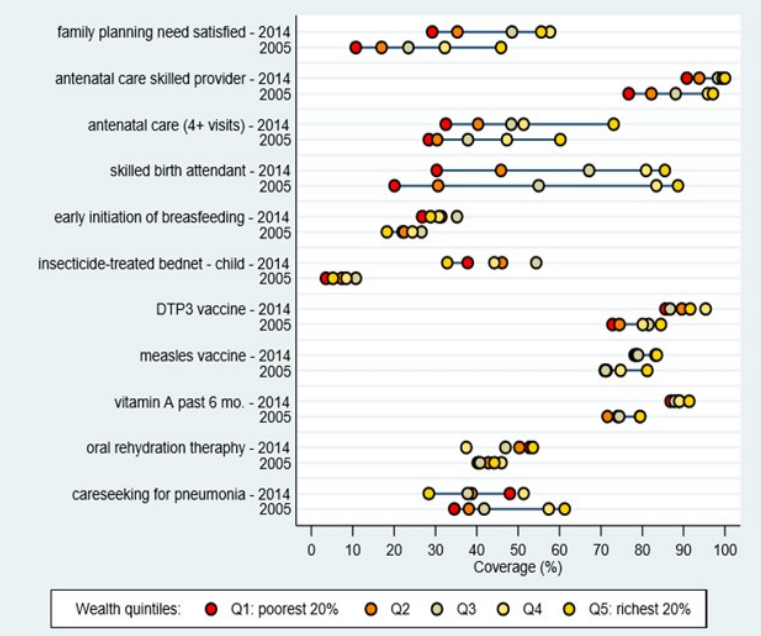
Senegal was found to have implemented many of the EBIs designed to reduce U5M in low- and middle-income countries. Many of the EBIs were implemented and sustained using a group of strategies described below, successfully achieving national scale-up and associated improvements in the causes of death and diseases targeted. Some examples included care-seeking for pneumonia and diarrhea, selected vaccinations (e.g. PCV and Hib, as part of pentavalent vaccine) that achieved and sustained high coverage, and facility-based delivery (see Table 1). However, some EBIs were implemented with inconsistency of coverage and variability of integration into a sustainable national scale strategy, resulting in gaps in effective coverage and sustainability. For example, some EBIs were piloted in selected districts but did not reach national scale, such as the Community-based Maternal and Newborn Health and Nutrition project. The incidence of a number of underlying conditions decreased, including diarrhea, fever, and acute respiratory infections (ARIs). Coverage of other EBIs showed improvement, including tetanus protection at birth and HIV-testing during ANC or labor, with demonstrated results. Inequity of coverage was seen among the different wealth quintiles in some indicators, including satisfaction of family planning need and attendance of four or more ANC visits, although some success was achieved in narrowing the equity gaps for ANC with a skilled provider, skilled birth attendance, measles, and vitamin A (Figure 1).

Table 1: Coverage of Selected EBIs In Senegal (Based on Available Nationally Representative Data) (2000-2016) (STAT Compiler, WHO)

U5 Causes of Death	Intervention	2000*	2005	2010	2012	2014	2015	2016
Acute Respiratory Infections	Children with symptoms of ARI taken to health facility	-	49%	46%	47%	47%	49%	51%
	Children with Symptoms of ARI who received antibiotics	-	-	30%	31%	36%	30%	36%
	Vaccination: 3 doses of PCV	-	-	-	-	81%	89%	93%
	Vaccination: Hib (as part of Pentavalent)	-	-	94%	-	-	-	95%
	U5 with symptoms of ARI – 2 weeks preceding survey	**-**	**13%**	**5%**	**3%**	**3%**	**4%**	**3%**
Diarrheal Diseases	Oral rehydration therapy (ORS or RHF)	-	26%	26%	21%	24%	33%	20%
	Vaccination: 3 doses of Rotavirus	-	-	-	-	-	83%	93%
	Children with diarrhea taken to health facility	-	21%	35%	39%	33%	41%	35%
	U5 with diarrhea – 2 weeks preceding survey	**-**	**22%**	**21%**	**14%**	**19%**	**18%**	**15%**
Malaria	Household ownership of ITN	-	20%	63%	73%	74%	77%	82%
	Proportion of under-5 children who slept under ITN night prior to the DHS survey	-	7%	35%	46%	43%	55%	67%
	Advice or treatment for fever sought from a health facility or provider	-	43%	42%	44%	44%	43%	45%
	Treatment of children with fever by artemisinin-based combination therapy (ACT)**	-	-	3%	1%	1%	0.4%	2%
	U5 with fever – 2 weeks preceding survey	**-**	**30%**	**23%**	**17%**	**11%**	**15%**	**13%**
Measles	Measles vaccination coverage		74%	82%	78%	80%	79%	81%
Malnutrition	Exclusive breastfeeding from 0-5 months	-	34%	39%	38%	32%	33%	36%
	U5 receiving vitamin A supplements in the six months preceding survey	-	-	78%	84%	89%	88%	78%
	U5 stunted	-	20%	27%	19%	19%	21%	17%
	U5 wasted	-	9%	10%	9%	6%	8%	7%
	U5 underweight	-	14%	18%	16%	13%	16%	14%
HIV	HIV counselling during ANC	-	-	27%	-	-	33%	28%

	HIV-testing during ANC or labor and results received	-	32%	36%	-	-	52%	52%
Other Vaccine Preventable Diseases	Full vaccination coverage with 3 doses DPT, 3 doses polio, measles and BCG	-	59%	63%	70%	74%	68%	70%
Neonatal Causes of Death	Total fertility rate (15-49)	-	5	5	5	5	5	5
	Teenagers who are pregnant with their first child	-	4%	3%	3%	4%	3%	3%
	Tetanus protection at birth	-	-	69%	82%	84%	84%	82%
	Antenatal care: 4+ visits by a skilled provider	-	40%	49%	46%	47%	46%	53%
	Delivery attended by skilled provider	-	53%	65%	51%	60%	53%	60%
	Facility based delivery	-	64%	73%	72%	78%	75%	77%
	Delivery by Caesarean section	-	4%	5%	4%	6%	5%	5%
	Newborn's 1st PNC in first two days after birth	-	-	-	-	-	50%	53%
	Doctor/nurse/midwife provided 1st PNC	-	-	-	-	-	21%	27%
* Data not available for 2000 ** Data not available for children with diagnosed malaria								

Figure 1: Senegal's Equity Profile – Coverage of Selected Under-5 Mortality Interventions (Source: Countdown2030 Equity Profile)



1.2.2 Common Implementation Strategies

We identified a number of implementation strategies that were applied to many of the EBIs, though some strategies were implemented with variable success, such as integrating equity into implementation. Commonly identified strategies included:

- National leadership and accountability
- Pilot testing prior to national scale-up
- Leveraging a strong existing community-based care delivery system
- Leveraging existing programs and systems by integrating or building onto them
- Engagement and coordination of implementing partners and donors
- Adaptation of interventions to local setting
- Community engagement and sensitization
- Integrating equity focus into policy and implementation
- Removal of user fees or provision of free access for many EBIs
- Data systems strengthening
- Supporting data use for decision-making
- Supply chain strengthening

1.2.3 Examples of Implementation of EBIs to Address Major Causes of Death

Modeling from IHME found that throughout the period of interest (2000-2016), major amenable causes of death included diarrhea, respiratory infections, and malaria. Mortality rates for each of these causes of death decreased over this time period as Senegal implemented many of the EBIs that addressed the major causes of death: diarrhea, malaria, and respiratory illness. Before or during the study period, other vaccination and maternal care EBIs were also implemented. The work to reduce U5M in Senegal also included initiatives addressing underlying causes of under-5 death such as water, sanitation, and hygiene (WASH) practices, which may have contributed to the decline in mortality. Responding to a slower decline in neonatal mortality as a growing proportion of under-5 deaths occurring in this age group, Senegal also targeted expansion of already implemented EBIs such as Facility-Based Integrated Management of Childhood Illnesses (FB-IMCI) to include a neonatal focus (FB-IMNCI) in 2016. Similar to many other countries and reflecting the increased proportion of under-5 deaths in neonates, the relative proportion of neonatal causes of death has increased. Below, we describe three illustrative EBI implementations and the implementation strategies chosen to represent examples of the application of core implementation strategies. Complete descriptions of the range of initiatives can be found in the full report.

Community-Based Integrated Management of Childhood Illness

In the early 2000s, because of Senegal's need to extend case management of childhood illness beyond health facilities to the community level and to ensure better access for rural and harder-to-reach populations, it explored community-based treatment of respiratory infection. The plan was to build Community-Based Integrated Management of Childhood Illness (CB-IMCI) onto the existing community-based government malaria program to expand community health workers' (CHWs) roles to include delivery of community-based care that addressed diarrhea and ARIs. This decision was met with some opposition by stakeholders within Senegal, particularly with respect to the use of antibiotics by CHWs. In

response, a pilot test of CB-IMCI was carried out between 2003 and 2004, with additional advocacy efforts made to health care professionals. The pilot's success led to the national scale-up of CB-IMCI in 2006 with the development of guidelines, training of trainers (TOT), and supply chain strengthening. Between 2006 and 2010, Senegal adapted its CB-IMCI program and updated guidelines to reflect local evidence and international recommendations. For example, the program changed malaria treatment from sulfadoxine/pyrimethamine (SP) and amodiaquine (AQ) to artemisinin-based combination therapy (ACT) in 2006, following World Health Organization (WHO) recommendations.[8,9] In 2008, recognizing that there were harder-to-reach populations in the south and southeast with high malaria morbidity and mortality, Senegal introduced another cadre of CHWs – DSDOMs (*dispensateurs de santé à domicile,* home-based care providers) – to the CB-IMCI program, to test and treat malaria cases within homes. In 2012, DSDOMs' roles were expanded to include pneumonia.[8] A study of the quality of CB-IMCI implementation in Senegal found that 90% of ARI cases managed by CHWs were correctly classified as pneumonia, well managed with cotrimoxazole and/or referred in severe cases, and well followed up.[10] However, as shown in Table 1, care-seeking for diarrhea, fever, and ARIs only showed a minimal increase between 2005 and 2016. National scale of CB-IMCI was close but not achieved (65 of 76 districts, 86%).

Pneumococcal Vaccination

In 2000, GAVI began supporting the introduction of pneumococcal vaccination (PCV) into the immunization programs of developing countries, although WHO did not recommend its introduction until 2007.[11] Between 2007 and 2008 a surveillance study was commissioned to produce local data to inform recommendations for which PCV vaccine type would be most suitable for Senegal's epidemiological context. This study found PCV13 to be the most appropriate vaccine type for Senegal.[12] Following the study, the process of preparing for the introduction of PCV13 began with planning and budgeting, calculating vaccine supplies required, and assessing cold and supply chain capacity.[12] Other preparations involved developing a communication plan for providers and community engagement, training guides, and adaptation of existing Expanded Program on Immunization (EPI) data systems for monitoring and evaluation (M&E). Reflecting country ownership, Senegal also increased its budget line for vaccines and consumables and committed to raise the budget by 15% between 2012 and 2015 to accommodate the introduction of PCV. Using data from cold chain assessments, which revealed that Senegal did not have the capacity to receive the PCV products, introduction was delayed from 2012 to 2013. In 2013, Senegal became the 34th of the 73 GAVI-eligible countries to introduce PCV13 into its routine immunization program. Initial and ongoing trainings were carried out, as well as supervisory visits and monitoring of adverse effects following immunization. PCV immunization coverage among 1-year-olds in Senegal was 81% and 89% in 2014 and 2015, respectively, and reached 93% by 2016.

Insecticide-Treated Nets

Insecticide-treated nets (ITNs) had been used in Senegal prior to 1998 but were mainly provided by small-scale, donor-supported initiatives. A government-led ITN program was introduced to Senegal in 1998 with support from USAID. To ensure feasibility, the program adopted a strategy of selling nets at a subsidized cost through agreements between private sector net distributors and facility health committees.[9] Preparation activities for the introduction of the subsidized ITNs included social marketing activities

through pharmacies, petrol stations, and various smaller scale community-level vendors to promote the nets. An ITN module for CHWs was also incorporated into routine National Malaria Control Program trainings, reflecting a focus on sustainability. Between 1998 and 2008, Senegal implemented its ITN program by selling subsidized nets. Social marketing activities employing both in-person and mass media campaigns, also used during the preparation phase, were used to engage communities and increase acceptability and sale of ITNs at pharmacies and other vendors. The nets were sold for 500CFA (approximately US$0.88 in 2008) at health facilities and 1000CFA (approximately US$1.76 in 2008) at pharmacies.[14] By 2007, reflecting a focus on equity, Senegal introduced mass distribution of free nets in addition to sales of subsidized nets to ensure universal coverage. This decision was made in response to the WHO's recommendation for free large scale distribution as a useful strategy for malaria control as well as the selection of Senegal as a President's Malaria Initiative (PMI) country in 2007.[9,15] The proportion of children under 5 who slept under an ITN the night prior to the DHS survey increased from 7% in 2005 to 35% in 2010, just before a national campaign, and rose to 55% in 2015 and 67% in 2016.[7] Household ownership of ITNs increased from 20% in 2005 to 63% in 2010 and 82% in 2016.[7] However, the ITN program continues to experience challenges. For example, in 2016, after the study period ended, research found that the distribution of nets in some regions (e.g. Dakar) was delayed during a mass distribution campaign.[9]

1.3 Cross-Cutting Contextual Factors

A number of contextual factors that impacted the implementation of many of the EBIs associated with the drop in U5M in Senegal were identified. These factors were critical in creating the environment and providing the support that contributed to the country's success, directly or indirectly. These factors also represented barriers to success in achieving equitable and quality coverage. At the national level, these facilitating contextual factors ranged from strong leadership and accountability, which was reflected in goal and priority setting; ownership of U5M EBIs; data availability and use; and the roles of the donors and availability of financial and non-financial resources to address U5M. Although mostly driven by the central level, many of these factors were also reflected at the subnational level. These cross-cutting contextual factors broadly include:

1. Effective Leadership and Control – Setting Clear Goals and Policies: While most active and effective nationally, leadership, with associated responsibility and accountability, cascaded to the ministry, subnational, and local levels. This leadership and commitment resulted in local authority and ownership of interventions and willingness to continue to adapt implementation to challenges encountered. This commitment to effective leadership within and beyond the Ministry of Health (MOH) was often reflected in key policies and strategies, such as the action-planning meetings at all levels, the government's investment in U5M initiatives, and oversight provided by non-MOH ministries through quarterly technical and financial supervision provided by the Ministry of the Interior to non-governmental organizations (NGOs) and civil society organizations (CSOs). Further, Senegal's strong leadership influenced the setting of clear goals and priorities related to U5M reduction. These goals and priorities were further reflected in specific data-driven policies and plans developed and/or implemented in Senegal within the time period, such as the

Paquet d'Activités Intégrées de Nutrition (PAIN, 1998) and the Free Delivery and Caesarean Policy (FDCP, 2005).

2. **Donor and Implementing Partner Resources:** Various multilateral organizations, such as the World Bank, GAVI, the Global Fund, the PMI, and USAID, invested in Senegal's U5M initiatives between 2000 and 2016. While donor and partner funding was mainly a facilitator, where it was time-limited it created disruptions in the implementation of programs (e.g. the initial implementation of FB-IMCI). Beyond funding, these donors and partners were key collaborators, technical advisors, and implementers of U5M reduction activities in Senegal, as noted below.
3. **Donor Coordination and Multisectoral Approach:** Coordination and collaboration between the MOH, implementing partners, donors, and other ministries was a major facilitator of U5M reduction in Senegal (e.g. for FB-IMCI, CB-IMCI, and PCV), although the number of projects that did not scale or sustain would demonstrate that this was also at times a failure. For example, donor-funded stand-alone oral rehydration solution (ORS) programs in Senegal post-2000 did not reach scale as a result of limited coordination, which caused limited funding of ORS by the government and supply stock-outs. The main coordination forum for the different stakeholders working within U5M reduction was the Reproductive, Maternal, Newborn, and Child Health (RMNCH) cluster, which was headed by the MOH.
4. **Community Engagement and Activism:** Multiple advocacy initiatives contributed to ensuring accountability in U5M reduction in Senegal. These advocacy initiatives produced evidence of insufficiencies and gaps in service delivery at the community level in Senegal and contributed to training citizens to effectively communicate with decision-makers on U5M-related issues.[16]
5. **Country and Local Ownership:** The sense of ownership was reflected at the national and community level, mainly fostered by the government's efforts to engage communities in developing and implementing EBIs. Other contributors to this sense of ownership at the community level included the government's move to decentralize the health system and the status associated with delivering care within the community.
6. **Strengthening Community Health Systems and Structures:** Senegal worked to extend access to services at the community level, encourage community engagement in health care delivery, improve effectiveness of services, and make governance and management more effective at the community level.
7. **Data Availability, Quality, and Use:** Senegal has a long history of valuing data and has been conducting standard DHS since 1986, with more recent work to do a continuous DHS since 2011.[17] Data collected were used to monitor and evaluate the implementation of multiple national programs, including EBIs aimed at U5M reduction, against predefined performance and coverage indicators. Senegal's strong surveillance system across program areas, including IMCI and vaccines, was also an important factor in its successes at reducing U5M. For example, for FB-IMCI, the surveillance unit of the National Malaria Control Program recommended the switch from chloroquine to SP and AQ in 2003, based on increasing resistance to chloroquine.
8. **Water, Sanitation, and Hygiene:** The MOH's efforts to improve U5M-related indicators between 2000 and 2016 were complemented by corresponding improvements in sanitation and water facilities. Access to sanitation services increased from 38.5% in 2000 to 48.4% in 2015 and the

proportion of people with basic drinking water services increased from 61.6% in 2000 to 75.2% in 2015.[4]

9. Conflict and Harder-to-Reach Areas (Barrier): The Casamance conflict in the south and harder-to-reach geography in the southeast limited U5M efforts, which is reflected by an inequity of U5M rates in Senegal.

1.4 Challenges

Despite the progress made, Senegal has been challenged by a number of factors that have limited U5M reduction efforts, prevented them from achieving equity in coverage, and pose potential threats to sustaining and continuing progress. These include:

- Lack of consistent availability of key equipment at health facilities, with implications for neonatal mortality figures. However, after the study period, Senegal increased its focus on neonatal mortality reduction with an accompanying improvement in equipment availability at facilities (e.g. for neonatal corners).
- Senegal's ongoing dependence on donor funding for much of its U5M reduction programs, which has implications for sustainability of key programmatic activities, including supervision. This has continued to result in pilot or smaller scale projects, which do not always reach national coverage even when effective.
- The government continues to work to reduce the large levels of out-of-pocket spending by expanding the Mutuelle de Santé scheme, which began in the 1990s, in addition to providing a number of free services for women, children under 5, and individuals over 60. Nonetheless a proportion of the population, mainly rural, still do not have access to care because they cannot afford the costs. In 2010-2011, most women (94%) and men (92%) interviewed had no medical coverage.[17] This challenge of health care costs began to be addressed with the introduction of the Universal Health Coverage program in 2014.
- Senegal has continued to experience challenges with equity of coverage of EBIs, such as wealth quintile disparities in mosquito net use.

1.5 Transferrable Knowledge for Other Countries

There are a number of replicable strategies from Senegal that would be relevant for other countries looking to accelerate declines in U5M learning from Senegal's successes and challenges. These include building a strong community health program, which was used to integrate multiple initiatives and expand access and community engagement; building on existing health system capacity through integrating new initiatives; generating local evidence to inform implementation of new EBIs; planning and adapting for equity; and consultation and engagement with stakeholders. Others include multisectoral collaboration to address health and health-related determinants; investment in health; planning for sustainability; and private sector engagement.

Areas of strength and recognized challenges:

1. Develop and/or ensure community health worker programs with standardized education, management, and accountability systems that involve community members and health professionals

The CHWs were repeatedly noted as key implementers of U5M EBIs in Senegal with multiple EBIs incorporated into their scope of work. The success of the CHWs was also related to the strong governance structure that involved nurses at health posts in education and supervision as well as participation of the community – who chose the CHWs and funded the building of health huts – and the authority and respect they maintained within the communities. Senegal's adaptability to current needs and demands, including introducing and adjusting CHW remunerations for motivation and sustainability (e.g. for CB-IMCI and the Programme de Renforcement de la Nutrition – the Nutrition Enhancement Program, or PRN) and introducing additional cadres (bajenou gokh and DSDOM), were also key to its success.

2. Integrating new initiatives by building on existing health system capacity while strengthening the underlying health system

Integration of new initiatives into existing structures and previous initiatives was important to reduce risk for vertical projects and duplication of work, while providing resources to increase overall capacity. This was at the local and subnational care delivery level and the central level in protocols, policies, and management. Notable examples of this include:

- CB-IMCI was integrated into the existing community health system involving three existing cadres of CHWs: agents de santé communautaires, matrones, and relais communautaires.
- Integration of additional diseases into existing surveillance systems. For example, the measles surveillance system leveraged existing polio surveillance systems and employed the existing network of agents de santé communautaires and relais communautaires.

3. Strengthening and building existing health information systems to assess need and monitor effectiveness and coverage of new EBIs

- Prior to the national switch to ACT, Senegal spent two years doing a pilot, led by the Cheikh Anta Diop University, in Oussouye District. This district was selected because it was a Health and Demographic Surveillance Site and could support the collection of surveillance data throughout the pilot testing. A one-year pilot test of rapid diagnostic tests (RDTs) in Senegal was also carried out in the same district, to leverage the existing surveillance system.
- After the introduction of the rotavirus vaccine, Senegal's rotavirus-caused diarrhea sentinel surveillance system monitored its impact.

4. Using evidence-based decision-making to determine need and appropriateness of EBIs, and create policies and implementation strategies based on global and local scientific evidence; balancing the need for local evidence with the strength of existing global evidence and prioritizing rapid adoption and scale-up of EBIs where appropriate

Senegal had a practice of exploring globally emerging EBIs (such as the IMCI strategy) and then requiring local research to determine appropriateness before deciding to implement. Pilot testing to determine feasibility, effectiveness, or acceptability of potential EBIs before scale-up was also strongly favored in

Senegal. However, the country recognized the importance of rapid introduction and scale-up of EBIs that did not require much context-specific adaptation and had a history of acceptability of similar EBIs, such as rotavirus vaccine and PCV, which were rapidly introduced and scaled because of high acceptability of vaccines. Further, in cases where local data already existed, Senegal did not conduct additional research, instead using these data. For example, adaptation of the disease-management component of WHO IMCI protocols was based on existing Senegal-specific data. Specific lessons included:

- *Prioritization of local evidence*
    - Senegal adopted new EBIs based on local research to determine appropriateness and feasibility, and to inform program design. For example:
        - A randomized, placebo-controlled, double-blind trial in Niakhar, Fatick region in 2005 led by the parasitology laboratory at Cheikh Anta Diop University found that giving chemo-prophylactic malaria treatment (one dose of SP and one dose of artesunate) to children under 5 reduced the incidence of malaria by 86%; this research was used to inform the design of the children's intermittent preventive treatment (IPT) program.
        - The IMCI nutrition sub-working group employed the "Trials of Improved Practices" approach across four districts in different regions of Senegal to identify their feeding practices and beliefs and assess their purchasing power as the basis for designing the nutrition component of FB-IMCI for a trial period.
        - Senegal's introduction of the rotavirus vaccine was delayed because the country prioritized the introduction of PCV, based on disease burden data and country vaccine capacity. In addition, PCV was introduced at scale without any pilot testing based on acceptability and strength of global evidence.
    - Senegal pilot tested selected EBIs (before scale-up) in districts chosen to determine feasibility, effectiveness, and acceptability. For example:
        - For FB-IMCI, districts were chosen if they had relatively high U5M rates, if there was availability of partners already working within the districts to support the process, and if they were harder-to-reach areas.
    - Senegal adapted EBI eligibility criteria and EBI guidelines based on emerging local data. For example:
        - Use of local data to adjust criteria for areas eligible for the children's IPT program.
        - Use of surveillance data from the National Malaria Control Program to adapt malaria treatment from chloroquine to a combination of SP and AQ.
        - Senegal identified the high cost of treating malaria without confirmatory tests, and introduced RDTs for confirming malaria cases before treating, three years earlier than the 2010 WHO recommendations.
        - Senegal moved away from deltamethrin (for indoor spraying) based on local resistance data.

5. Planning for equity from the beginning and adapting systems for equity

Senegal constantly implemented systems to address equity with variable success. Specific examples of successes and failures include:

- *Ensuring financial accessibility through systems designed to safeguard equity*
    - Senegal employed strategies such as free distribution and subsidization of commodities to priority populations to ensure equity of coverage, such as IPT and ITNs for children and pregnant women, and HIV treatment.
    - Success was limited in certain areas. For example, since the 1970s, Senegal has employed risk pooling schemes including mandatory employer-based insurance, public subsidies for specific services and population groups, and voluntary community-based health insurance (CBHI) to ensure financial access to health care for its citizens. However, as of 2010-11, most women (94%) and men (92%) had no medical coverage.[17]
- *Integrating an equity agenda into program implementation decisions*
  Senegal focused on high-risk areas for tetanus vaccination and the poorest regions for initial implementation of the FDCP.
- *Adapting existing systems to ensure equity: Ensuring geographical accessibility through adapting existing systems*
  The National Malaria Control Program introduced the PECADOM program, which included another cadre of CHWs. DSDOMs were added to the CB-IMCI program to test and treat malaria cases within homes in harder-to-reach areas like Kedougou and Tambacounda. Reflecting Senegal's integration strategy, they were also later trained to manage pneumonia.
- *Redesigning information systems to reflect focus on equity*
  One major adaptation for the introduction of rotavirus vaccine was the disaggregation of vaccination data by sex in order to track gender equity.

6. Consultations and participation: Engaging and consulting stakeholders and leveraging their expertise, including MOH, other sectors, donors, academics, implementing partners, and communities

This approach ensured both better acceptability and potential for scale through broad engagement at the start and leveraging of available technical knowledge. This was typically done through technical working groups as well as identifying technical experts to lead the pilot testing, which was characteristic of the start of implementation of selected EBIs. The scope of engagement included pilot testing and program design, technical support during implementation, and adaptation of existing EBIs.

- *Leveraging and coordinating donor and implementing partner activities*
  Senegal has had significant donor support, which has driven a number of effective initiatives. However, a number of others were never scaled nationally or were suspended because of the lack of coordination (for example the ORT programs), and challenges were experienced when the funding available from donors was time limited (such as Basic Support for Institutionalizing Child Survival, or BASICS, for FB-IMCI). Some lessons include:
    - Leveraging donors during the exploration phase: In 1996, at the request of the Government of Senegal, WHO organized several meetings at the national level to present the IMCI approach.

- Leveraging donors during the preparation phase: For implementing FB-IMCI, Senegal invited WHO experts for a preliminary visit to assess its readiness for implementing the strategy. A working group was set up to guide the preparation process with support from USAID, WHO, and UNICEF. Similarly, preparations for the children's IPT program involved the development of policies, guidelines, protocols, and data collection tools with support from the Global Fund, USAID, and UNICEF.
- Leveraging donors and implementing partners throughout implementation: Intervention harmonization workshops were useful platforms for donors and implementing partners to align with government stakeholders in the implementation of FB-IMCI. Also, GAVI co-funded the initial and ongoing implementation of rotavirus vaccine and PCV programs while WHO, UNICEF, and USAID provided technical support.

- *Leveraging national and local stakeholders, including academics*
  Senegal leveraged its academics and program implementers through discussions during exploration and preparation and throughout implementation. Specific examples include:
  - Cheikh Anta Diop University led the pilot test of the introduction of ACT into the FB-IMCI program. Similarly, the CB-IMCI pilot was designed by a professor of pediatrics at the Cheikh Anta Diop University.
  - An indoor residual spraying (IRS) steering committee was set up to include representatives from Cheikh Anta Diop University.
- *Ensuring focus on communities in program design and implementation*
  Senegal integrated a focus on communities into the design of its U5M reduction programs, such as inclusion of mothers (and caregivers more broadly) in decisions regarding their children's care as part of the IMCI approach. Other examples include:
  - Community engagement, education, and sensitization for the introduction of rotavirus vaccine and PCV.
  - Social marketing activities employing both in-person and mass media campaigns to engage communities in order to increase the sales of ITNs at pharmacies and other vendors.
  - Community engagement through awareness-raising campaigns involving a variety of door-to-door and community-wide outreach activities to improve ITN use.
  - Setting up refusal case management committees for the children's IPT program.
  - Community control of the ongoing selection of CHWs.

7. Multi-sectoral collaboration to address health and health-related determinants

Through engagement of multiple sectors, Senegal addressed health determinants of U5M (e.g. through WASH programming).

8. Investing in health systems

Between 2000 and 2015, Senegal invested in its health system with total health expenditure per capita increasing from US$22 to US$36 overall. While per capita increased from US$22 to US$40 between 2000 and 2010, it declined to US$36 in 2015. Senegal's domestic health expenditure, as a percentage of overall

health expenditure, fluctuated between 2000 and 2015, peaking at 45.13% in 2006 (from 36.75% in 2000) and dropping to 26.46% in 2013, although this increased to 31.75% in 2015.[4] Despite these investments, donor funding continued to be used for a significant portion of U5M reduction programs. More detailed data on donor funding for health were not found.

9. Planning for sustainability

Senegal used a range of strategies to ensure sustainability, which largely focused on integration. Other examples include integration of new EBIs into the national development plan. For example, Senegal integrated IMCI into the National Plan for Health and Social Development (PNDS) (1998-2007). IPT for pregnant women was integrated into the National Malaria Control Program policy and Senegal's Reproductive Health policy and guidelines were developed based on WHO standards. Training modules on new EBIs were integrated into existing training guides. As an example, rotavirus and other new vaccine training modules were integrated into routine immunization trainings in Senegal for both newly recruited health workers and annual refresher trainings for existing health workers.

10. Private sector engagement

Senegal engaged its private sector to expand access through public-private partnerships (e.g. with a mining company for expansion of diarrhea treatment). In addition, oversight of the private sector service delivery takes place through the division of private health facilities within the directorate of health facilities at the MOH. However, this has not always been successful. For example, a private organization's – l'Agence d'Exécution de Travaux d'Intérêt Public – implementation of the Community Nutrition Program experienced efficiency and effectiveness challenges due to the organization's limited reach and relative absence of a national-level body to lead the implementation of the program.

1.6 Conclusions

Senegal has achieved remarkable drops in U5M and neonatal mortality despite ongoing challenges with equity and coverage of some EBIs. Effective leadership and control, donor engagement and coordination, integration of new initiatives into existing systems, data systems strengthening and data use, community engagement, planning for sustainability, and investment in health systems were identified as some of the facilitators of this drop. However, challenges remain, such as overreliance on donor funding, inadequate reflection of policy at the service delivery level, and significant out-of-pocket spending on health care, despite efforts to improve medical insurance coverage.

Etudes comparatives en matière de réduction de la mortalité des moins de 5 ans: cas du Sénégal

1 APERCU GENERAL

1.1 Contexte

1.1.1 Le Projet « Exemplars in Global Health Under-5 Mortality »

Ce projet vise l'identification des leçons sur les succès réalisés par des pays dans la réduction de la mortalité chez les enfants de moins de 5 ans dans le but d'inspirer les décisions des dirigeants, des décideurs politiques ainsi que des bailleurs de fonds. L'UGHE coopère avec Gates Ventures ainsi qu'avec la Fondation Bill & Melinda Gates pour appréhender les succès exemplaires des pays dans la réduction de la mortalité dans le groupe d'âge de moins de 5 ans (« U5M » ou MM5) – une question de haute priorité dans la santé mondiale. Le Projet « Exemplars » a coopéré avec l'Institut pour la Population, le Développement et la Santé Reproductive au sein de l'Université Cheikh en vue de comprendre la réduction de la MM5 au Sénégal. Le projet est conçu pour identifier et vulgariser des stratégies transversales de mise en œuvre des leçons tirées des politiques pouvant être adaptées et adoptées dans d'autres pays qui travaillent pour réaliser un progrès similaire. Le champ d'application se limite aux décès exploitables dans la prestation et la qualité des soins de santé et se concentre sur l'adoption d'interventions fondées sur des preuves (« EBI ») recommandées pour réduire le taux de mortalité des moins de 5 ans entre 2000 et 2016. Nous avons appliqué des lentilles de la science de mise en œuvre ainsi qu'un mélange de méthodes pour appréhender non seulement ce qui avait été sélectionné et les résultats quantitatifs, mais aussi de quelle manière et pour quelles raisons les EBI ont été mises en œuvre ainsi que les facteurs contextuels qui ont défié ou facilité leur impact et leur durabilité.

1.1.2 Le Sénégal

Le Sénégal est un pays d'Afrique de l'Ouest bordé par le Mali, la Guinée, la Guinée Bissau, la République de Mauritanie, ainsi que par l'Océan Atlantique à l'Ouest.[1] La majeure partie de la population sénégalaise est musulmane (94%), et les groupes ethniques les plus importants sont les Wolof, les Pular, les Serer, les Jola, les Mandinka, ainsi que les Soninke. La population est presque à part égale urbaine et rurale avec une population urbaine résidant principalement dans la région Dakar.[2] La population du Sénégal a connu une forte croissance sur le temps, doublant de 7,4 millions en 1990 à 15,4 millions en 2016.[18] Le PIB par tête du Sénégal a conservé une tendance à la hausse de $877 US en 2000 à US$1003 en 2010, et US$1092 en 2016. En 2016, le Sénégal disposait d'un PIB par habitant significativement supérieur à celui de ses voisins régionaux comme le Mali (US$746) et la Guinée (US$780).[4] L'Indice de Développement Humain avait également connu une croissance passant de 0,380 en 2000 à 0,499 en 2016 avec des améliorations graduelles semblables au sein de la proportion de sa population vivant en dessous du seuil de la pauvreté qui était tombée de 55,2% en 2001 à 48.3% en 2005 et 46,7% en 2011.[5]

Au cours d'une partie importante de la période d'étude (principalement jusqu'en 2014, et de manière irrégulière par la suite), le Sénégal a connu un conflit de nature séparatiste dans sa région à prédominance chrétienne à savoir la Casamance au Sud avec pour conséquence des pertes en vies humaines. Même si ces défis pourraient avoir ralenti l'absorption et le redimensionnement de certaines interventions dans la région, le pays a connu une baisse drastique de la MM5 à travers des quintiles de richesse, même si l'absence d'équité persiste.[19]

D'après les estimations de l'IHME, MM5 avait chuté de 115 pour 1 000 naissances vivantes en 2000 à 49 pour 1 000 naissances vivantes en 2016, soit une baisse de 57%. L'Enquête Démographique et de Santé au Sénégal (DHS), cependant, a montré que la MM5 avait chuté de 139 pour 1 000 naissances vivantes en 1997 (la date disponible la plus proche) à 51 pour 1 000 naissances vivantes en 2016, soit une baisse de 63%.[2] Cette réduction de la MM5 avait largement dépassé les attentes en fonction de la croissance du PIB et des taux de baisse de la MM5 sur les plans régional et mondial. En dépit du fait que la réduction de la mortalité néonatale ait été moins dramatique, avec une chute de 45% de 38 décès pour 1 000 naissances vivantes en 2000 à 21 décès pour 1 000 naissances vivantes en 2016 d'après les estimations de l'IHME. Le DHS au Sénégal a montré que la mortalité néonatale a eu une chute de 37 pour 1 000 naissances vivantes en 1997 (la date disponible la plus proche) á 21 pour 1 000 naissances vivantes en 2016, soit une baisse de 43%. Ces chiffres dépassent les chiffres de la région sub-saharienne en Afrique et ceux des pays à faibles revenus (LIC) plus largement, qui avaient connu une chute de la mortalité néonatale entre 2000 et 2016 de 32% (entre 41 et 28 décès sur 1 000 naissances vivantes) en Afrique Sub-Saharienne et 34% (41 à 27 décès sur 1 000 naissances vivantes) dans les LIC/PFR.[4]

1.1.3 Les méthodes

En collaboration avec l'équipe UGHE et avec l'appui de Gates Ventures, EvaluServe a réalisé une analyse documentaire de la littérature publiée et de la littérature grise sur le contexte politique, culturel et économique général du Sénégal ainsi que des interventions fondées sur des preuves (EBI) mises en œuvre pour réduire le taux de MM5. L'équipe UGHE s'est associée à un consultant local à savoir l'Institut pour la Population, le Développement et la Santé de la Reproduction de l'Université Cheikh Anta Diop afin d'effectuer et analyser 23 entretiens avec des informateurs clés, des décideurs, des responsables de la mise en œuvre aux niveaux national et sous-national ainsi qu'avec des partenaires pour comprendre les stratégies de mise en œuvre, les politiques et les facteurs contextuels les plus pertinents pour réussir à réduire la mortalité des moins de 5 ans dans le pays. Des méthodes qualitatives, des stratégies de mise en œuvre et des approches (connaissances transférables) pouvant être mises en œuvre dans d'autres pays ont été extraites. Des analyses supplémentaires du Centre International pour l'Equité en Santé (Université fédérale de Pelotas) et la cartographie géo spatiale de 'l'Institute for Health Metrics and Evaluation' (Université de Washington) ont été utilisées pour comprendre l'évolution de l'équité pour la mortalité et la couverture des Interventions Basées sur les preuves « EBI ».

1.2 Les résultats clés

1.2.1 Couverture et Equité des Interventions contre la MM5 choisies

Il a été constaté que le Sénégal avait mis en œuvre de nombreuses EBI conçues pour réduire le taux de mortalité des moins de 5 ans dans les pays à revenu faible et intermédiaire. Un grand nombre des EBI ont été mises en œuvre et maintenues à l'aide d'un groupe de stratégies décrites ci-dessous, en réalisant avec succès une mise à l'échelle nationale ainsi que des améliorations maintenues en santé dans les causes de décès et de maladies ciblées. Certains exemples comprenaient la recherche de soins contre la pneumonie et la diarrhée, les vaccins sélectionnés (par exemple, PCV et Hib, dans le cadre du vaccin pentavalent) qui ont atteint et maintenu une couverture élevée, et l'accouchement dans les formations sanitaires (Tableau 1). Toutefois, certaines EBI ont été exécutées avec une couverture incohérente et une intégration variable dans une stratégie durable à l'échelle nationale, ce qui a entraîné des lacunes dans la couverture effective et la durabilité. Par exemple, certains EBI ont été mis à l'essai dans des districts sélectionnés mais n'ont pas atteint l'échelle nationale. C'est les cas du Projet de santé et de Nutrition Maternelles et Néonatales à base communautaire. L'incidence d'un certain nombre d'affections sous-jacentes avait baissé, notamment la diarrhée, la fièvre et les infections respiratoires aiguës. La couverture des autres EBI a révélé une amélioration, telle que la protection contre le tétanos à la naissance et le dépistage du VIH pendant les soins prénataux ou l'accouchement (avec des résultats démontrés). Des inégalités en couverture ont été constatées entre les différents quintiles de richesse dans certains indicateurs dont les besoins en matière de planification familiale couverts et la participation à d'autres visites prénatales supplémentaires, bien que certaines réussites ont été réalisées dans la réduction des écarts en soins prénataux avec un prestataire compétent, une assistance qualifiée en accouchement, rougéole et en vitamine A (Figure 1).

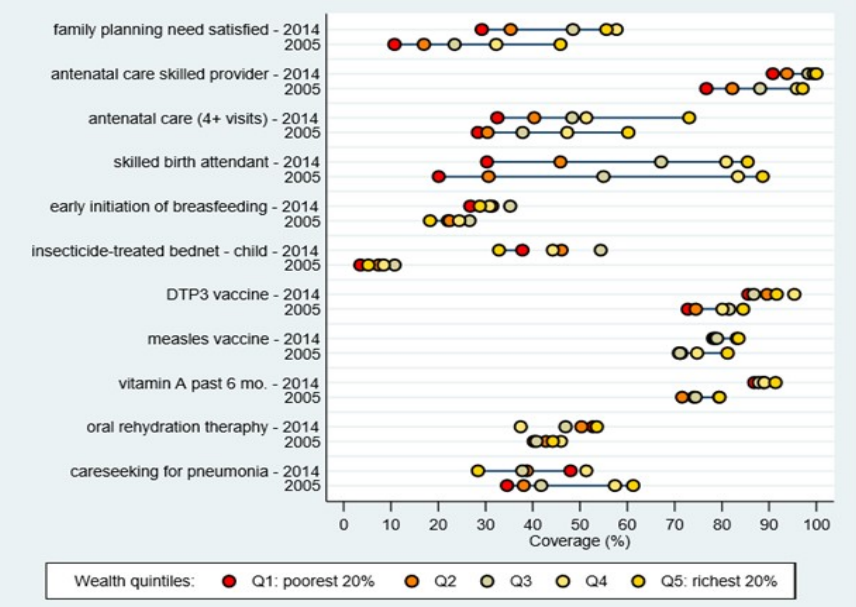
Tableau 1 : Couverture des EBI choisies au Sénégal (sur base des données disponibles et représentatives sur le plan national) (2000-2016) (STAT Compiler, WHO)

Causes des décès des M5	Intervention	2000*	2005	2010	2012	2014	2015	2016
Infections respiratoires aiguës	Enfants avec symptômes d'IRA conduits au centre de santé	-	49%	46%	47%	47%	49%	51%
	Enfants avec symptômes d'IRA qui ont eu des antibiotiques	-	-	30%	31%	36%	30%	36%
	Vaccination: 3 doses de PCV	-	-	-	-	81%	89%	93%
	Vaccination : Hib (dans le cadre du Pentavalent)	-	-	94%	-	-	-	95%
	M5 ans avec symptômes d'IRA – 2 semaines avant l'enquête	**-**	**13%**	**5%**	**3%**	**3%**	**4%**	**3%**
Maladies diarrhéiques	Thérapie de Réhydratations Orale (soit SO ou RHF)	-	26%	26%	21%	24%	33%	20%
	Vaccination : 3 doses de Rotavirus	-	-	-	-	-	83%	93%

	Enfants avec diarrhée conduits au centre de soins	-	21%	35%	39%	33%	41%	35%
	M5 ans avec diarrhée – 2 semaines avant enquête	**-**	**22%**	**21%**	**14%**	**19%**	**18%**	**15%**
Paludisme	Ménage propriétaires de MII	-	20%	63%	73%	74%	77%	82%
	Proportion des enfants de -5 qui ont dormi sous MII avant l'enquête DHS	-	7%	35%	46%	43%	55%	67%
	Conseil ou traitement cherché auprès d'un centre de soins ou d'un prestataire	-	43%	42%	44%	44%	43%	45%
	Traitement d'enfants avec fièvre grâce à la Combinaison à base de l'Artemisinine (ACT)**	-	-	3%	1%	1%	0.4%	2%
	M5 avec fièvre – 2 semaines avant enquête	**-**	**30%**	**23%**	**17%**	**11%**	**15%**	**13%**
Rougeole	Couverture vaccination contre la Rougeole		74%	82%	78%	80%	79%	81%
Malnutrition	Allaitement au sein maternel exclusif 0-5 mois	-	34%	39%	38%	32%	33%	36%
	M5 recevant supplémentation en vitamine A dans les six mois précédant l'enquête	-	-	78%	84%	89%	88%	78%
	M5 avec retard de croissance	-	20%	27%	19%	19%	21%	17%
	M5 affaiblis	-	9%	10%	9%	6%	8%	7%
	M5 sous poids	-	14%	18%	16%	13%	16%	14%
VIH	counseling VIH lors du CPN	-	-	27%	-	-	33%	28%
	Examen VIH au cours de la CPN ou accouchement et résultats reçus	-	32%	36%	-	-	52%	52%
Autre vaccin Maladie pouvant être prévenue	Couverture vaccinale complète avec 3 doses DPT, 3 doses polio, rougeole et BCG	-	59%	63%	70%	74%	68%	70%
Causes de décès néonataux	Taux de fécondité totale (15-49)	-	5	5	5	5	5	5
	Adolescente enceinte pour la première fois	-	4%	3%	3%	4%	3%	3%
	Protection contre le Tétanos à la naissance	-	-	69%	82%	84%	84%	82%
	CPN: 4+ visites par un prestataire compétent	-	40%	49%	46%	47%	46%	53%
	Accouchement assisté par prestataire compétent	-	53%	65%	51%	60%	53%	60%
	Accouchement en milieu sanitaire	-	64%	73%	72%	78%	75%	77%
	Accouchement par césarienne	-	4%	5%	4%	6%	5%	5%

	1e CPN de nouveau-né les 2 premiers jours après naissance	-	-	-	-	-	50%	53%
	1e CPN par un Médecin/infirmier/accoucheuse	-	-	-	-	-	21%	27%
* Données non disponibles pour 2000 ** Données non disponibles pour les enfants diagnostiqués avec paludisme								

Figure 1 : Portrait d'équité du Sénégal- Couverture des interventions choisies sur la MM5 (Source : Décompte 2030 Portrait d'Equité)



1.2.2 Stratégies courantes de mise en œuvre

Nous avons identifié un certain nombre de stratégies de mise en œuvre qui ont été appliquées à bon nombre des EBI, bien que certaines aient été exécutées avec succès variable, telles que l'intégration de l'équité dans la mise en œuvre. Les stratégies communément identifiées incluent :

- Leadership national et responsabilité
- Test pilote avant la mise à l'échelle nationale
- Tirer parti d'un solide système de prestation de soins existant dans la communauté
- Tirer profit des programmes / systèmes existants en les intégrant ou en les développant
- Engagement et coordination des partenaires d'exécution et des bailleurs des fonds
- Adaptation des interventions au contexte local
- Engagement et sensibilisation de la communauté
- Intégrer l'équité dans les politiques et la mise en œuvre
- Suppression des frais d'utilisation ou accès gratuit pour de nombreuses EBI
- Renforcement des systèmes de données
- Soutenir l'utilisation des données pour la prise de décision
- Renforcement de la chaîne d'approvisionnement

1.2.3 Exemples de mise en œuvre des EBI pour s'attaquer aux causes majeures de décès

La modélisation IHME a trouvé qu'à travers la période d'intérêt (2000-2016), les causes majeures susceptibles de décès comprenaient la diarrhée, les infections respiratoires ainsi que le paludisme. Les taux de mortalité pour chacune de ces causes de décès ont baissé au cours de cette période, le Sénégal ayant mis en œuvre un grand nombre d'EBI répondant aux principales causes de décès - diarrhée, paludisme et maladies respiratoires. Avant ou pendant la période de l'étude, d'autres EBI en vaccination et en soins maternels ont également été mises en place. Les travaux visant la baisse du taux de mortalité des moins de 5 ans au Sénégal comprenaient également des initiatives pour remédier aux causes sous-jacentes de la mortalité chez les moins de 5 ans, telles que l'eau, l'assainissement et l'hygiène (WASH), qui pourraient avoir contribué à la chute de la mortalité. En réponse au ralentissement de la baisse de la mortalité néonatale en raison d'une proportion croissante de décès chez les moins de 5 ans dans ce groupe d'âge, le Sénégal a également ciblé l'élargissement des EBI déjà mises en œuvre, telles que la gestion intégrée des maladies de l'enfant par les établissements de santé (FIB-PCIME) pour inclure un point de focalisation néonatal (FB-IMNCI) en 2016. Comme dans de nombreux autres pays et reflétant l'augmentation du nombre de décès d'enfants de moins de 5 ans chez les nouveau-nés, la proportion relative de causes de décès néonatales a augmenté. Ci-dessous, nous décrivons trois exemples de mise en œuvre d'EBI ainsi que des stratégies de mise en œuvre choisies pour représenter des exemples d'application des stratégies de mise en œuvre principales. Des descriptions complètes de la gamme d'initiatives peuvent être trouvées dans le rapport complet.

Prise en charge à base communautaire intégrée des maladies d'enfance

Au début des années 2000, étant donné le besoin du Sénégal d'élargir la prise en charge des cas de maladies infantiles à partir des établissements de santé vers le niveau communautaire et de garantir un meilleur accès aux populations rurales et difficiles à atteindre, il avait exploré un traitement communautaire des infections respiratoires. Le plan consistait à bâtir le prise en charge à base communautaire intégrée des maladies (CB-IMCI) sur le programme étatique existant contre le paludisme afin d'élargir les rôles des TSC (travailleurs/agents de santé communautaire) afin d'inclure la prestation de soins de proximité prenant en charge la diarrhée et les infections respiratoires aiguës. Les parties prenantes au Sénégal se sont montrées opposées à cette décision, notamment en ce qui concerne l'utilisation d'antibiotiques par les TSC. En guise de réponse, un test pilote de la CB IMCI fut réalisé entre 2003 et 2004, avec des efforts supplémentaires de plaidoyer auprès des professionnels de santé. Le succès du projet pilote avait mené à l'extension nationale de la CB-IMCI en 2006 avec l'élaboration de directives, une formation de formateurs et le renforcement de la chaîne d'approvisionnement. Entre 2006 et 2010, le Sénégal a adapté son programme de CB-IMCI et mis à jour ses directives afin de refléter les preuves locales et les recommandations internationales. Par exemple, le programme a changé le traitement du paludisme de sulfadoxine/pyrimethamine (SP) et amodiaquine en un traitement d'association à base d'artémisinine en 2006, à la suite des recommandations de l'OMS.[8] En 2008, reconnaissant qu'il y avait des populations plus difficiles à rejoindre dans le Sud et Sud-Ouest avec une morbidité élevée en paludisme, le Sénégal avait introduit un autre cadre CHW-DSDOM (Prestataires de soins à domicile) - au programme CB-IMCI, dans le but de tester et de soigner le paludisme à domicile. En 2012, les rôles des DSDOMs avaient été élargis pour inclure la pneumonie.[8] Une étude de la qualité de

mise en œuvre du CB-IMCI au pays avait réalisé que 90% d'IRA prises en charge par les TSC étaient correctement classifiées comme pneumonie, bien prises en charge à la cotrimoxazole et/ou référées pour des cas graves, et bien suivies.[20] Néanmoins, tel qu'indiqué au Tableau 1, la recherche des soins contre la diarrhée, la fièvre et les IRA avaient révélé uniquement une croissance minimale entre 2005 et 2016. L'échelle nationale de CB-IMCI était proche mais pas réalisée (65 des 76 districts, 86%).

Vaccination contre la Pneumocoque

En 2000, GAVI avait commencé à appuyer l'introduction de la VCP dans les programmes de vaccination des pays en développement bien que l'OMS n'ait pas recommandé son introduction jusqu'en 2007.[11] Entre 2007 et 2008 une étude de surveillance avait été commanditée pour obtenir des données locales afin d'inspirer les recommandations pour lesquelles un type de VCP devrait convenir le mieux au contexte épidémiologique du Sénégal. L'étude avait trouvé la VCP13 comme étant le type le plus approprié pour le Sénégal.[12] Suite à cette étude, le processus de préparation de l'introduction de ce vaccin avait commencé par une planification et une budgétisation, le calcul de l'approvisionnement en vaccin requis et l'évaluation de la capacité de la chaîne de froid et d'approvisionnement.[21] Une autre préparation consistait en l'élaboration d'un plan de communication à l'endroit des prestataires, en l'implication de la communauté, des guides de formation ainsi que l'adaptation des systèmes des données PEV existants pour le suivi et évaluation. Reflétant son appropriation, le Sénégal avait également augmenté sa ligne budgétaire pour les vaccins et les consommables et s'était engagé à rehausser ce budget de 15% entre 2012 et 2015 pour permettre l'introduction du CVP. A l'aide des données des évaluations de la chaîne de froid qui avaient révélé que le Sénégal n'avait pas la capacité de recevoir les produits VCP, l'introduction avait été retardée de 2012 à 2013. En 2013, le Sénégal est devenu le 34ème des 73 pays admissibles à GAVI à introduire le VCP13 dans son programme de vaccination de routine. Des formations initiales et en cours étaient organisées, ainsi que des visites de supervision et une surveillance des effets indésirables après la vaccination. Au Sénégal, la couverture vaccinale chez les enfants âgés d'un an était de 81% et 89% en 2014 et 2015, respectivement, et atteignait 93% en 2016.

Moustiquaires imprégnées d'insecticide

Les moustiquaires imprégnées d'insecticide (MII) avaient été utilisés au Sénégal avant 1998, mais elles étaient principalement fournies par des initiatives à petite échelle soutenues par des bailleurs de fonds. Un programme MII dirigé par le gouvernement était introduit au Sénégal en 1998 grâce à un appui de l'USAID. Pour assurer sa faisabilité, le programme avait adopté une stratégie de vente des moustiquaires à un coût subventionné à travers un accord entre les distributeurs de moustiquaires du secteur privé et les comités de préparation des établissements de santé[9] pour les activités de préparation à l'introduction des MII subventionnés comprenaient des activités de marketing social dans les pharmacies, les stations-service et divers vendeurs à plus petite échelle au niveau communautaire pour promouvoir les moustiquaires. Un module MII pour les TSC était également intégré aux formations de routine du Programme National de lutte contre le Paludisme, mettant un accent sur la durabilité. Entre 1998 et 2008, le Sénégal avait mis en œuvre son programme de MII en vendant des moustiquaires subventionnées. Des activités de marketing social se servant à la fois des tête-à-tête ainsi que des campagnes médiatiques de masse (également utilisées lors de la phase préparatoire) étaient utilisées

pour engager les communautés et accroître l'acceptabilité et la vente de la MII dans les pharmacies et auprès d'autres vendeurs. Les moustiquaires étaient vendues à 500 FCFA (environ 0,88 USD en 2008) dans des établissements de santé et à 1 000 FCFA (environ 1,76 USD en 2008) dans les pharmacies.[22]

Autour de 2007, reflétant un focus sur l'équité, le Sénégal avait introduit une distribution de masses de moustiquaires (gratuites) en plus des ventes de celles subventionnées dans le but d'assurer une couverture universelle. Cette décision avait été prise en réaction aux recommandations de l'OMS pour une distribution large et gratuite comme stratégie utile de lutte contre le paludisme et en guise du choix du Sénégal en tant que pays d'Initiative du Président contre le Paludisme en 2017.[15] La proportion des enfants de moins de 5 ans dormant sous MII la nuit précédant l'enquête DHS s'était accrue de 7% en 2005 à 35% en 2010, juste avant la campagne nationale, et à 55% en 2015 et 67% en 2016.[7] Les ménages disposant des MII étaient passés de 20% en 2005 à 63% en 2010 et à 82% en 2016.[7] Toutefois, le programme MII continue à se heurter à des défis. En 2016 par exemple, après la fin de la période d'étude, une recherche avait révélé que la distribution des moustiquaires dans certaines régions (ex. Dakar) avait été retardée pendant une campagne de distribution de masses.[9]

1.3 Facteurs contextuels transversaux

Un certain nombre de facteurs contextuels ont été identifiés comme ayant eu un impact sur la mise en œuvre de nombreuses EBI associées à la chute de la MM5 au Sénégal. Ces facteurs furent primordiaux dans la création de l'environnement et dans l'apport de l'appui qui a contribué directement ou indirectement au succès du pays. Ces facteurs avaient également constitué des obstacles au succès de la réalisation d'une couverture équitable et de qualité. Au niveau national, ces facteurs contextuels facilitants allaient d'un leadership fort et de la responsabilité, qui se reflétaient dans la définition des objectifs; l'appropriation des EBI MM5, la disponibilité et utilisation des données, ainsi que les rôles des bailleurs des fonds et la disponibilité de ressources financières et non financières pour traiter le problème la MM5. Bien que principalement conduits par le niveau central, nombre de ces facteurs avaient été reflétés au niveau sous-national également. Ces facteurs contextuels transversaux comprennent généralement :

1. **Leadership et lutte efficaces: Définition des objectifs et politiques clairs :** Alors qu'il est le plus actif et efficace au niveau national**,** le leadership était réparti aux niveaux ministériel, local et sous-national. Ce leadership et cet engagement ont abouti à la prise en charge des interventions par les autorités locales et à la volonté de continuer à adapter la mise en œuvre aux défis rencontrés. Cet engagement à assurer un leadership efficace au sein et au-delà du Ministère de la Sante était souvent reflété dans les politiques et stratégies clés, telles que les réunions de planification de l'action à tous les niveaux, l'investissement du gouvernement dans les initiatives contre la MM5 et la supervision assurée par des ministères autres que le Minisanté par le biais de rapports techniques et financiers trimestriels apportés par le ministère de l'Intérieur aux organisations non gouvernementales (ONG) et aux organisations de la société civile (OSC). De plus, le leadership fort du Sénégal avait influencé la définition d'objectifs et de priorités clairs en matière de réduction de la MM5. Ces objectifs et priorités étaient en outre reflétés dans les

politiques et plans spécifiques élaborés et / ou exécutés au Sénégal au cours de la période considérée, tels que le Paquet d'Activités Intégrées de Nutrition (PAIN, 1998) et la Politique d'accouchement gratuit et de la Césarienne (FDCP, 2005).

2. Les ressources des bailleurs et des Partenaires chargés de la mise en œuvre : Diverses organisations multilatérales telles que la Banque Mondiale, GAVI, Global Fund, Initiative du Président contre le Paludisme (PMI) et USAID ont investi dans les initiatives sénégalaises en faveur du programme de lutte contre la MM5 entre 2000 et 2016. Tandis que les financements des bailleurs et partenaires constituaient principalement un facteur facilitateur, là où ils étaient limités par le temps, ils avaient créé des perturbations dans les programmes de mise en œuvre (ex. mise en œuvre initiale du FB-IMCI). Au delà du financement, ces bailleurs des fonds et partenaires étaient des collaborateurs de premier ordre, des conseillers techniques, et des metteurs en œuvre des activités de réduction de la MM5 au Sénégal tel que noté ci-dessous.
3. Coordination des bailleurs de fonds et approche multisectorielle : La coordination et collaboration entre le Ministère de la Santé, les partenaires de mise en œuvre, les bailleurs de fonds et d'autres ministères constituaient un facilitateur majeur de réduction de la MM5 au Sénégal (ex. pour FB-IMCI, CB-IMCI, PCV), même si le nombre de projets qui ne s'étaient pas élargis ou pérennisés démontreraient que ceci était par moment un échec. Par exemple des programmes ORS indépendants au Sénégal après 2000 n'avaient pas été élargis suite à une coordination limitée, causée par un financement limité du ORS par l'Etat ainsi qu'à des ruptures de stock. Le principal forum de coordination pour différents acteurs travaillant dans la réduction de la MM5, était constitué par le Groupe de travail sur la Santé Reproductive, Maternelle, du Nouveau-né et de l'Enfant (RMNCH) qui était chapeauté par le Ministère de la Santé.
4. Mobilisation communautaire et Activisme : Multiples initiatives de plaidoyer ont contribué à assurer la reddition des comptes dans la réduction de la MM5 au pays. Elles ont produit des preuves de satisfaction et des écarts dans la prestation de services au niveau communautaire et ont contribué à la formation des citoyens à communiquer efficacement avec les décideurs sur les dossiers de MM5.[16]
5. Appropriation par le pays et au niveau local : Le sens d'appropriation était reflété au niveau de la communauté nationale, encouragé principalement par les efforts du gouvernement à mobiliser les communautés dans l'élaboration et l'exécution des EBI (Initiatives basées sur les Preuves). Les autres contributeurs à ce sens d'appropriation au niveau communautaire comprenaient la démarche gouvernementale de décentraliser le système de santé ainsi que le statut associé à la prestation des soins au sein de la communauté.
6. Renforcement des systèmes et structures de santé communautaires : Le Sénégal s'est employé à élargir l'accès aux services au niveau communautaire, à encourager la mobilisation communautaire dans la prestation des soins de santé, à améliorer le niveau d'efficacité de services et à rendre la gouvernance ainsi que la gestion plus efficaces au niveau communautaire.
7. Disponibilité, qualité et usage des données : Le Sénégal a une tradition de valorisation des données et avait effectué des évaluations de DHS standards depuis 1986 avec du travail récent de mener un DHS continu depuis 2011.[17] Les données collectées ont servi à faire le suivi et à évaluer la mise en œuvre de plusieurs programmes nationaux dont les EBI visant la réduction de la MM5.

Pour le FB-IMCI par exemple, l'Unité de Surveillance du Programme Nationale de lutte contre le Paludisme avait recommandé le passage de la chloroquine à la SP et à l'amodiaquine en 2003, compte tenu de la résistance accrue face à la chloroquine.

8. **Eau, Assainissement et Hygiène (WASH) :** Les efforts de l'OMS pour améliorer les indicateurs relatifs à la MM5 entre 2000 et 2016 étaient complétés par des améliorations correspondantes dans les installations d'eau et d'assainissement. L'accès aux services d'assainissement a connu une augmentation de 38.5% en 2000 à 48.4% en 2015 et le nombre de personnes bénéficiant des services en aux potable a augmenté passant de 61.6% en 2000 à 75.2% en 2015.[23]
9. **Conflit et zones difficiles d'accès (Barriere)** : Le conflit en Casamance dans le Sud ainsi que les régions difficiles d'accès au Sud-Est avaient limité les efforts de réduction de la MM5 ; ce qui reflétait l'inéquité dans les taux de MM5 au Sénégal.

1.4 Les défis

En dépit des progrès réalisés, le Sénégal a été mis au défi par un certain nombre de facteurs qui ont limité les efforts de réduction de la MM5, les ont empêchés d'atteindre une couverture équitable et qui constituent une menace potentielle pour des progrès durables et continus. Il s'agit de :

- Manque de disponibilité constante des équipements clés dans les établissements de santé, ce qui a des conséquences sur les chiffres de mortalité néonatale. Cependant, en réponse, bien que postérieurement à la période de l'étude, le Sénégal se concentre davantage sur la réduction de la mortalité néonatale avec une amélioration concomitante de la disponibilité des équipements dans les établissements (par exemple pour les zones néonatales).
- La dépendance continue du Sénégal vis-à-vis des fonds des bailleurs pour beaucoup de ses programmes de réduction de la MM5 ; ce qui a des implications sur la viabilité des activités pragmatiques clés comme la supervision. Ceci continue à donner lieu à des projets pilotes ou à petite échelle qui n'atteignent pas toujours la couverture nationale même lorsqu'ils sont efficaces.
- Le gouvernement continue à travailler à la réduction des dépenses de poche par l'élargissement du système de la Mutuelle de Santé (entamé depuis les années 90) en, plus d'apporter un certain nombre de services gratuits aux femmes, enfants de moins de 5 ans, et aux individus âgés de plus de 60 ans, mais il reste une proportion de la population, principalement rurale qui n'ont pas accès aux soins car ils ne peuvent pas supporter les coûts. En 2010–11, la plupart de femmes (94%) et d'hommes (92%) interrogés n'avaient aucune couverture médicale.[23] Ce défi de coûts des soins de santé a commencé d'être relevé par l'introduction du programme de Couverture Universelle en Soins de Santé depuis 2014.
- Le pays continue à faire face à des défis d'équité dans la couverture des EBI tel que les disparités en quintile de richesse dans l'usage des moustiquaires.

1.5 Les connaissances transmissibles à d'autres pays

Il existe un certain nombre de stratégies reproductibles du Sénégal qui pourraient être utiles pour d'autres pays qui souhaitent accélérer la chute de la mortalité des moins de cinq ans, en tirant des enseignements de succès et des difficultés rencontrés au Sénégal. Il s'agit notamment de mettre en place un programme de santé communautaire solide, qui a été utilisé pour intégrer plusieurs initiatives et élargir l'accès et l'engagement communautaire; s'appuyer sur les capacités des systèmes de santé existants en intégrant de nouvelles initiatives; générer des preuves locales pour éclairer la mise en œuvre de nouvelles EBI; planifier et adapter pour l'équité; ainsi que des concertations et la mobilisation des parties prenantes. Les autres stratégies comprennent la collaboration multisectorielle pour aborder la santé ainsi que les déterminants liés à la santé, l'investissement dans la santé, la planification de la durabilité ainsi que la mobilisation du secteur privé.

Domaines de force et de défis reconnus:

1. Elaborer et/ou assurer un programme des travailleurs en santé communautaire avec une éducation standardisée, des systèmes de gestion et de reddition de comptes qui impliquent les membres des communautés et des professionnels de santé.

Les Travailleurs en Santé Communautaire ont été maintes fois remarqués comme étant les principaux responsables de la mise en œuvre des EBI MM5 au Sénégal tandis que plusieurs EBI ont été incorporés à leur champ de travail. Le succès des TSC dépendait également de la structure de gouvernance solide qui impliquait les infirmières (aux postes de santé) pour l'éducation et la supervision, ainsi que de la participation de la communauté (qui avait choisi les TSC et financé la construction de cases de santé) et des autorités ainsi que du respect qu'ils ont maintenu au sein des communautés. L'adaptabilité du Sénégal aux besoins et aux demandes actuels, y compris l'introduction et l'ajustement des rémunérations des TSC pour la motivation et la durabilité (par exemple pour la PCIME et le PRN) et l'introduction de cadres supplémentaires (bajenou gokh et DSDOM), ont également été déterminants pour son succès.

2. Intégrer de nouvelles initiatives en se fondant sur la capacité du système de santé existant pendant que l'on renforce le système fondamental

L'intégration de nouvelles initiatives dans les structures et initiatives précédentes était importante pour réduire le risque pour des projets verticaux ainsi que le dédoublement du travail lorsqu'on apporte des ressources dans le but d'améliorer la capacité globale. Ceci s'est déroulé au niveau local, sous-national de soins de santé ainsi qu'au niveau central dans les protocoles, les politiques et dans la gestion. Voici quelques-uns des exemples remarquables :

- Le CB-IMCI était intégré au système de santé existant en impliquant trois cadres existants des TSC- les agents de santé communautaires, les matrones, et les relais communautaires
- L'intégration des maladies supplémentaires dans les systèmes de surveillance existants. Par exemple le système de surveillance de la rougeole avait exploité le portefeuille de systèmes de surveillance existant et avait employé le réseau existant des agents de santé communautaires ainsi que des relais communautaires.

3. Renforcement et construction des systèmes existants d'informations de santé pour estimer les besoins et faire le suivi de l'efficacité et de la couverture des EBI

- Avant de passer à l'ACT, le Sénégal avait effectué une phase pilote dans un district pendant deux ans (Oussouye), conduite par l'université Cheikh Anta Diop, lequel district était choisi car il constituait un Site de santé et de Surveillance démographique et pouvait soutenir la collecte des données par le biais d'une expérimentation pilote. Une expérimentation pilote d'une année en RDT avait été menée sur le même district aussi pour exploiter le système de surveillance existant.
- Après l'introduction du vaccin anti- rotavirus, le système de surveillance sentinelle du Sénégal avait fait le suivi des impacts de la diarrhée causée par le Rotavirus.

4. Se servir d'une prise de décision pour déterminer les besoins et la pertinence des EBI et créer des politiques ainsi que des stratégies de mise en œuvre fondées sur des évidences scientifiques locales et mondiales ; équilibrer la nécessité d'une évidence locale avec la force d'une preuve mondiale existante et donner priorité à une adoption rapide ainsi qu'à un élargissement des EBI là où cela est approprié

La Sénégal avait une pratique d'explorer des EBI émergentes sur le plan mondial (ex. La stratégie) et exigeait ensuite une recherche locale pour en déterminer la pertinence avant de décider de les appliquer. Une phase pilote pour déterminer la faisabilité, l'efficacité ou l'acceptabilité des EBI potentielles avant extension étaient fortement encouragées au pays. Mais, le Sénégal reconnaissait l'importance d'une introduction rapide et l'élargissement des EBI qui n'exigeaient pas beaucoup d'adaptations spécifiques au contexte et avait une tradition d'acceptabilité d'EBI similaires comme le vaccin anti-rotavirus et le PCV, qui étaient rapidement introduits et élargis grâce à une grande acceptabilité des vaccins. Bien plus, dans les cas où des données locales existaient déjà, le Sénégal n'effectuait pas davantage de recherches et utilisait plutôt ces données. Par exemple, l'adaptation de la composante prise en charge de maladies des Protocoles OMS IMCI était basée sur des données existantes spécifiques au Sénégal. Parmi les leçons spécifiques, il y avait:

- *Priorisation des preuves locales :*
    - Le Sénégal a adopté de nouvelles EBI basées sur des recherches locales pour déterminer la pertinence et la faisabilité et pour éclairer la conception du programme. Par exemple:
        - Un essai randomisé, à double insu et contrôlé par placebo, mené en 2005 par le laboratoire de parasitologie de l'Université Cheikh Anta Diop à Niakhar, dans la région de Fatick, avait révélé que l'administration d'un traitement antipaludique chimioprophylactique (une dose de SP et une dose d'artésunate) était administrée aux enfants de moins de 5 ans, réduit l'incidence du paludisme de 86%; cette recherche avait été utilisée pour éclairer la conception du programme IPT en faveur des enfants.
        - Le sous-groupe de travail sur la nutrition de la PCIME a utilisé l'approche « Essais de Pratiques Améliorées» dans quatre districts des différentes régions du Sénégal pour identifier leurs pratiques et croyances alimentaires et évaluer leur pouvoir d'achat en tant que base pour concevoir le volet nutrition de la FB-IMCI pour une période d'essai
        - L'introduction du vaccin anti-rotavirus par le Sénégal avait pris du retard car le pays donnait priorité à l'introduction du VCP basée sur les données du fardeau de

la maladie ainsi que la capacité vaccinale du pays. En outre, le PCV avait été introduit à l'échelle sans expérimentation pilote fondée sur l'acceptabilité et la force d'une preuve mondiale.

- Le Sénégal avait procédé à un test pilote des EBI avant l'extension à appliquer dans des districts choisis pour établir la faisabilité, l'efficacité et l'acceptabilité. En guise d'exemple :
    - Pour FB-IMCI, les districts étaient choisis en raison de leurs taux relativement élevés de MM5, la disponibilité des partenaires travaillant déjà dans les districts pour appuyer le processus ainsi qu'en raison des zones difficiles à atteindre.
- Le Sénégal avait adapté les critères d'admissibilité des EBI et les directives EBI en fonction des données locales émergeantes. Par exemple :
    - L'utilisation des données locales pour ajuster les critères pour les zones admissibles au programme IPT pour enfants.
    - Utilisation des données de surveillance du Programme national de lutte contre le paludisme pour adapter le traitement antipaludique de la chloroquine à une combinaison de SP et d'AQ.
    - Le Sénégal a identifié le coût élevé du traitement du paludisme sans tests de confirmation et avait introduit les TDR pour confirmer les cas de paludisme avant le traitement, un an plus tôt avant les recommandations de l'OMS de 2008.
    - Le Sénégal avait abandonné le deltamethrine (pulvérisation à domicile) en vertu des données locales sur la résistance.

5. Planifier l'équité dès le début et adapter les systèmes pour l'équité

Le Sénégal a constamment mis en place des systèmes pour aborder l'équité avec un succès variable. Des exemples spécifiques de succès et d'échecs comprennent :

- *Assurer l'accessibilité financière par le biais de systèmes conçus pour préserver l'équité*
    - Le Sénégal a fait usage des stratégies telles que la distribution gratuite et la subvention des produits de base aux populations prioritaires afin d'assurer une couverture équitable, comme dans le TPI et les MII, pour les enfants et les femmes enceintes ainsi que le traitement du VIH.
    - Le succès a été limité dans certains domaines. Par exemple, depuis les années 1970, le Sénégal a mis en place des systèmes de mutualisation des risques comprenant une assurance obligatoire des employés, des subventions publiques pour des services et des groupes de population spécifiques et une assurance maladie volontaire à base communautaire pour assurer un accès financier aux soins de santé à ses citoyens. Cependant, à partir de 2010-11, la plupart des femmes (94%) et des hommes (92%) n'avaient aucune couverture médicale.[23]
- *Intégrer un calendrier pour l'équité dans les décisions de mise en œuvre du programme*
    - Le Sénégal s'est concentré sur les zones à haut risque pour la vaccination antitétanique et les régions les plus pauvres pour la mise en œuvre initiale du Programme d'Accouchement Gratuit et par Césarienne.

- *Adaptation des systems existants pour garantir l'équité : Assurer une acceptabilité géographique à travers une adaptation des systems existants*
    - Le programme national de lutte contre le paludisme a introduit le programme PECADOM, qui comprenait un autre groupe de TSC. Des DSDOM ont été ajoutés au programme CB-IMCI pour tester et traiter les cas de paludisme dans les ménages situés dans des zones difficiles d'accès tells que Kédougou et Tambacounda. Reflétant la stratégie d'intégration du Sénégal, ils les ont ensuite formés à la prise en charge de la pneumonie.
- *Reconcevoir les systèmes de santé pour refléter une focalisation sur l'équité*
    - Une adaptation majeure pour l'introduction du vaccin anti-rotavirus était la désagrégation des données sur la vaccination par sexe pour être en mesure de faire le suivi de l'Egalité entre les deux sexes.

6. Concertations et participation: Mobiliser et tenir des concertations avec les intervenants dont le Ministère de la Santé, d'autres secteurs, les bailleurs des fonds, les universitaires, les partenaires en charge d'exécution ainsi que les communautés et exploiter leur expertise.

Cette approche garantissait à la fois une meilleure acceptabilité et un potentiel pour l'extension grâce à une vaste forte mobilisation et à l'exploitation des connaissances techniques disponibles. Cela s'est généralement fait au travers des groupes de travail techniques et de l'identification d'experts techniques pour mener les essais pilotes, ce qui était caractéristique du début de la mise en œuvre des EBI sélectionnés. La portée de la mission comprenait les essais pilotes et la conception du programme, un appui technique pendant la mise en œuvre et l'adaptation des EBI existantes.

- ***Exploitation et coordination des activités des bailleurs des fonds et partenaires de mise en œuvre***

  Le Sénégal a bénéficié d'un soutien important des bailleurs des fonds ; ce qui a conduit à un certain nombre d'initiatives efficaces. Cependant, un certain nombre d'autres projets n'ont jamais connu d'extension au niveau national ni maintenus en raison du manque de coordination (programmes ORT, par exemple) tandis que des été rencontrées lorsque le financement disponible des bailleurs des fonds était limité dans le temps (par exemple, BASICS for FB-IMCI). Parmi les leçons, on peut retenir :
    - Tirer profit des bailleurs des fonds au cours de la phase d'exploration: en 1996, sur demande du gouvernement, l'OMS avait organisé plusieurs réunions au niveau national pour présenter l'approche IMCI.
    - Tirer profit des bailleurs de fonds lors de la phase préparatoire: Pour mettre en œuvre le FB-IMCI, le Sénégal avait invité des experts de l'OMS à une visite préliminaire en vue d'évaluer son état de préparation à la mise en œuvre de la stratégie. Un groupe de travail était mis en place pour orienter le processus de préparation avec un appui de l'USAID, OMS, et UNICEF. De même, la préparation pour le programme IPT en faveur des Enfants avait impliqué l'élaboration des politiques, des directives, des protocoles, des outils de collecte des données avec l'appui des Fonds mondial, USAID et UNICEF.
    - Tirer profit des bailleurs des fonds et des partenaires de mise en œuvre: des ateliers d'harmonisation des interventions ont constitué des plateformes utiles pour les bailleurs

et les partenaires d'exécution pour s'aligner derrière les acteurs gouvernementaux dans la mise en œuvre du FB-IMCI. En outre, GAVI avait cofinancé la mise en œuvre initiale et en cours du vaccin contre le rotavirus et les programmes PEV PCV tandis que l'OMS, l'UNICEF, et l'USAID avaient fourni de l'appui technique.

- *Tirer profit des intervenants nationaux/locaux y compris les universitaires*
  Le Sénégal a tiré parti de ses universitaires et des responsables de la mise en œuvre des programmes existants lors de discussions au cours de l'exploration, de la préparation et de la mise en œuvre. Des exemples spécifiques comprennent :
  - L'Université Cheikh Anta Diop a mené des essais pilotes de l'introduction d'ACT dans le FB-IMCI. De même, l'essai pilote CB-IMCI était conçu par un professeur de pédiatrie de l'Université Cheikh Anta Diop.
  - Un comité de pilotage IRS comprenant des représentants de l'université Cheikh Anta était mis en place.
- *Garantir la concentration sur les communautés dans la conception et l'exécution des programmes*
  Le Sénégal a intégré une concentration sur les communautés dans la conception de ses programmes de réduction de la MM5, tels que l'inclusion des mères (et plus généralement des personnes responsables) dans les décisions relatives à la garde de leurs enfants dans le cadre de la PCIME. Parmi les autres exemples, on peut citer :
  - La mobilisation communautaire, l'éducation, et la sensibilisation à l'introduction du vaccin anti- rotavirus et le PCV.
  - Des activités de marketing social utilisant des têtes à têtes et des campagnes des media des masses pour mobiliser les communautés en vue d'accroitre les ventes des MII aux pharmacies et auprès d'autres vendeurs.
  - La mobilisation de la communauté par des campagnes d'éveil de conscience impliquant une variété d'activités de vulgarisation porte à porte et communautaire au sens large en vue d'accroitre l'utilisation des MII.
  - La mise en place des comités de gestion des cas de refus pour le programme IPT des Enfants.
  - Le contrôle par la communauté du choix en cours des TSC (travailleurs/agents de santé communautaire).

7. Collaboration multisectorielle en vue de s'occuper des déterminants de la santé et des déterminants relatifs à celle-ci

A travers l'engagement des multiples secteurs, le Sénégal est parvenu à s'occuper de déterminants de santé dans la réduction de la MM5 (ex Eau, Assainissement et Hygiène).

8. Investir dans les systèmes de santé

Entre 2000 et 2015, le Sénégal a investi dans son système de santé avec le total des dépenses de santé par habitant passant de 22 à 36 de dollars US. Alors que le budget par habitant est passé de 22 à 40 dollars entre 2000 et 2010, il est tombé à 36 dollars en 2015. Les dépenses de santé intérieures du Sénégal ont

varié entre 2000 et 2015, atteignant 45,13% 36,75% en 2000) et sont tombés à 26,46% en 2013, bien que ces chiffrent soient montés à 31,75% en 2015.[4] Malgré ces investissements, le financement par des bailleurs des fonds avaient continué à être utilisé pour une portion significative des programmes de réduction de la MM5. Nous n'avons pas été en mesure d'obtenir davantage de données sur le financement de la santé.

9. Planification en faveur de la durabilité

Le Sénégal s'est servi d'une série de stratégies pour assurer la durabilité, lesquelles étaient principalement Axées sur l'intégration. Parmi d'autres exemples on peut citer l'intégration de nouvelles EBI au plan de Développement national. Par exemple, le Sénégal a intégré la PCIME dans le Plan national de développement de la santé (PNDS) (1998-2007). Le TPI pour les femmes enceintes a été intégré à la Politique du Programme National de Lutte contre le Paludisme Et à la Politique et Directives relatives à la Santé en matière de Reproduction du Sénégal ont été élaborées sur la base des normes de l'OMS. De plus, des modules de formation sur les nouvelles EBI ont été intégrés aux guides de formation existants. A titre d'exemple, des modules de formation sur les nouveaux vaccins et les vaccins contre le rotavirus ont été intégrés aux formations de vaccination de routine dans le pays pour les agents de santé nouvellement recrutés et aux formations de recyclage annuelles pour les agents de santé existants.

10. Mobilisation du secteur privé

Le Sénégal a engagé son secteur privé à élargir l'accès par le biais de partenariats public-privé (ex. Exemple avec une société minière pour élargir le traitement de la diarrhée). En outre, la supervision des services du secteur privé se fait au travers de la division des établissements de santé privés au sein de la direction des établissements de santé du ministère de la santé. Cependant, ceci n'a pas toujours été couronné de succès. Par exemple, la mise en œuvre du Programme communautaire de nutrition par une organisation privée – l'Agence d'exécution des travaux publics – s'est heurtée à des problèmes d'efficience et d'efficacité en raison de la portée limitée de cette organisation et de l'absence relative d'un organisme au niveau national pour diriger la mise en œuvre du programme.

1.6 Conclusions

Le Sénégal a réalisé une réduction remarquable de la MM5 et néonatale en dépit des défis qui s'observent encore au sujet de l'équité et la couverture de certaines EBI. Un leadership efficace ainsi que le contrôle, la mobilisation et la coordination des bailleurs des fonds, l'intégration des nouvelles initiatives aux systèmes existants, le renforcement et l'utilisation des systèmes des données, la mobilisation communautaire, la planification pour la durabilité et les investissements dans les systèmes de Santé ont été identifiés comme étant parmi les facilitateurs de cette baisse. Néanmoins, des défis demeurent, en l'occurrence l'excès de dépendance vis-à-vis des financements par des bailleurs, un reflet insuffisant de la politique au niveau de la prestation de service, et des dépenses significatives en santé par sa propre poche, en dépit des efforts.

2 Introduction

2.1 Exemplars in Global Health

The Exemplars in Global Health project aims to support high-impact global health decisions by making it easier to replicate large-scale global health successes through evidence-based narratives to inform decision-making. The core of the project involves deep and rigorous content detailing the successes, as well as drivers of those successes, among "exemplars" – positive outlier countries or regions that have demonstrated outperformance relative to peers or beyond what might be expected given context and/or financing. This content, organized across several global health sub-topics, is designed to be data-driven and rigorous, but also accessible and broad.

Exemplars content is intended primarily for an audience of national policymakers, implementers, and funders – people with the potential to significantly impact global health policy at scale. It will be complemented by delivery mechanisms that maximize its reach and impact.

2.2 Exemplars in Under-5 Mortality

The University of Global Health Equity (UGHE) is working with the team at Gates Ventures and the Bill and Melinda Gates Foundation to better understand countries' successes in reducing under-5 mortality (U5M). This work was initially designed with two aims:

1. To develop and test an implementation framework and mixed methods approach to understand the successes of these countries; and
2. To extract 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 causes of death – 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);
2. Developing and applying an implementation science-based approach to understanding how the EBIs put into place by these exemplar countries were prioritized, adapted, implemented, and sustained;
3. Understanding how the EBIs implemented by a country were prioritized, adapted, implemented, and sustained through both existing publicly available sources and primary key informant interviews (KIIs); and
4. Identifying the key contextual factors and policy interventions critical to each country's success **(see Appendix A: Exemplars in Under-5 Mortality Project Methodology and Framework).**

The work was guided by the development of a framework which was informed by a number of frameworks in use for U5M (e.g. Countdown 2015, WHO) and implementation science.

Seven countries meeting "exemplar" criteria for U5M were chosen based on the rates of decline in U5M compared with countries in their region or similar economic resources. One of the selected countries was Senegal. This selection process was performed with input from a Technical Advisory Panel. These countries were chosen to represent a range of locations and sizes, with the goal of identifying implementation success factors common to countries that have over-performed in U5M.

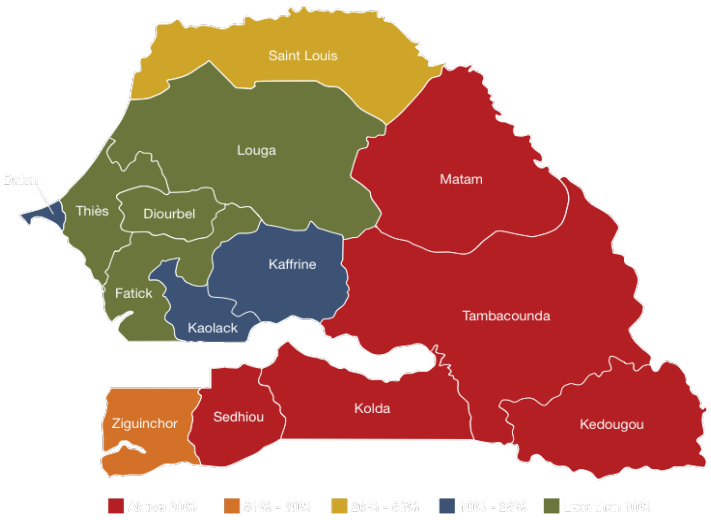
2.3 Senegal

Background

Senegal is a predominantly flat country in West Africa, with elevations not more than 100 meters. It is surrounded by Mali, Guinea, Guinea Bissau, the Republic of Mauritania, and the Atlantic Ocean to the west.[1] Senegal includes 14 regions[24] (Figure 2):

1. North: Louga, Matam, Saint-Louis
2. West: Dakar (capital), Thiès
3. Central: Diourbel, Fatick, Kaffrine, Kaolack
4. South: Kédougou, Kolda, Sédhiou, Tambacounda, Ziguinchor

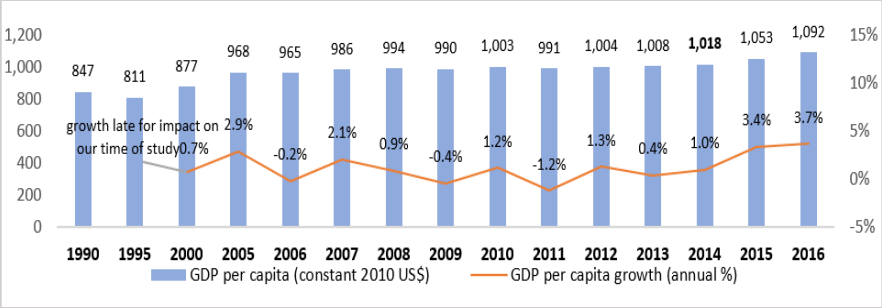
Figure 2: A Map of Senegal showing the different Regions (Source: Aljazeera 2016)



The languages spoken in Senegal include French (official); Pulaar, Jola, Wolof, and Mandinka. The main religion in Senegal is Islam (94%), followed by Christianity (5% – mainly Roman Catholic) and indigenous religions (1%). The main ethnic groups in Senegal are Wolof (43.3%), followed by Pular (23.8%), Serer (14.7%), Jola (3.7%), Mandinka (3%), Soninke (1.1%), and other ethnic groups (9.4%). One percent of the population identified as Lebanese and European.[25] In 2016 the country's population was split almost equally between urban and rural areas; with urban residence figures at 53% (31% in the Dakar region).[2] Senegal's population has also grown steadily, doubling from 7.4 million in 1990 to 15.4 million in 2016.[26]

Economic Status and Development

Figure 3: GDP Per Capita (Constant 2010 US$) and Annual GDP Per Capita Growth (1990-2016) (Source: World Bank, 2018)



Much of Senegal's economic reforms in the mid- to late 1990s and early 2000s resulted from its devaluation of the CFA Franc in 1994, at the request of the World Bank and International Monetary Fund, following a longstanding recession in the 1980s and early 1990s. This devaluation aimed to make Senegal's goods cheaper and more attractive on the global market, but led to huge domestic increases in the price of basic goods like milk and rice, and economic difficulties.[27] The implications of this devaluation for U5M reduction programming (especially nutrition EBIs) are discussed in the EBI section of this case study.

World Bank estimates showed that Senegal's Gross Domestic Product (GDP) per capita maintained an upward trend from US$811 in 1995 to US$877 in 2000, US$1003 in 2010, and US$1092 in 2016 (Figure 3).[28] In 2016, Senegal had a significantly higher GDP per capita compared to its regional neighbors like Mali (US$746) and Guinea (US$780).[29,30]

The Human Development Index in Senegal also increased, from 0.368 in 1995 to 0.380 in 2000 and 0.499 in 2016.[31] Senegal had similar gradual improvements in the proportion of its population living below the poverty line, dropping from 55.2% in 2001 to 48.3% in 2005, and 46.7% in 2011.[32] GDP at Purchasing Power Parity, the sum of the cost of all goods and services produced in the year, valued at their cost in the US, also showed significant improvements, increasing from US$16.2B in 2001, to US$20.6B, US$25.5B, and US$39.7B in 2005, 2011, and 2016, respectively.[33]

Traditionally, Senegal's economy was predominantly driven by the agricultural sector with groundnut production accounting for most of its external trade. However, the government focused on diversifying its economy between 1980 and 2000, so that by 2007, although groundnut still accounted for most (60%) of Senegal's external trade, fisheries, for one example, had become a major source of foreign exchange (22%). By 2018, after the study period had ended, groundnut and fisheries were still major anchors of the economy in Senegal in addition to rice, millet, and fertilizer production.[34,35]

In 2014, in order to accelerate progress in the economy, Senegal established a framework for the country's economic and social policy in the mid- and long-term, by adopting a new development model, the Plan for Emerging Senegal. The key priority areas of the plan included structurally transforming the economy, promoting human capital, and enabling good governance. The Plan for Emerging Senegal is being implemented through a five-year Priority Action Plan to help Senegal improve its annual growth rate.[36] Although the impact of the Plan for Emerging Senegal and the Priority Action Plan are beyond the

reference period of this study, preliminary assessments show that Senegal experienced relatively higher economic growth in 2015 and 2016 as reflected in GDP per capita growth rates of 3.4% and 3.7% in both years, respectively, compared to 2000-2013 GDP per capita growth rates which did not exceed 2.9% (Figure 3). There was also an accompanying decrease in fiscal deficit (% GDP) from 4.8% in 2015 to 4.2% in 2016 and 3.7% in 2017.[36]

Political Context and Conflict

Senegal gained independence from France when it merged with the French Soudan to form the Mali Federation in 1959. In 1960, Senegal became a sovereign state when the Federation broke up. In 1982, Senegal merged with Gambia to become Senegambia, but this union was dissolved in 1989 due to inability of the two countries to fully integrate. This dissolution resulted in the predominantly Christian Casamance region remaining part of Senegal, resulting in the Casamance conflict between the Government of Senegal and the separatist force, the Movement of Democratic Forces of Casamance, in the south and southwest of Senegal. The main fighting in the Casamance conflict took places between 1982 and 2014, with the majority of the 1,000 deaths occurring between 1992 and 2001.[37] However, according to key informants (KIs), the conflict remains active, although irregular, post-2014, in the Casamance region.

Under-5 Mortality in Senegal

According to IHME estimates, U5M dropped from 115 per 1,000 live births in 2000 to 49 per 1,000 live births in 2016, a decline of 57% (Figure 4).[38] Senegal's DHS however showed that U5M dropped from 139 per 1,000 live births in 1997 (closest available date) to 51 per 1,000 live births in 2016, a decline of 63%. This reduction in U5M occurred across wealth quintiles and across all regions, although the southeast lagged behind the rest of the country (Figures 5 and 6).[39] (See contextual factors and remaining challenges sections.) The infant mortality rate also dropped, from 66 in 1992 to 68 (1997), 61 (2005), 47 (2010), and 36 (2016).[7]

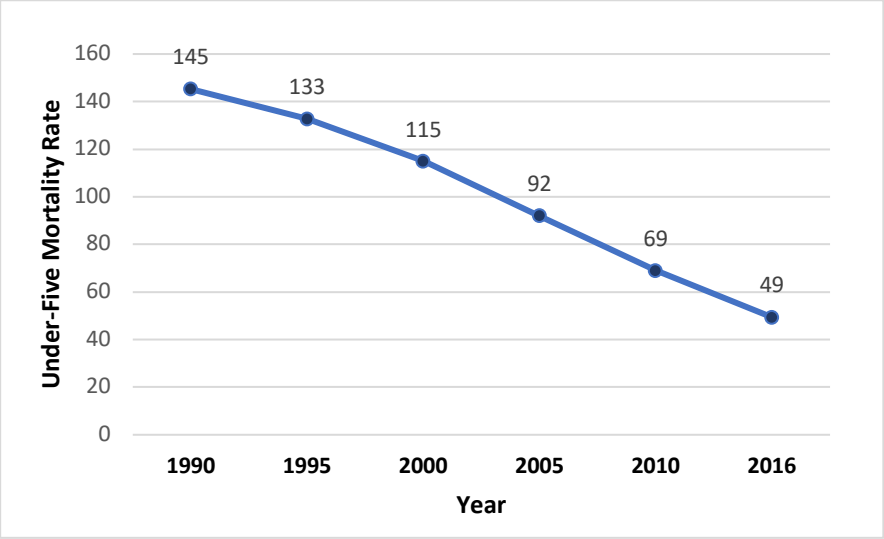


Figure 4: Under-5 Mortality Rate in Senegal (Per 1,000 Live Births, 1990-2016) (Source: IHME 2018)

Figure 5: Map of Senegal Showing the Trend of Under-5 Mortality Across the Different Regions (2000-2016) (Source: IHME 2018)

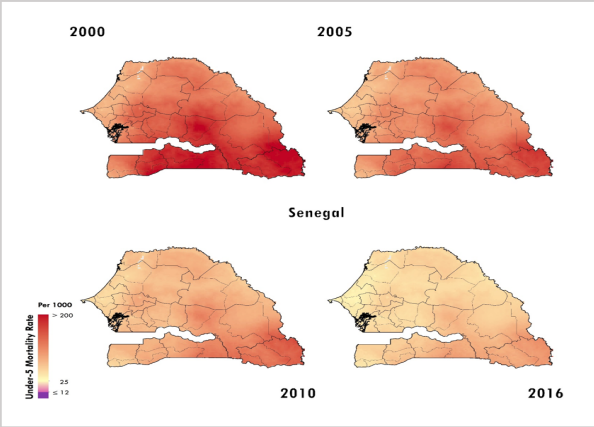


Figure 6: Equity Analysis of Under-5 Mortality Rate in Senegal (1997-2016) (Source: Victora, et al 2018)

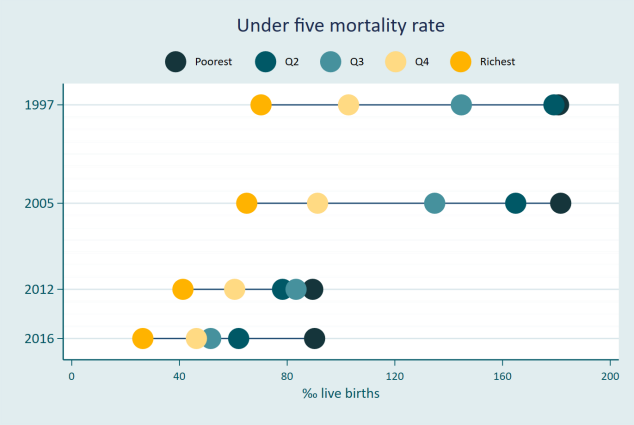
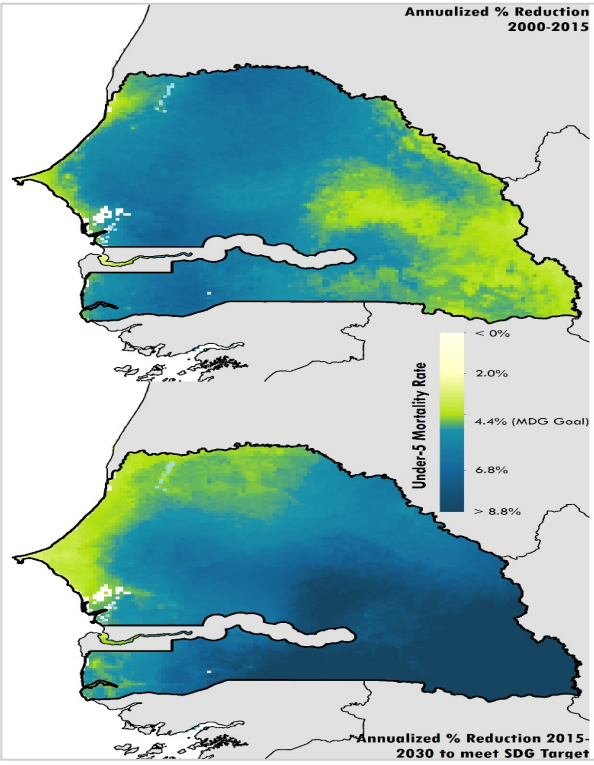


Figure 7: Map of Senegal Showing Annualized Percentage U5M Rate Reduction (2000-2015) and Annualized Percentage Reduction Required to Achieve SDG (2015-2030) (Source: Victora, et al 2018)



The annual percentage of U5M rate reduction in Senegal between 2000 and 2015 was not uniform, with slower decline in the southeast, and more rapid decline around Dakar on the west coast, and in the northwest (Figure 7). Similarly, the annual percentage reduction in U5M required for Senegal to achieve the UN Sustainable Development Goal (SDG) 3 of 25 or fewer per 1,000 live births, between 2015-2030, is higher in the southeast and lower around Dakar and the northwest (Figure 7).[40]

The reduction in neonatal mortality was slightly less, with a decline of 44%: from 36 per 1,000 live births in 2000 to 20 per 1,000 live births in 2016 (Figure 8).[38] Similar to overall U5M reduction, Senegal's DHS showed that neonatal mortality dropped from 37 per 1,000 live births in 1997 (closest available date) to 21 per 1,000 live births in 2016, a decline of 43%. The decline in neonatal mortality occurred across wealth quintiles and regions, but the southeast and north-central lagged behind the rest of the country (Figures 9 and 10).[26,41] (See contextual factors and cross-cutting and remaining challenges sections.)

Senegal also made substantial improvements in U5M and neonatal mortality in comparison to other LMICs with similar GDPs, e.g. Lesotho, and similar geographies within West Africa for example, Côte d'Ivoire and Ghana (Table 2).[42]

Figure 10: Neonatal Mortality Rate in Senegal (Per 1,000 Live Births) (1990-2016) (Source: IHME 2018)

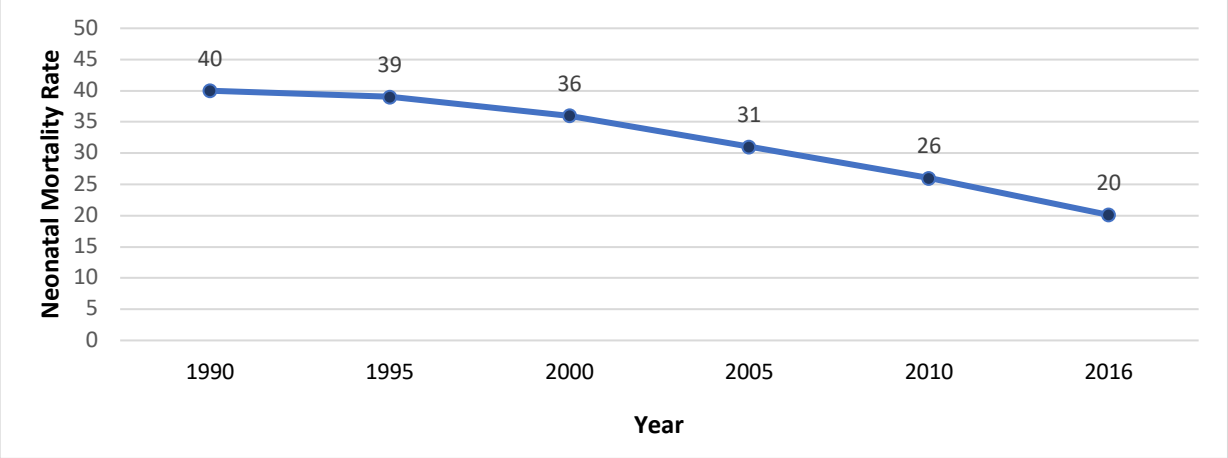


Figure 9: Equity Analysis of Neonatal Mortality Rate in Senegal (1997-2016) (Source: Victora, et al 2018)

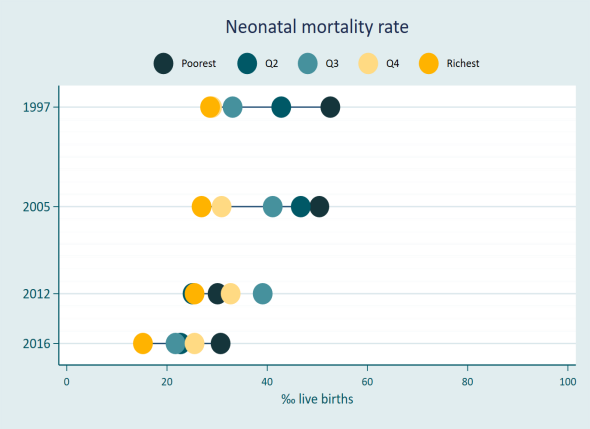


Figure 8: Equity Analysis of Neonatal Mortality Rate in Senegal (1997-2016) (Source: Victora, et al 2018)

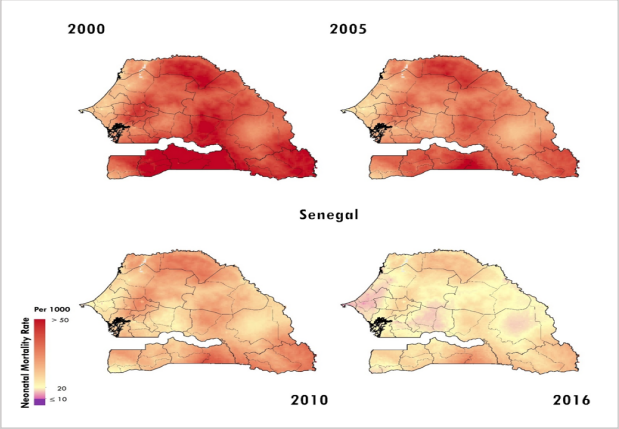


Table 2: A Comparison of Senegal's U5M and Neonatal Mortality Rates with Those of Countries with Similar GDPs and Countries with Similar Geographies within West Africa (2000-2015) [42]

Indicators	Under-five mortality rate (per 1,000 live births)		Neonatal mortality rate (per 1,000 live births)	
	2000	2015	2000	2015
Senegal	115	52	35	21
Lesotho	100	68	40	38
Côte d'Ivoire	137	90	47	37
Ghana	101	55	35	25

Causes of Death in Children Under 5 in Senegal

As shown in Table 3, according to data from IHME, the three main causes of death among children under 5 in Senegal between 2000-2016 remained diarrheal diseases, respiratory infections, and malaria, although the relative proportion has changed, with the decline in malaria being the most notable. Other leading causes of death in 2000 included meningitis, malnutrition, measles (which dropped from 4% in 2000 to 0.7% in 2016), HIV/AIDS, tetanus, and diphtheria. In neonates, the causes of death have remained relatively constant with leading causes estimated to be preterm birth complications, birth asphyxia and birth trauma, and sepsis (and other neonatal infections) (Table 4).[42]

Table 3: Causes of Death in Senegal, Ordered by Rate of Deaths Per 100,000 of Under-5 Population (2000-2016) (Source: IHME)[42]

Cause of Death	Rate of deaths per 100,000 of U5 population (% of deaths)		
	2000	2005	2016
Diarrheal diseases	432 (17%)	292 (14%)	138 (13%)
Respiratory infections (RI)	313 (12%)	289 (14%)	131 (12%)
Malaria	484 (19%)	276 (19%)	71 (7%)
Meningitis	91 (4%)	94 (4.5%)	53 (5%)
Malnutrition	112 (4%)	102 (4.9%)	42 (4%)
Measles	96 (4%)	11 (0.5%)	7.8 (0.7%)
HIV/AIDS	8.4 (0.3%)	10 (0.5%)	2.4 (0.2%)
Tetanus	16 (0.6%)	6.2 (0.3%)	1.6 (0.2%)
Diphtheria	0.5 (0.02%)	0.2 (0.01%)	0.05 (0.005%)

Table 4: Causes of Death in Senegal, Ordered by Rate of Deaths Per 100,000 of Neonatal Population (2000-2016) (Source: IHME)[42]

Cause of Death	Rate of deaths per 100,000 of neonatal population (% of deaths)		
	2000	2005	2016
Preterm birth complications	12,303 (25%)	11,490 (27%)	7,367 (28%)
Birth asphyxia and birth trauma	11,250 (23%)	10,117 (24%)	7,286 (27%)
Sepsis and other neonatal infections	6,889 (14%)	6,599 (16%)	4,506 (17%)
Congenital birth defects	4,278 (8.8%)	3,882 (9.2%)	2,624 (9.8%)
Respiratory infections	4,279 (8.8%)	3,319 (7.9%)	1,618 (6.1%)
Diarrheal diseases	1,627 (3.3%)	900 (2.1%)	351 (1.3%)
Tetanus	770 (1.6%)	279 (0.7%)	74 (0.3%)

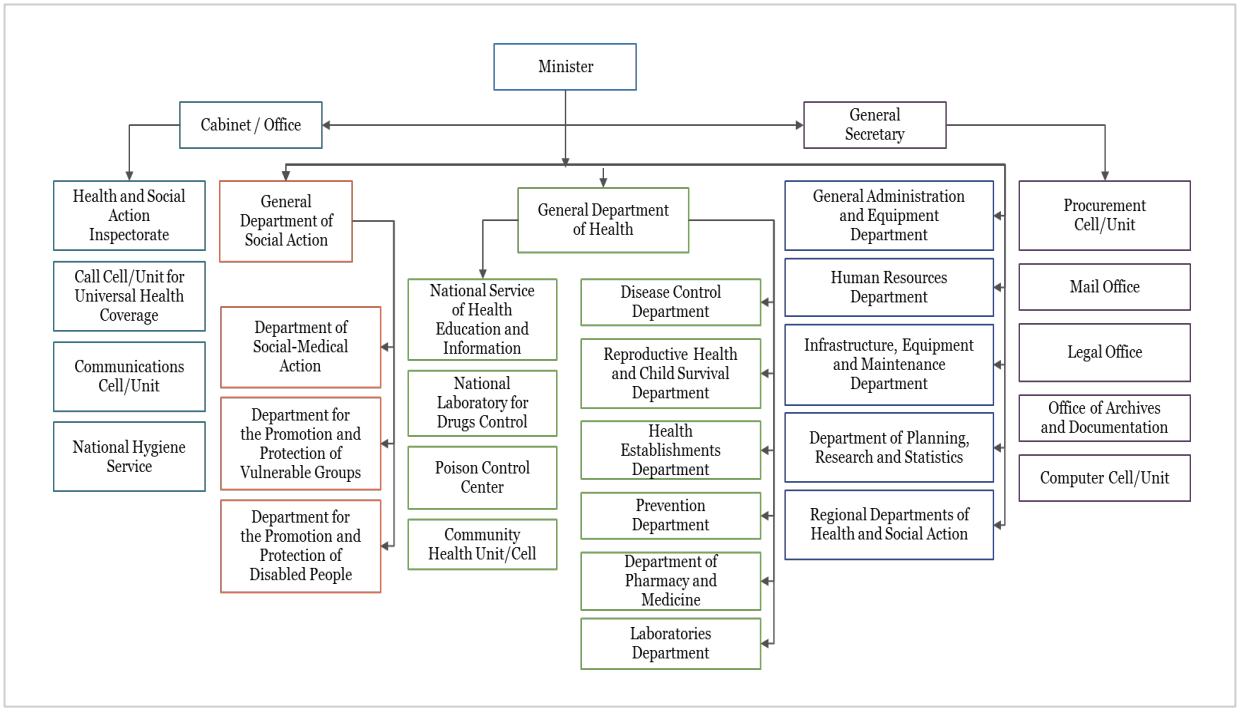
Ministry of Health: System and Structure

Decentralization

Senegal's public health system has made tremendous efforts in ensuring both public and private sector collaboration in delivering efficient and effective care for Senegal's population. A key component of these efforts has been the ongoing decentralization of the health system. Decentralization efforts began in the 1970s, with a gradual transfer of administrative responsibilities to the local level. During the 1990s, regions, municipalities, and rural communities were transferred the responsibility for the management of health facilities and in 1998, hospitals were designated autonomous "public health establishments," which in turn gave them more control over their own finances and overall management. Local governments were also made responsible for the health district and regional hospital budgets. These steps and the introduction of policies that encouraged public-private partnerships (PPPs) in the health sector spurred an increase in the collaboration between the government and the private sector, with accompanying improvements in health care delivery.[43–45] However, decentralization remained a work in progress in Senegal and in 2006, the Health Development Committee (at the MOH) began discussions to set up a local development health committee to lead the completion of the decentralization process. An Act of Decentralization was passed in 2014 to ensure the completion of the process.[43]

Current Structure (2016)

Figure 11: Organogram of Senegal's Ministry of Health and Social Action (2016) (Source: Senegal MOH & SA 2018)



In 2016, Senegal's MOH comprised three general departments and 26 departments, inspectorates, cells, national services, and units. Of the three general departments, the general department of health was

responsible for overall planning, implementation, and monitoring of health policy. It was also responsible for coordinating, implementing, and monitoring the delivery of health programs throughout the country. The general department of social action also implemented and provided oversight for health programs, within the context of addressing the needs of vulnerable groups. The third general department, of administration and equipment, provided oversight for the administrative, finance, and infrastructure functions of the ministry (Figure 11).[46]

Health Management Information System and Other Data

Senegal had a history of data generation and use with the introduction of the Demographic and Health Survey (DHS) in 1986, the Malaria Indicator Survey in 2006, and the continuous Service Provision Assessment (SPA) and DHS in 2012.

Senegal introduced an electronic health information system (eHIS) to synthesize facility-level data in 2005. Research conducted in 2016, after the case study period ended, assessed availability of electronic maternal, newborn, and child health data at the national level, and found an above-average availability in Senegal with a score of 9 (compared to an average of 7.5) out of 15 possible points.[47]

However, Senegal continued to experience challenges with data quality including completeness and effective use of data.[47] According to KIs, the eHIS had not reached 100% completeness despite efforts by the government, mainly as a result of gaps in data from private health facilities. Nonetheless, KIs explained that Senegal continued to work towards improving data quality and use especially at the district-level (vis-à-vis decentralization), with ongoing efforts (including trainings) to increase district-level ownership of data quality monitoring and data use capacity.

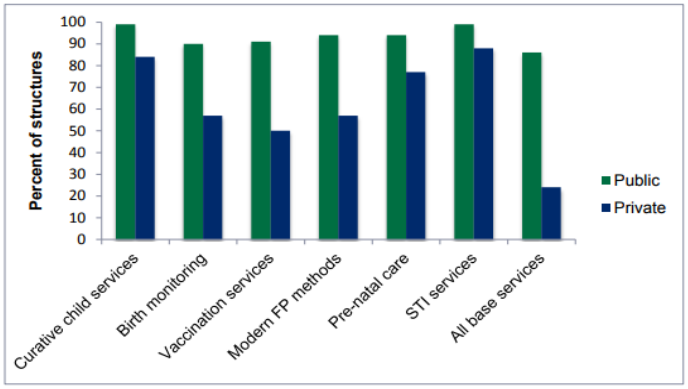
Senegal's Health System Structure and Capacity through 2016

Public Sector

In Senegal, regional hospitals provide specialized care while district health centers provide first-level referrals and relatively limited hospitalization services. Health posts provide preventive and primary curative services, care for chronically ill patients, family planning services, health promotion and education activities, and prenatal services. Most institutional deliveries occur at health posts.[48] Health huts offer basic services provided by community health workers (CHWs) – agents de santé communautaire and matrones, including an integrated package of maternal and child health, malaria, nutrition, and family planning services. The CHWs are supervised by the chief nurse at the nearest health post who oversees the area.[49] (See community health program section for details on CHWs.)

Continuous SPA data from 2012 found satisfactory availability of basic services overall including curative child health services, ANC, vaccinations, and child growth monitoring in 75% of facilities. Curative child health services and ANC were found to be available in 94% and 89% of facilities respectively while vaccinations and growth monitoring were available in 80% and 86% of facilities, respectively.[50] (Pre-2012 data were unavailable for the team to review.)

Figure 12: Proportion of Public and Private Sector Facilities Offering Basic Health Services in Senegal (2014)



Continuous SPA data from 2012 also showed that, overall, the public sector had more facilities providing most of the basic health services relevant to U5M such as vaccinations and modern family planning methods, prenatal care, sexually transmitted infection services, and curative child health services (Figure 12). Additional data from 2014 also confirmed that the majority of these services were more available at government facilities compared to private facilities in Senegal.[50–52]

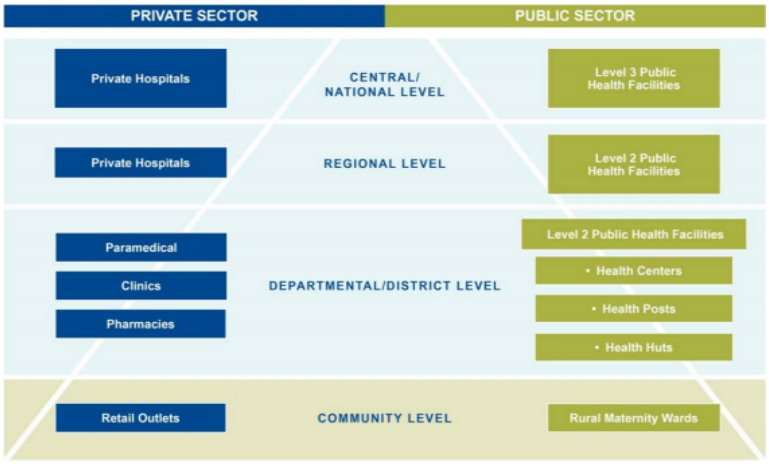
However, variability existed such as in Dakar where the private sector was more prominent. (See private sector, below.) Regarding facilities' service readiness, a review of SPA data from 2012-2014 showed that public hospitals had higher Service Readiness Indices of 80% compared with 63% for private hospitals.[53,54] Non-hospitals (e.g. health centers) had similar scores (57% and 60% in public and private sectors, respectively).[53]

Private Sector

The private health sector in Senegal consisted of for-profit and non-profit, non-governmental organizations (NGOs) and civil society organizations (CSOs). Private for-profit facilities served as a significant source of health service provision and coverage, especially in and around Dakar, where 72% of such facilities were located.[50] The division of private health facilities within the directorate of health facilities at the MOH provided oversight for all private health facilities in Senegal.[51]

The non-profit sector played a small but significant role in health service provision in Senegal, particularly in peri-urban and selected rural areas, where NGO clinics filled a critical health coverage gap. The non-profit sector was mainly classified into two categories – *associatif* (association-based) and *confessionnelle* (faith-based). Non-profit associations and faith-based networks operated hospitals, clinics, and medical practices, similar to the private for-profit sector.[50] The Ministry of the

Figure 13: Senegal's Health System (Public and Private Sectors) (2014) (Source: Brunner et al 2016)



Interior provided oversight for the non-profit sector in Senegal. Figure 13 shows a breakdown of Senegal's health system at community, district, regional, and central levels for both the private and public sectors.[50]

Human Resources for Health

Senegal's public health system had challenges throughout the study period with the number and distribution of human resources. The number of physicians and nurses/midwives remained well below the WHO target of 2.3/1,000 populations since 1990, ranging from 0.03/1000 doctors and 0.28/1000 nurses in Matam (in the north) to 0.20/1000 doctors and 0.37/1000 nurses in Dakar. In addition, there was geographic inequity, with much of the country's higher skilled health personnel predominantly concentrated in urban areas especially, in Dakar (Table 5).[55] (See Facility-Based Delivery in Section 4.)

Table 5: Distribution of Doctors and Nurses Across the Regions in Senegal (2008)[55]

Region		Doctors	Doctors/1000	Nurses	Nurses/1000
Diourbel	Central	48	0,04	178	0,14
Fatick	Central	16	0,02	157	0,23
Kaolack (incl. Kaffrine)	Central	32	0,03	237	0,20
Louga	North	30	0,04	129	0,17
Matam	North	14	0,03	144	0,28
Saint-Louis	North	33	0,04	215	0,26
Kolda (incl. Sedhiou)	South	18	0,02	160	0,17
Tambacounda (incl. Kedougoou)	South	31	0,04	179	0,25
Ziguinchor	South	25	0,05	197	0,42
Dakar	West	524	0,20	956	0,37
Thiès	West	61	0,04	303	0,21
Total		**832**	**0,07**	**2855**	**0,25**

Community Health Program

CHWs have been a key component of Senegal's health workforce since health huts were introduced in the 1970s, especially in rural and hard-to-reach areas where nurses and doctors were reluctant to work. CHWs are directly linked to health systems. To increase community acceptability and ownership, the community also controlled ongoing selection of CHWs in Senegal, although this strategy was not favored by supervising nurses at health posts, who felt that the selection process should be driven more by the trained providers based at the health post.[49]

The types and roles of CHWs in Senegal in 2014 included:[56]

1. **Relais communautaires (community volunteers):** Their role was to provide health information and education as well as health promotion services. Data on when this cadre of CHWs was

introduced, and how the role evolved during the study period, were unavailable for the team to review.

2. **Matrones:** Their role was to assist women in delivery, distribute misoprostol, and provide child health services, malaria treatment, and family planning. Data on when this cadre of CHWs was introduced, and how the role evolved during the study period, were unavailable for the team to review.
3. **Agents de santé communautaire (community health agents):** Their role was to provide family planning, vaccinations, Community-Based Integrated Management of Childhood Illnesses (CB-IMCI), and general primary care services. Data on when this cadre of CHWs was introduced, and how the role evolved during the study period, was unavailable for the team to review.
4. **Dispensateurs de santé à domicile (DSDOM) (home-based care providers):** Their role was to provide home-based malaria care within designated areas. This cadre of CHWs was introduced in 2008 and their role remained targeted until 2012 when additional responsibilities were added onto their role as part of the CB-IMCI program. (See CB-IMCI section.)
5. **Bajenou gokhs:** Their role was to provide maternal, newborn, and child health counselling and advocacy services. This cadre of CHWs was introduced in 2009 to facilitate the reduction of maternal, newborn, and child deaths, as part of the Programme Santé/Santé Communautaire. (See Improving ANC section).

Table 6 shows that by 2014, the number of all CHWs were below the nationally determined recommended numbers, especially bajenou gokhs and relais communautaires. Data for the recommended number of dispensateurs de santé a domicile were unavailable for the team to review.[57]

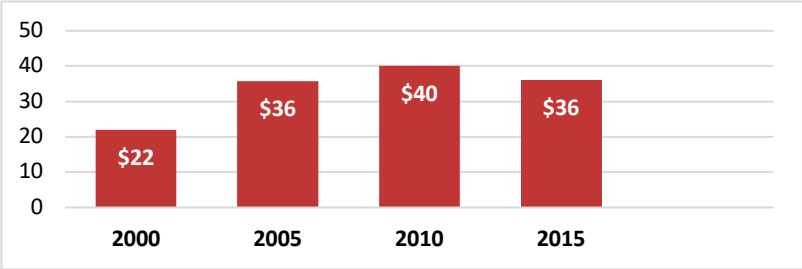
Table 6: Coverage of Different Community Health Worker Cadres in Senegal[49,57]

Number of community health provider cadres	5 main cadres				
	Agents de santé communautaire (ASC)	Bajenu gox	Dispensateurs de santé à domicile (DSDOM)	Matrones	Relais communautaires (relais)
Recommended number of community health providers	4,200 ASC and matrones[1]	12,000 bajenu gox	*Information not available in policy*	4,200 ASC and matrones[1]	15,000-23,069 relais[2]
Estimated number of community health providers	3,748 ASC and matrones	3,406 bajenu gox	1,992 DSDOM	3,748 ASC and matrones	7,435 relais
Recommended ratio of community health providers to beneficiaries	1 ASC: 3,000 people[3]	1 bajenu gox: 100 households[4]	1 DSDOM: 1 home-based care site[5]	1 matrone: 3,000 people	1 relais: 250 people

Health Financing

Between 2000-2015, Senegal's total health expenditure per capita increased, from US$22 in 2000 to US$40 in 2010, and declined to US$36 in 2015 (Figure 14).[58]

Figure 14: Senegal's Health Expenditure Per Capita (US$) (2000-2015) (Source: Knoema 2018)



Government Funding for Health

Senegal's domestic health expenditure as a percentage of overall health expenditure fluctuated between 2000-2015, peaking at 45.13% in 2006 (from 36.75% in 2000) and dropping to 26.46% in 2013, although this increased to 31.75% in 2015 (Table 7). These figures on government spending reiterate information provided by KIs who mentioned that although government funds were available for U5M reduction interventions, donor funding facilitated a significant component of their implementation.[59] (See EBIs and contextual factors sections.)

Table 7: Domestic Government Health Expenditure as Percentage of Current Health Expenditure (2000-2015)[59]

Units	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
%	36.75	39.09	34.59	35.38	33.99	41.48	45.13	36.44	39.67	37.26	32.14	35.16	32.68	26.46	33.13	31.75

Out-of-Pocket Expenditure for Health

All-cause out-of-pocket health expenditure per capita decreased somewhat from $53 in 2000, to $49 in 2005 and $42 in 2010, rising slightly to $44 in 2015.[60]

Health Insurance

Since the 1970s, Senegal's health insurance programs were mainly risk pooling schemes, and included mandatory employer-based insurance, public subsidies for specific services and population groups, and voluntary community-based health insurance (CBHI). Private insurance organizations also provided coverage for a small segment of the population.[51]

The mandatory health insurance scheme for government employees and their families was established in 1972. Managed by the Ministry of Finance and funded by the central government's budget, it covered 80% of the medical care expenses incurred at public health providers.[51] In 1975, social health insurance institutions were introduced to extend medical coverage to private-sector workers and their families, and membership was made mandatory. Senegal required that all companies with more than 300 employees create these insurance institutions, while companies with fewer than 300 employees were required to either collaborate with other companies in setting up an inter-enterprise institution or join existing ones.

These insurance institutions were financed through direct payroll contributions from employees' salaries (6%), half of which was financed by employers. Depending on the capacity of individual insurance institutions, the fund covered 40-80% of the costs incurred on medical care. Between 1972-2012, private insurance organizations also provided health coverage for both individuals and companies, and the government ran several programs that exempted indigents and other population groups, such as senior citizens and children under the age of 5, from certain health payments.[51]

Senegal introduced voluntary CBHI schemes for the informal sector and rural workers in the 1990s. These schemes, known as mutuelles, provided financial risk protection to informal sector and rural workers who were not eligible for mandatory health insurance schemes. Mutuelles followed a national standard for basic benefit packages which included a minimum set of services that each mutuelle was mandated to cover. In 2012, CBHI schemes covered only about 14% of the target population, and expanding the coverage remained a major challenge for Senegal.[50]

In order to address these challenges, in 2013 Senegal announced its Universal Health Coverage strategic plan for 2013–17. To reduce inequity and vulnerability among the population, the plan incorporated elements of coverage expansion and risk pooling. (See Universal Health Coverage Program in Section 5. Cross-Cutting Contextual Factors).[51]

Overall, Senegal's health financing system remained largely inequitable. As of 2010–2011, most women (94%) and men (92%) had no health insurance coverage.[23]

Health Equity

The Composite Coverage Index used by Countdown 2030[48] showed that there was no major narrowing of the equity gap between 2005 and 2014 (Figure 15). For example, skilled birth attendance at delivery in 2014 was 30% for the lowest quintile, 86% for the highest quintile, and 60% for the general population (Figure 16).[61]

Figure 16: Composite Coverage Index in Senegal by Wealth and Year (Source: Victora et al, Countdown2030 Equity Profile)

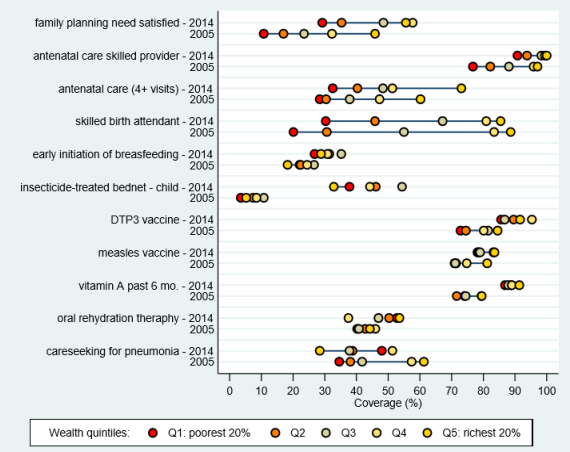


Figure 15: Senegal's Equity Profile – Coverage of Selected Under-5 Mortality Interventions (Source: Countdown2030 Equity Profile)

3 METHODS

The methodology for this research was designed to generate new and actionable insights through applying implementation science methods to selected Exemplar countries. This was done by identifying and evaluating the steps countries employed in deciding on the policies and EBIs to reduce U5M, their implementation strategies and execution, as well as understanding the contextual factors which either obstructed or facilitated the implementation of these EBIs within these countries, between 2000-2016.

3.1 Project Framework

Both the desk review and the primary research were informed by an implementation science framework designed specifically for this project. While it was often possible to identify policies and EBIs chosen by a country to reduce U5M, the key lessons in how these were chosen, adapted, implemented, and sustained were often missing from available published or gray literature. Because the same policies and interventions often produce different results in different countries, implementation science offered 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 to understand the contribution of contextual factors and the different levels of actors involved- global, national, ministry, subnational, facility, and community. Our framework combines elements of existing frameworks: Aarons et al's (2011) Exploration, Preparation, Implementation, and Sustainment (EPIS); and Proctor et al's (2010) Implementation outcomes- Feasibility, Fidelity, Acceptability, Reach, and Effectiveness. We also added a new step, Adaptation, to the EPIS framework.[62,63] Further details can be found in the Appendix and in the accompanying methods document.

3.2 Desk Review

In collaboration with UGHE and Gates Ventures, EvaluServe undertook an extensive review of available information and published data on the rates and progress of U5M in Senegal, including policies, strategies, EBIs available to potential Exemplar countries, the uptake and implementation of these EBIs in Senegal, and key global and national contextual factors. The literature review was done through MEDLINE (PubMed) and Google, using search terms such as "child mortality" or "under-5 mortality" and "Senegal." Further searches included specific EBIs, causes of death, or contextual factors as search terms (e.g. "insecticide-treated nets," "malaria," or "community health workers").

The desk review was an iterative process, with ongoing additions occurring throughout the initial research and case study development processes as additional sources (published articles, reports, case studies, policy and other country documents) were identified. The desk review focused on the list of health systems-delivered EBIs targeting amenable causes of death (see Appendix). However, work was also done to explore important broad interventions that may have contributed to U5M reduction. These included education, poverty reduction, water and sanitation, and programs designed to improve nutritional status. Section 5. Cross-cutting Contextual Factors reflects these and explores their contribution to U5M and

neonatal mortality reductions. Following this, the UGHE team supplemented the review to expand the capture of published literature and other relevant documents relevant to the work.

3.3 Primary Research

In collaboration with our in-country partner in Senegal, the Institute of Population, Development, and Reproductive Health, Cheikh Anta Diop University Dakar, we identified KIs 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 close collaboration with the in-country partners, prioritizing those KIs able to provide information on the EPIS stages during the period of study. Key informants 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. While we prioritized individuals active in the study period, we were able to also capture some experiences from before 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 causes of death 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 the project Principal Investigators (Agnes Binagwaho and Lisa Hirschhorn) or in-country team leads, with support from Research Associates and Research Coordinators on both teams taking notes and operating recorders. Following the close of the interviews, notes were combined and the tape recordings (if allowed) were used to clarify areas as needed.

Interview guides were translated into French and interviews were conducted in French or English depending on the linguistic comfort of the KI.

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 cause of death and coverage of chosen EBIs, as well as facilitators and barriers at the local, national, and global levels. This approach was designed to understand what, how, and why the Government of Senegal was able to achieve success in decreasing U5M and what the challenges were. The analyses were also informed by work completed by other initiatives, including Countdown 2015,

equity plots from the International Center for Equity in Health (Victora and team), and geospatial mapping from the Institute for Health Metrics and Evaluation (S Hays and team), amongst others.

Key informant interviews were coded by one of the researchers, using Nvivo software 12, and reviewed by at least one of the Principal Investigators for accuracy. The framework was used to extract the EPIS steps, implementation strategies, implementation outcomes, and contextual factors. A priori codes for contextual factors and strategies were adapted and expanded as emerging themes were identified.

3.5 Human Subjects Review

This research was approved by the National Ethics Committee for Health Research, Ministry of Health and Social Work, Senegal. The ethics review committees of UGHE and Northwestern University also approved the study. No quotes or specific viewpoints which are identifiable to the source were included without explicit permission. All recordings and interviews had names removed and were kept in password protected computers and stored on a limited access Google Drive. All recordings were destroyed once the interview coding had been completed.

Key informants were informed about the goals and structure of the project, and consent for participation and recording was obtained separately from the interview (recording was solely for the purpose of reviewing notes).

3.6 Key Informants

In total, 23 KIs were interviewed. The number of KIs who spoke to contextual factors at the different levels – global, national, and subnational – as well as the different causes of death and periods of neonatal risk examined by this case study are presented in Table 8.

Table 8: Key Informants Interviewed

Contextual Factors and Causes of Death		Number of KIs
Contextual Factors	Global	2
	National	19
	Sub-National	2
Non-Neonatal Causes of Death	LRIs	4
	Malaria	6
	Diarrhea	6
	Measles	1
	Malnutrition	2
	HIV	1
	Meningitis	1
	Other Vaccine-Preventable Diseases	2
	Vitamin A	2
Neonatal Periods of Risk	Preconception	1
	Antenatal	1
	Intrapartum	1
	Postnatal	1

4 Specific Causes of Death and Evidence-Based Interventions

This section focuses on EBIs designed to address specific causes of death for children under 5 in Senegal. See Appendix A for a complete listing of U5M causes of death and EBIs considered in this case study. Table 9 shows coverage of EBIs targeting common U5M causes of death and prevalence of selected conditions between 2000-2016 from the DHS.[7,13]

Table 9: Coverage of Selected EBIs in Senegal (Based on Available Nationally Representative Data) (2000-2016)[7,13]

U5 Causes of Death	Intervention	2000*	2005	2010	2012	2014	2015	2016
Acute Respiratory Infections	Children with symptoms of ARI taken to health facility	-	49%	46%	47%	47%	49%	51%
	Children with symptoms of ARI who received antibiotics	-	-	30%	31%	36%	30%	36%
	Vaccination: 3 doses of PCV	-	-	-	-	81%	89%	93%
	Vaccination: Hib (Pentavalent)	-	-	94%	-	-	-	95%
	U5 with symptoms of ARI – 2 weeks preceding survey	-	**13%**	**5%**	**3%**	**3%**	**4%**	**3%**
Diarrheal Diseases	Oral rehydration therapy (ORS or RHF)	-	26%	26%	21%	24%	33%	20%
	Vaccination: 3 doses of Rotavirus	-	-	-	-	-	83%	93%
	Children with diarrhea taken to health facility	-	21%	35%	39%	33%	41%	35%
	U5 with diarrhea – 2 weeks preceding survey	-	**22%**	**21%**	**14%**	**19%**	**18%**	**15%**
Malaria	Household ownership of ITN	-	20%	63%	73%	74%	77%	82%
	Proportion of children under 5 who slept under ITN night prior to the DHS survey	-	7%	35%	46%	43%	55%	67%
	Advice or treatment for fever sought from a health facility or provider	-	43%	42%	44%	44%	43%	45%
	Treatment of children with fever by artemisinin-based combination therapy (ACT)**	-	-	3%	1%	1%	0.4%	2%
	U5 with fever – 2 weeks preceding survey	-	**30%**	**23%**	**17%**	**11%**	**15%**	**13%**
Measles	Measles vaccination coverage		74%	82%	78%	80%	79%	81%
Malnutrition	Exclusive breastfeeding from 0-5 months	-	34%	39%	38%	32%	33%	36%

	U5 receiving vitamin A supplements in the six months preceding survey	-	-	78%	84%	89%	88%	78%
	U5 stunted	-	20%	27%	19%	19%	21%	17%
	U5 wasted	-	9%	10%	9%	6%	8%	7%
	U5 underweight	-	14%	18%	16%	13%	16%	14%
HIV	HIV counselling during ANC	-	-	27%	-	-	33%	28%
	HIV-testing during ANC or labor and results received	-	32%	36%	-	-	52%	52%
Other Vaccine Preventable Diseases	Full vaccination coverage with 3 doses DPT, 3 doses polio, measles, and BCG	-	59%	63%	70%	74%	68%	70%
Neonatal Causes of Death	Total fertility rate (15-49)	-	5	5	5	5	5	5
	Teenagers who are pregnant with their first child	-	4%	3%	3%	4%	3%	3%
	Tetanus protection at birth	-	-	69%	82%	84%	84%	82%
	Antenatal care: 4+ visits by a skilled provider	-	40%	49%	46%	47%	46%	53%
	Delivery attended by skilled provider	-	53%	65%	51%	60%	53%	60%
	Facility based delivery	-	64%	73%	72%	78%	75%	77%
	Delivery by Caesarean section	-	4%	5%	4%	6%	5%	5%
	Newborn's first PNC in first two days after birth	-	-	-	-	-	50%	53%
	Doctor/nurse/midwife provided first PNC	-	-	-	-	-	21%	27%
*Data not available for 2000 **Data not available for children with diagnosed malaria								

4.1 Malaria, Diarrhea, and Pneumonia

There were a range of EBIs which targeted these major causes of death for children under 5 in Senegal. According to estimates by IHME, in Senegal, these causes accounted for 48% of all U5 deaths in 2000; 17% caused by diarrhea, 12% by pneumonia, and 19% by malaria.[42]

Across the three conditions, care-seeking remained relatively stagnant with 51% or less of care givers reporting use of services between 2000-2016. In prevention-based interventions, there were some successes including the rapid introduction and scale of rotavirus starting in 2014, just before the end of our study period, and uptake of preventive measures for malaria (insecticide-treated nets, for example). Uptake of other vaccines including Haemophilus influenza type B vaccine (Hib) and pneumococcal conjugate vaccine (PCV) and measles (lowest at 81%) achieved and maintained high coverage. In addition,

rates of some of the conditions reported by caregivers in the two weeks preceding the DHS survey also dropped including diarrhea (22% in 2005 to 15% in 2016), ARI (13% in 2005 to 3% in 2016), and fever (30% in 2005 to 13% in 2016) (Figure 17).[7]

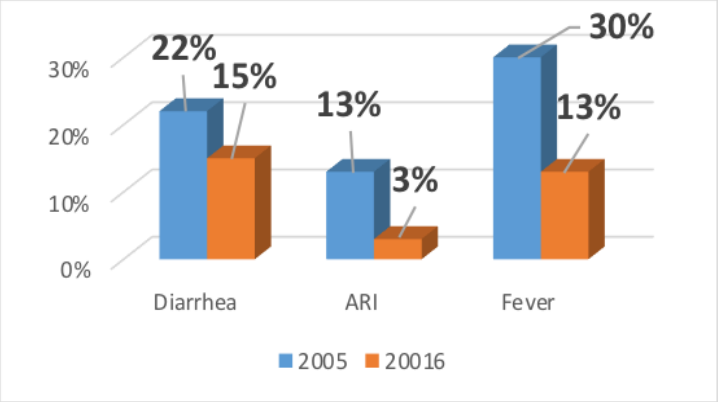


Figure 17: Dropping Rates of Diarrhea, ARI, and Fever Between 2005 and 2016 (STAT Compiler)

4.1.1 Facility-Based Integrated Management of Childhood Illness

WHO and UNICEF developed the IMCI strategy in 1995 to guide the prevention and treatment of the most common childhood illnesses including diarrhea, pneumonia, and malaria, globally.[64] The IMCI strategy focuses on improving health care providers' abilities to diagnose and treat common illnesses in high child mortality countries and improving family and community health behaviors through integrating health education.[8]

Table 10: Key Facility-Based IMCI Implementation Strategies

Implementation Strategies
• Learning from other countries • Use of data to understand disease • Integration into national policy and protocols • Engagement of existing program implementers • Engagement of academics and service providers • Engagement of partners • Adaptation of existing training and guidelines to reflect local context • Piloting and rapid scale-up • Training of trainers (TOT) and cascade to district and facility levels • Integration into pre-service training (nurse) • Monitoring and evaluation (M&E) and supervision • Leveraging of donor funding and partner capacity • Data-driven adaptations for cost and effectiveness • Surveillance • Focus on equity

EXPLORATION

Following development of the IMCI strategy, WHO supported the process of implementing this approach in several countries. In 1996, upon request of the Government of Senegal, WHO organized several meetings at national level to present this new approach, all tools required to implement it as well as the experiences of other countries (for example, Uganda) which had already started implementation of the IMCI strategy.[65] Participants of these meetings included donors, implementing partners, and the MOH departments responsible for coordinating and implementing diarrhea, ARI, malaria, nutrition, and vaccination programs in Senegal. Leading the way among many countries, Senegal decided to rapidly adopt IMCI as the strategy for reducing U5M, replacing the child survival section of the existing Primary Health Care strategy which had been developed in response to the 1978 Alma-Ata declaration. Inclusion of mothers (and caregivers more broadly) in decisions regarding their children's care was also one of the aims of Senegal's IMCI strategy.

PREPARATION

In 1997, Senegal integrated the IMCI into the National Plan for Health and Social Development (PNDS) (1998-2007) and invited WHO experts for a preliminary visit to assess Senegal's readiness for implementing the strategy. In addition, a working group (with four sub-working groups focused on clinical adaptation, nutrition, local terminology, and policy and guidelines) was set up to guide the preparation process with support from USAID, WHO, and UNICEF. The sub-groups included academics and service providers to ensure a diversity of viewpoints on the feasibility of the strategy in Senegal. These sub-working groups also employed different methodologies to adapt the generic WHO IMCI protocols to Senegal's context. For example, the nutrition sub-working group employed a "Trials of Improved Practices" approach, a formative research methodology which involved conducting qualitative interviews across four districts (Darou Mousty, Kaffrine, Kebemer, and Sédhiou) in the different regions of Senegal to identify their feeding practices and beliefs and assess their purchasing power. The four districts were selected to ensure diversity of feeding practices and beliefs and purchasing power. The findings of this research served as the basis for designing the nutrition component of the Facility-based Integrated Management of Childhood Illness (FB-IMCI) for a trial period. After this period, further research was conducted to measure acceptability of the results and ultimately inform the final nutrition component design.

One KI, speaking on the importance of the Trial of Improved Practices approach, explained that "It is a methodological approach that is based on the social realities and food availability of the place. We wanted to know what were the beliefs of populations and what the foods available were in a specific place… because reality here is not there or even elsewhere. In each zone where one intervenes it is necessary to make a test of an improved practice."

The process of adapting the disease-management components of the generic WHO IMCI protocols involved reviewing and revising them to reflect country-specific data (where available) on the effectiveness of the different interventions that comprise IMCI.[66] Further preparation included human

resource assessments to inform the design and scope of trainings needed. The working group also collaborated with the Senegal National Health Information System to incorporate the indicators required for monitoring and evaluating the FB-IMCI approach.

Initial piloting of the full FB-IMCI strategy began in 1999 in Darou Mousty district with the aim of identifying the added value of the strategy for Senegal and potential challenges before scaling up. Darou Mousty district was selected because of its small size, which helped to ease the rolling out of FB-IMCI. Nurses received training on using FB-IMCI guidelines adapted from WHO IMCI guides.[67] However, a study to evaluate the nurses' compliance with FB-IMCI protocols found that only 16% of them followed the FB-IMCI across diagnostic, therapeutic, and other areas. The study recommended that as part of scale-up, basic training and in-service courses should place greater emphasis on FB-IMCI procedures and highlighted the need for regular supervision to better optimize the strategy.[67] The findings of this study influenced the full rollout of the FB-IMCI strategy as one KI explained: "*the question of supervision, remains a constraint of the system today but (as a result of the study), the post-training follow-up and the supervision of providers were reinforced as key elements of implementation of the IMCI strategy…*"

In 2000, a pilot test was expanded to include all health structures (excluding health huts) in the four districts of Kaffrine, Darou Mousty, Kebemer, and Sedhiou. These districts were selected based on two criteria: their relatively high U5M rates, and the availability of partners already working within the districts to support the process and their location/geography (i.e. they were hard to reach areas such as Darou Mousty, which was also selected for the initial pilot in 1999 because of its small size). The expanded pilot focused on testing the feasibility of the strategy in difficult circumstances. According to KIs, the second pilot testing phase provided evidence for the acceptability of the FB-IMCI approach with increased engagement of mothers by health workers, in issues regarding their children's care.

In 2001, an evaluation of the second pilot test of FB-IMCI implementation in Senegal found high levels of readiness and quality. For example, all facilities implementing FB-IMCI had IMCI guidelines (compared to 75% of non-IMCI facilities which had some form of treatment guidelines). Also, 96% of malaria cases (compared to 70% in non-IMCI facilities) were given appropriate antimalarial and 86% of pneumonia cases (compared to 88% in non-IMCI facilities) were treated appropriately with antibiotics; in facilities implementing FB-IMCI. In addition, at health facilities implementing FB-IMCI, a high proportion (86%) of caregivers were given adequate instructions on how to administer the medications and 87% of health workers also inquired about the severity of the child's illness, compared to only 21% in non-IMCI facilities. Overuse of antibiotics was also reduced in FB-IMCI facilities with 30% of children without pneumonia receiving antibiotics, compared to 80% in non-IMCI facilities.[68] The study found that FB-IMCI reduced costs, with ARI and diarrhea treatment costing 563% and 302% more in facilities not implementing IMCI guidelines compared to non-FB-IMCI facilities, mainly due to overuse of prescription antibiotics and cold medicines.[68]

IMPLEMENTATION

In 2001, Senegal began the process of scaling up the FB-IMCI strategy nationwide. However, there were challenges in the availability of resources since a major USAID-funded program responsible for assisting in the implementation of FB-IMCI (BASICS) was awaiting renewal of funding. This delay in funding resulted in advocacy efforts by the Government of Senegal to a broader range of donors and partners including USAID, WHO, UNICEF, and the Integrated Health Development Program of the World Bank for funds and technical support to continue the implementation of the FB-IMCI strategy. Key informants reported that donors and implementing partners were committed to funding the FB-IMCI approach: "*It's thanks to the conjunction of all [these donors and partners] that IMCI experienced a very large scale."* The government's contribution was indirect through overall health systems funding, including capital costs such as costs of health structures; fixed costs such as salaries for health workers; and operating costs such as water, electricity, and communication costs. FB-IMCI scale-up begun in 2002. Nurses were trained on the FB-IMCI protocols for 11 days and supervised shortly post-training by district health teams, who themselves had been trained by central-level health teams. According to KIs, this IMCI-targeted supervision by district health teams also ensured better coordination in the supervision of previously vertical diarrhea, malaria, and pneumonia programs. Senegal also periodically evaluated the quality of the FB-IMCI supervision process.

The ongoing implementation of Senegal's FB-IMCI was evaluated using DHS and SPA data (to assess the availability and quality of malaria treatment, and care delivery). SPA data from 2012-2013 showed high levels of malaria readiness. For example, 99% of all sampled facilities across the different regions in Senegal offered malaria diagnosis and treatment services and 78% of staff at these facilities had undergone in-service training on malaria diagnosis and treatment; 85% had malaria diagnosis and treatment guidelines available.[52]

As noted, donors and partners were a key part of the implementation of FB-IMCI in Senegal. In addition to implementation support provided during the initial implementation of FB-IMCI they provided technical support, while USAID (through the BASICS program) helped to coordinate the National Service of Nutrition and Feeding – which at the time was the directorate in charge of IMCI at the MOH – and led the IMCI technical working group. However, the scope of support provided by partners including BASICS changed: in order to ensure adequate support for each region, Senegal opted to divide regions among the various partners, for implementation of all health programs (including FB-IMCI). Given their child health programming focus BASICS, for example, was assigned regions with the worst child health indicators.

An important strategy used in Senegal to ensure harmonization of donors was "intervention harmonization workshops" where issues related to IMCI implementation including diarrhea and malnutrition management were discussed with all donors and partners. These workshops were held twice a year: once at the beginning of the year to align the strategy with the National Health Plan as the overarching guide for the year and another at the middle of the year as a mid-term review to assess progress, meet emerging challenges, and re-plan activities for the rest of the year. Key informants mentioned that these workshops *"avoided duplication or high concentration of resources in one area."*

ADAPTATION DURING IMPLEMENTATION

Senegal adapted its IMCI program in response to local and international research, M&E results within the country, and partner and donor recommendations. For example, at the start of IMCI in Senegal, malaria treatment was chloroquine. However, surveillance conducted by the National Malaria Control Program found that resistance to the medication had exceeded 25% (the limit according to WHO recommendations). In response, in 2003 Senegal adopted the combination of sulfadoxine/pyrimethamine (SP) and amodiaquine (AQ) for malaria treatment. In 2006, based on new WHO recommendations, Senegal introduced artemisinin-based combination therapy (ACT).[69] This was accomplished through a Global Fund-supported needs assessment, quantification, and costing meeting at MOH with donors, partners, the National Pharmacy, and district and regional health teams; to develop a funding proposal and implementation plan which was successfully rolled out.

Prior to the national switch to ACT, Senegal spent two years (2006-2008) doing a pilot in one district (Oussouye) led by the Cheikh Anta Diop University, to identify potential challenges to this adaptation. Oussouye district was selected because it was a Health and Demographic Surveillance Site which would support the collection of surveillance data throughout the pilot testing. Piloting began at the facility level first, then moved to training agents de santé communautaires, relais communautaires, and matrones when ACT was rolled out at the community level (see CB-IMCI, below). Key informants mentioned that piloting was successful in ensuring that the feasibility and acceptability of ACT were determined prior to the full rollout. By 2014, ACTs were used at all health facilities in Senegal.[70]

Another adaptation occurred in 2007, when Senegal identified the high cost of treating malaria without confirmatory tests and, in response, introduced rapid diagnostic tests (RDTs) for confirming malaria cases before treating. This was an early adoption occurring three years earlier than the 2010 WHO recommendations.[71] In addition, Senegal's experience with chloroquine resistance further informed its decision to introduce RDTs to prevent the emergence of ACT resistance. As one KI explained, *"apart from the ACTs we had nothing else in terms of safety nets. They were the most effective medicine and there was nothing behind them. Which meant that if the ACTs did not work anymore, we would have problems. By misusing the medicine, we risked the phenomenon of resistance. So, it was better to make the effort to test to treat real cases and use the medicine efficiently."*

Following the usual implementation strategies in Senegal, a one-year pilot testing of RDTs in Senegal was carried out (2007-2008) in the same district as for ACT to leverage on the existing surveillance system. The study developed an approach for sensitizing communities to the introduction of RDTs and provided evidence for their acceptability at the community level.[72] For example, in describing some of the lessons learned, a KI who was a key member of the team which led the pilot testing process said, *"we learned something very important at the community level. When health workers use a tool to do the diagnostic, they are upgraded. Community say: ah! They now have a tool! He's more respectable among the health workers*." The pilot testing phase was also useful for identifying the feasibility of introducing RDTs in Senegal. According to KIs, this included the optimum temperature for storing RDTs as well as developing a supply chain strategy including forecasting and needed stock levels at both health facilities and

communities. It was also helpful in determining the most suitable delivery modes for RDTs to health facilities (central medical store using a "pull system") and communities (district level facility stores). Similar to the introduction of ACT, a Global Fund-supported needs assessment, quantification, and costing exercise was done by the MOH, donors, partners, and regional and district health teams to develop a funding proposal and implementation plan for the RDTs.

The protocol for RDT use initially excluded testing for fever cases with symptoms consistent with other causes as opposed to testing all cases. According to KIs, this was important in the initial stages to keep the needed quantity of RDTs and therefore related cost as low as possible. However, this protocol was changed in 2013-2014 to include all cases of fever in children in the rainy season. In 2017, after the case study period ended, the protocol was changed to include all cases of fever irrespective of age and season to reflect Senegal's pre-elimination approach which involved active testing, diagnosis, and treatment of malaria cases.[70] This decision was taken to ensure prompt identification of malaria cases. The introduction of RDTs (and treatment of only confirmed malaria cases) presented a challenge for comparing data on the proportion of children with fever who received prompt treatment with ACT which fell from 3% in 2010 to 0.4% in 2015.[70]

Another example of an adaptation due to data was the change in Senegal's IMCI protocol for ARIs. The MOH surveillance laboratory found increasing resistance to Cotrimoxazole so the antibiotic was changed to Amoxicillin.

In 2016, Senegal adapted its IMCI program to include neonatal care protocols and training in response to data showing relatively higher neonatal mortality compared to non-neonatal U5M figures and following WHO recommendations.[42] This adaptation was led by a working group set up by the MOH and facilitated by the integration of the neonatal and maternal health units into one unit. The scope of Senegal's IMCI training was also adapted in 2016 to include the neonatal components.

Table 11: FB-IMCI Implementation Strategies and Outcomes

Implementation Outcomes	Implementation Strategy	Evidence
Appropriateness	Use of data to understand disease burden Initial and ongoing adaptation of existing training and guidelines to reflect local context and resources	(+): The IMCI approach was appropriate. Malaria, diarrhea, and pneumonia each accounted for more than 400 deaths per 100,000 of the total under-5 population in Senegal in 1990, and together, they accounted for 48% of U5 deaths that year.[7] (+): Adaptation based on evidence of chloroquine resistance and staff training times
Acceptability	Engagement of existing programs in exploration Adaptation of existing training and guidelines to reflect local context	(+): A KI who was a key member of the team which led the pilot testing process for the introduction of RDTs said, "When health workers use a tool to do the diagnostic, they are upgraded. Community say: ah! They now have a

	Engagement of academics and service providers in preparation Engagement of broad range of donors and partners in preparation and implementation Piloting adaptations, e.g. ACT, RDTs	tool! He's more respectable among the health workers." (-): Care-seeking behavior remained unchanged for diarrhea (34% of children with diarrhea taken to a health facility in 1997 just before the introduction of IMCI and 35% in 2016), for fever (43% in 2005 and 45% in 2016) or respiratory infections (49% to 51% between 2005 and 2016).[40] These unchanging rates of care-seeking behavior might be as a result of the introduction of CB-IMCI and consequent care-seeking from CHWs as opposed to health facilities.
Feasibility	Learning from other countries Pilot testing and adaptation Leveraging donor funding and partner capacity	(+): FB-IMCI was able to be implemented in facilities, with the last scale-up phase beginning in 2013.
Effectiveness and Coverage	TOT and cascade to district and facility levels Data-driven adaptations for effectiveness, e.g. introduction of RDTs, ACTs, testing all cases with RDTs before treatmentData use (Surveillance) (for switching to Amoxicillin) Supervision and training	(+): From 2000 to 2016, reduced death rate per 100,000 due to malaria (484 to 71), diarrhea (432 to 138), and pneumonia (deaths due to respiratory infections fell from 313 to 131), among under-5s. However, incidence also dropped in all three conditions so absolute contribution of IMCI could not be determined, and could have resulted from ITN use (malaria) and improvement in WASH (diarrhea). (+): Testing all cases of fever in children in the rainy season resulted in an 85% increase in the number of confirmed malaria cases. (+/-): Final scale-up phase began in 2013, but overall rates of reported care seeking remained well under universal coverage for pneumonia, diarrhea, and fever in 2016.[52]
Fidelity	Training using adapted materials M&E Supervision	(+): High levels of malaria readiness: 99% of all sampled facilities across the different regions in Senegal offered malaria diagnosis and treatment services; 78% had at least one trained provider; 85% had guidelines available.[52]
Cost	Data driven adaptations for cost- introduction of RDTs, reduction in medication overuse	(+) Cost of ARI and diarrhea treatment was lower in FB-IMCI implemented facilities.
Sustainability	Integration into pre-service training (nurse)	(-): Challenges with integrating IMCI strategy into nurses' pre-service training curriculum due to the high number of hours required. (+): National Policy (Clinical IMCI policy)

	Integration into national protocols and policy	(-): According to KIs, the budget for FB-IMCI in Senegal was not sufficient and needed to be increased as of 2019.
Equity	Piloting in hard to reach areas Focus on equity (equity-based allocation of partners)	(+): Care seeking improved among the poorest and was even higher in 2016 for diarrhea (41% versus 29% in the highest wealth quintile) (Figures 19-21).

SUSTAINMENT

Staff attrition posed a huge challenge to human resources availability for implementing FB-IMCI in Senegal. However, the government began the process of addressing this in 2002, by looking for ways to include the IMCI strategy in nurses' pre-service training curriculum as the primary providers of FB-IMCI. According to KIs, this had not been completed because of the time required to teach the IMCI strategy – over 60 hours – in addition to already existing demands of nurses' pre-service training curricula. As such, in 2016, at the end of the study period, IMCI training was the only part of the on-the-job training curriculum for nurses, but not the pre-service curriculum.

To ensure sustained funding for IMCI delivery, the government initiated a budget line for IMCI; however, by 2019, after the study period ended, KIs noted that the budget for FB-IMCI in Senegal remained insufficient and needed to be increased.

4.1.2 Community-Based Integrated Management of Childhood Illness

Figure 18 tracks the introduction of the community-based malaria, pneumonia, and diarrhea EBIs discussed in this case study, from the 1990s through 2010.[8] Senegal began the introduction of these EBIs by developing protocols and guidelines which were used as basis for piloting the EBIs before scale-up.

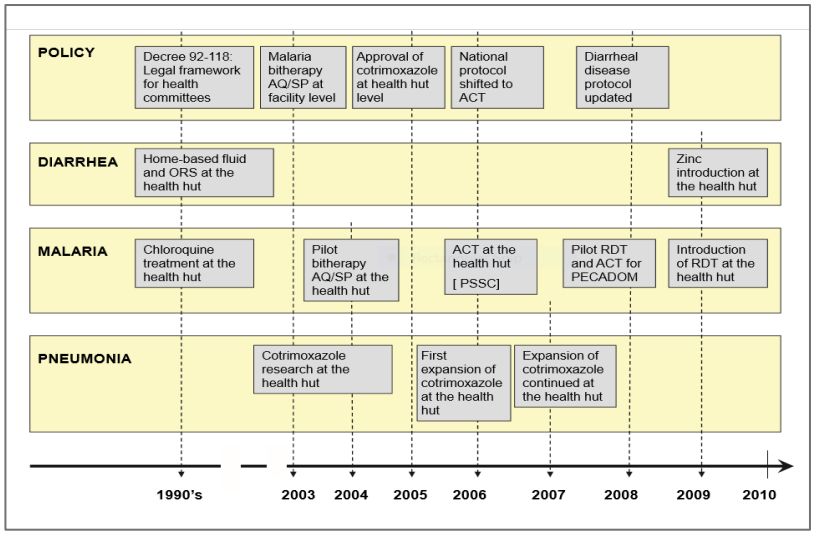


Figure 18: Timeline of Community-Based Malaria, Pneumonia, and Diarrhea EBIs In Senegal (1990s-2010) (Source: USAID and MCHIP 2010)

Table 12: Community-Based IMCI Key Implementation Strategies

Implementation Strategies
• Focus on equity • Data-based decision-making • Stakeholder engagement • Piloting • Research led by national experts • Advocacy • Community engagement • Adaptation of existing guidelines • Integration into existing structures and systems • Leveraging of community-based malaria program • Supply chain strengthening for malaria component (leveraging National Malaria Control Program) • Initial TOT and ongoing training through refresher courses • Supervision • Adaptation based on epidemiology, cost, international guidelines, and for equity

EXPLORATION

Although NGOs in Senegal had historically delivered a package of care which included components of CB-IMCI with community-based management of childhood illnesses like diarrhea and malaria, the CB-IMCI program grew out of the country's need to extend case management of childhood illness fully from health facility to community level to ensure better access for the more rural and hard-to-reach populations in the early 2000s.[73] The plan was to build CB-IMCI onto the existing community-based government malaria program and expand CHWs' roles to include delivery of community-based care that addressed diarrhea and acute respiratory infections (ARIs). One KI explained that, in contrast to FB-IMCI which was innovative in integrating case management of childhood illnesses, *"Community-based activities existed before Senegal adopted the [IMCI] strategy, they were [just] reformatted as part of the Integrated Community Case Management."* (See other malaria interventions and other diarrhea interventions sections for details of the malaria and diarrhea programs in Senegal, before CB-IMCI).

PREPARATION

The decision to expand the scope of CHWs' health care delivery in communities was opposed by some stakeholders within Senegal particularly on the use of antibiotics by community-based providers. In response, between 2003–2004, advocacy was done to health care professionals to allow the CHWs to use antibiotics in the treatment of pneumonia. In addition, important strategies including community engagement and human resources assessments to assess technical capacity and sufficiency of the existing CHWs for implementing the CB-IMCI were employed as part of the pilot study.

UNICEF and USAID provided funding for pilot testing of the pneumonia component in four districts (Khombole, Vélingara, Sedhiou, and Kaffrine) through the USAID-funded Community Health Program led by the ChildFund. The pilot assessed whether CHWs who were trained and supervised could correctly assess, classify, and treat pneumonia with antibiotics and recognize complex cases which required referral to higher levels of health care.[74,75] According to KIs, these pilot districts were selected because they had already began implementing the FB-IMCI strategy which could facilitate effective treatment of the complex cases referred. The study was led by the MOH through the divisions of Child Health and Pharmacy and designed by a local professor of Pediatrics at the Cheikh Anta Diop University. Key informants noted that inclusion of this Senegalese professor as the lead provided validity to the process and facilitated buy-in of stakeholders who had been resistant to the introduction of community-based treatment of ARIs with antibiotics. Results from the pilot test showed the care seekers' acceptance of CB-IMCI. Guidelines for treating childhood diseases were adapted to reflect the CB-IMCI program in Senegal. Integration of CB-IMCI into the national health management information system (HMIS) was not done during preparations, a gap that research in 2010 found remained a problem for effectively monitoring and evaluating the program at a national level.[8]

Three existing cadres of CHWs (agents de santé communautaires, relais communautaires, and matrones) were selected as initial implementers of CB-IMCI in Senegal at the time of piloting. The MOH and communities jointly selected the CHW cadres based on the role requirements of the CB-IMCI implementation. (See Community Health Program in Section 2 and the other malaria EBIs section for descriptions of the different CHW cadres in Senegal and details of the community-based malaria program before the introduction of CB-IMCI in 2003.) The agents de santé communautaires were the main deliverers of CB-IMCI and were trained on the full CB-IMCI program. The matrones and relais communautaires were also trained on the CB-IMCI and, in collaboration with the agents de santé communautaires, delivered the health promotion and social mobilization components of the program.[56]

Community engagement and education around CB-IMCI program were key to both the pilot and initial roll out of the program. Given that communities were already involved in the selection of the CHWs, community engagement further fostered acceptance and ownership of the program. This sense of ownership, according to KIs, was reflected in funding the building of health huts and buying medicines for the CB-IMCI program.[67] Preparations also included the development of a standardized training curriculum for the CHWs.

IMPLEMENTATION

USAID-funded Community Health Program, led by ChildFund, provided both funding and technical support (for example, trainings) for the full implementation of the CB-IMCI. Both health hut and home-based delivery approaches were adopted to ensure access for all of the population.

In 2006, the national scale-up of the CB-IMCI included strengthening the supply chain in some but not all needed commodities and training of some CHWs on the supply of drugs. At the community level, the supply took into account the needs of the fixed sites (health huts) and those of the CHWs. The malaria

component of the CB-IMCI program incorporated strategies for preventing stock-outs of supplies including monitoring par levels and distributing supplies to communities before they were stocked out. This supply chain strategy was not employed for other components of the CB-IMCI program – with stock-outs of needed drugs for diarrhea (e.g. zinc and ORS) and antibiotics for ARI observed in 2012-2013 in the south of the country (Kolda). Research in 2010 attributed this difference in supply chain strategy to the relatively poor integration of the malaria component of CB-IMCI into the overall program with the malaria component existing as part of the National Malaria Control Program, which was able to maintain a vertical supply chain.

Trainings for CB-IMCI or CHWs employed a TOT approach. Initial training of CHWs for CB-IMCI lasted five days and was conducted by health post nurses who were trained as part of the FB-IMCI program.[76] The training focused mainly on the 17 key behaviors selected by the country as key components of CB-IMCI. In addition, every CHW received training on community-based services, facilitation techniques, community participation, social marketing, management of medicines and other products, and information on the organization of the health system in Senegal. For ongoing trainings, health post nurses trained CHWs and were required to provide monthly supervision. Post-training meetings were also done to monitor and ensure fidelity (although they became increasingly infrequent).

Research conducted in 2007 found that 90% of ARI cases managed by the CHWs were correctly classified as pneumonia, well managed (i.e. treatment with cotrimoxazole and referral in severe cases), and well followed-up.[10]

ADAPTATION DURING IMPLEMENTATION

In 2006, guidelines for treating childhood diseases (child survival guidelines) were adapted to reflect the CB-IMCI program in Senegal.

Between 2006 to 2010, Senegal continued to adapt its CB-IMCI program and update guidelines to reflect local evidence and recommendations by multilateral organizations including WHO and UNICEF. For example, in 2006, similar to the FB-IMCI changes, the program changed malaria treatment from SP and AQ to ACTs in response to WHO recommendations and in the same year this change was rolled out at facility level.[76,77] In 2008, the CB-IMCI package was also expanded to include management of acute malnutrition at community level, reflecting a joint statement by WHO, the World Food Program, the UN System Standing Committee on Nutrition, and UNICEF, and the change in the protocol for malnutrition management in Senegal in 2007.[76,77]

In 2008, recognizing that there were hard-to-reach populations in the south and southeast with high malaria morbidity and mortality, the National Malaria Control Program introduced a home-based management of malaria program (*prise en charge à domicile*, PECADOM). This program introduced another cadre of CHWs – DSDOMs (home-based care providers) – to the CB-IMCI program, to test and treat malaria cases within homes. In 2012, DSDOMs were trained to manage pneumonia in addition to

malaria, in hard-to-reach areas like Kedougou and Tambacounda.[70] A 2014 study found that the number of DSDOM in Senegal was 1,992 with a recommendation of one DSDOM per home-based care site (each DSDOM's assigned area). Data on the optimality of this number were unavailable for the team to review.[57]

Introduction of zinc tablets to the program with revision of the diarrhea treatment guidelines was done in 2009 based on WHO recommendations. Also, in 2009, Senegal introduced RDTs to its CB-IMCI program, two years after its introduction at facility level. RDTs were introduced based on the high costs of treating for malaria without confirmatory tests. Also, Senegal's CB-IMCI changed from using cotrimoxazole to amoxicillin for treating ARIs in 2012-2013, reflecting data on increasing resistance to cotrimoxazole in Senegal from WHO.[8]

Research in 2010 also found that CHWs did not have the supply-chain management skills needed to prevent stock-outs and that health post personnel (e.g. nurses) did not understand their role in helping to manage stock levels within the community (health huts) nor consider community-level health delivery support a priority.[8] The findings of this research informed supportive supervision activities targeted at health post nurses. Training challenges were also identified in this study, with lack of finances and transportation, and high workloads at the health posts limiting supervision activities which ideally should have occurred monthly and after trainings. To address this, supervision visits were integrated into health post nurses' routine outreach activities- a strategy which was useful in improving their frequency, although this still remained largely sub-optimal.[8]

Finally, the MOH updated the CB-IMCI training modules to reflect changes in WHO's ARI management algorithm for nurses and CHWs in 2015.[78] According to KIs, the duration of refresher trainings for agents de santé communautaires on the CB-IMCI program was also changed to three days in 2017.

Table 13: CB-IMCI Implementation Strategies and Outcomes

Implementation Outcomes	Strategy	Evidence
Appropriateness	Data-based decision-making data use to identify disease burden. Adaptation of existing guidelines.	(+): The CB-IMCI program was appropriate. Malaria, diarrhea, and respiratory infections accounted for 484, 432, and 313 deaths, respectively, per 100,000 of the U5 population in Senegal in 2000, accounting for 48% of U5 deaths that year (source: IHME).
Acceptability	Use of nationally recognized expert to lead pilot testing. Advocacy aimed at health care professionals for acceptance of the use of antibiotics by CHWs, for the treatment of pneumonia, and other stakeholder engagement activities.	(+): The communities' sense of ownership was reflected in funding the building of health huts and buying medicines for program use. (+): In 2010, mothers within the community perceived the CB-IMCI program in Senegal as well adapted to their local contexts.[8]

	Community engagement and education around CB-IMCI and in the selection of CHWs.	(+/-): Care seeking rates for pneumonia and diarrhea (including from CHWs) had not improved from 2005 to 2016 suggesting low acceptability (Figures 19 and 21) while care seeking rates for fever (including from CHWs) improved slightly overall suggesting better acceptability (Figure 20).
Feasibility	Leveraging of existing community-based malaria program and other programs. Piloting CB-IMCI in four regions before scale-up. Selection of pilot districts based on where the FB-IMCI strategy had already been rolled out so if patients were referred to facilities within the district, there would be health providers trained in FB-IMCI, to treat them. Donor funding and support. Integration into existing CHW system, employing existing cadres to implement CB-IMCI. Integration of supervision into routine nurse outreach visits. Introduction of another cadre of CHWs- DSDOMs (home-based care providers) to test and treat malaria cases within homes.	(-): Supply chain strategies remained vertical (malaria only). (+/-): CB-IMCI implemented and achieved high coverage although not national scale. (+/-): Some increase in nurse supervision.
Effectiveness and Coverage	Supply chain strengthening (only for malaria component). Initial TOT and ongoing trainings through refresher courses. Adaptation based on high malaria morbidity and mortality in the south and southeast, to introduce home-based malaria care (PECADOM). Adaptations based on international guidelines and recommendations: switch to ACT and Amoxicillin, introduction of community-based management of acute malnutrition. Supervision by nurses.	(+): In 2007 only 23% of ARI cases within districts were managed by CHWs; 90% among them were well classified, well managed, and well followed-up.[10] (+/-): A 2014 study found that national scale was close but not achieved (86% districts covered by CB-IMCI); a result of funding challenges according to KIs. The number of CHWs providing CB-IMCI was sufficient, approximately three per district covered.[79] (+/-): A 2014 study found that the number of DSDOM in Senegal was 1,992.[57] See malnutrition section for coverage of community-based nutrition program.

Fidelity	Training and refresher trainings led by health post nurses (but trainings did not provide supply chain management to CHWs). Supervisions and post-training meetings were done initially to monitor and ensure fidelity.	(+): A post-pilot evaluation found CHWs could correctly assess, classify, and treat pneumonia with antibiotics at community level and recognize complex cases which required referral, with the right training and supervision.[64,75] (-): Integration of CB-IMCI into the national HMIS was not done during preparations, a gap which research in 2010 found remained a problem for effectively monitoring and evaluating the program at a national level.[8] (-): A 2010 study found lack of finances and transportation and high workloads at the health posts limited supervision activities which ideally should have occurred monthly and after trainings.[8] (-): Stock-outs of diarrhea and ARI supplies.[8] Data not available for CB-IMCI quality of care (at national scale).
Sustainability	Adaptation of existing guidelines.	(+): Senegal had CB-IMCI guidelines and by 2014, the first community health strategic plan was developed followed by the establishment of a community health unit at the MOH.
Cost	Adaptation based on cost: introduction of RDTs to its CB-IMCI program in 2007, reflecting the high costs of treating for malaria without confirmatory tests.	(+): A 2014 study found the CB-IMCI program in Senegal was the most cost efficient per capita (US$2.07) out of the seven countries examined by the study. This included management and supervision, refresher trainings, medicines and supplies, CHW compensation, and meetings.[79]
Equity	Focus on equity: CB-IMCI program grew out of the need to ensure better access for the more rural and hard-to-reach populations. The introduction of another cadre of CHWs- DSDOMs (home-based care providers) to reach underserved areas for malaria.	(-): According to a 2014 study, only 2.7% of cases of malaria, pneumonia, and diarrhea were addressed by CHWs implementing CB-IMCI in hard-to-reach areas.[79] (-): Figures 19-21 show care-seeking rates for pneumonia, fever, and diarrhea, and the reduction in wealth-related differences, which were largely due to a decrease in the wealthiest rather than an overall increase in care-seeking among the different wealth quintiles in Senegal.

SUSTAINMENT

Research conducted in 2012 identified continued weak coordination of linking expansion of the malaria program with the expansion of ARI and strengthening diarrhea case management. Malaria remained a more directed intervention under the National Malaria Control Program.[8] The malaria component of CB-IMCI also continued to receive vertical support from the PMI and the Global Fund.

According to KIs, in 2012 Senegal began to implement plans for paying CHWs for delivering CB-IMCI, given their expanding responsibilities and decreasing motivation, though a 2014 study found that CB-IMCI CHW attrition rates were at only 5%.[79] By 2019, after the study period ended, KIs noted that the initiative to begin paying CHWs had not yet been broadly implemented as part of CB-IMCI although, as part of the malaria program, each CHW received compensation of 2500 CFA per week. The 2014 study also found that the national scale-up was close but had not yet been achieved (65 out of 76 districts, or 86%) which, according to KIs, was a result of funding challenges. Further, the estimated number of CHWs providing CB-IMCI in Senegal was sufficient (3,240 CHWs; three per district) to provide services as part of the CB-IMCI program.[79] The same study found that the CB-IMCI program in Senegal was the most cost efficient per capita (at US$2.07) out of the seven countries including Cameroon, Malawi, Sierra Leone, the Democratic Republic of Congo, Senegal, Zambia, and South Sudan.[79] This study assessed the cost efficiency of each CB-IMCI program's management and supervision, refresher trainings, medicines and supplies, CHW compensation, and meetings. No data on relative quality or effectiveness was included.

Figure 19: Coverage and Equity Outcome: Care-Seeking for Pneumonia Across the Different Wealth Quintiles in Senegal (2005-2016) (Source: Victora, et al 2018)

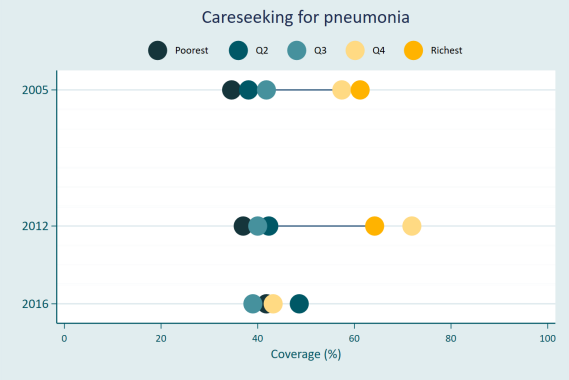


Figure 20: Coverage and Equity Outcome: Care-Seeking for Fever Across the Different Wealth Quintiles in Senegal (2005-2016) (Source: Victora, et al 2018)

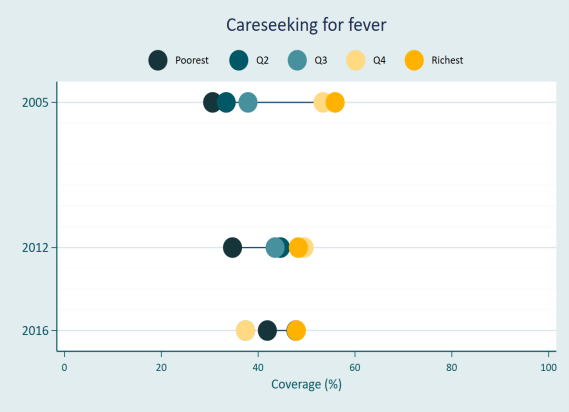
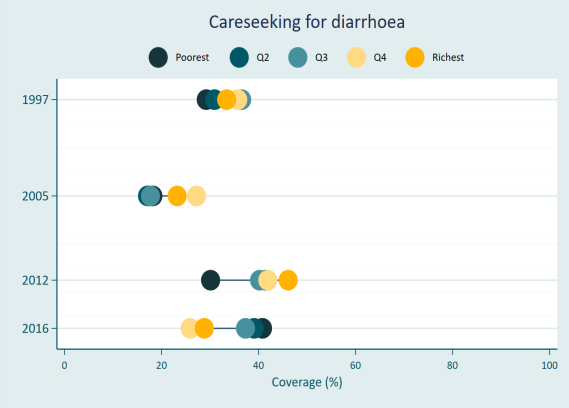


Figure 21: Coverage and Equity Outcome: Care-Seeking for Diarrhea Across the Different Wealth Quintiles in Senegal (2005-2016) (Source: Victora, et al 2018)



4.1.3 Other Diarrhea Interventions

4.1.3.1 Oral Rehydration Therapy and Zinc for Diarrhea

Table 14: ORT and Zinc Key Implementation Strategies

Implementation Strategies
• Adaptation of existing guidelines to reflect local context • Leveraging of partner and donor support • Private sector engagement (PPP) • Integration into existing systems e.g. Essential Medicines List • Integration into existing programs • Focus on equity • Community engagement • Training *See also FB-IMCI/CB-IMCI*

IMPLEMENTATION PRE-2000

The original adoption of oral rehydration therapy (ORT) to treat diarrhea in children started in Senegal in 1985, through the Primary Healthcare Technology Diarrheal Disease Control program funded by USAID and UNICEF and implemented by Management Sciences for Health. The program was responsible for adapting WHO's module on dehydration prevention to Senegal's context. USAID and UNICEF donated oral rehydration solution (ORS) to the MOH which, in turn, distributed it for free. In 1994, with national coverage of ORT at only 29%, BASICS began to promote use of this therapy by focusing on providing technical assistance for infant and child survival programs in Senegal.[80] Thereafter, in 1995, Senegal included ORS in its essential medicines list and in 1996 ORT was integrated into FB-IMCI.

Before 2000, the use of ORT remained low though it increased from 18% in 1992 to 33% in 1997, possibly due to the introduction of FB-IMCI in 1996 with accompanying community engagement.[80] Data on pre-2000 zinc usage were unavailable because zinc was integrated into the treatment of diarrhea from 2009.

IMPLEMENTATION AND ADAPTATION POST-2000

In 2003, Senegal expanded ORT availability through inclusion as part of the CB-IMCI program, although children with diarrhea who received ORT decreased from 33% in 1997 to 26% in 2005.[81] While uptake was not high, the availability of ORT continued to increase with ORT available at more than 1,600 health huts in 58 districts (out of 75), in Senegal in 2010. However, in 2016, only 20% of children with diarrhea were treated with either ORS or recommended home fluids (RHF); 21% of these received ORS (packet or fluids) only. This low uptake of ORT by children with diarrhea, according to KIs, may have resulted from ORT access from private facilities which were not reflected in the uptake data.

In 2006, WHO recommended ORS and zinc for diarrhea treatment and in 2008, Senegal adopted the recommendation, introducing it officially in 2009. That year, the CB-IMCI protocols included zinc in the treatment of diarrhea, but in 2010-2011, only 0.2% of children received zinc supplements during diarrheal episodes. This rate increased to 7% in 2016 (6% rural versus 8% urban).[81,82] According to KIs, poor coordination of zinc supply to different levels of care, the distribution of zinc capsules in galenic form which were not suitable for children, and the lack of prior training of staff and awareness of the populations may explain the low rates. To address these low rates, in 2012, the National Pharmacy and Micronutrient Initiative distributed zinc to all districts and trained all health actors in the public and private sectors and at the community level. In addition, the MOH in collaboration with partners implemented a communication campaign to increase community awareness about appropriate management of diarrhea in children. Despite all these efforts, procurement difficulties led to frequent stock-outs of zinc which continued to limit coverage of zinc for diarrhea treatment.[83]

Public-private partnerships were also a means for delivering diarrhea treatment. For example, in 2011, Senegal became a recipient of the Zinc Alliance for Child Health (ZACH), a partnership between Nutrition International, the Government of Canada, Teck (a mining company), and the MOH to reduce child deaths due to diarrhea, by scaling-up access to zinc supplements and ORS including training of selected CHWs. As of 2012, all ORS in Senegal was imported with no plans to begin local production, with implications for sustainability.[83]

Table 15: ORT and Zinc Implementation Strategies and Outcomes

Implementation Outcomes (Zinc and ORT)	Strategy	Evidence
Appropriateness	Adaptation of existing guidelines to reflect local context	(+): Reflected diarrhea as ongoing cause of death and evidence of zinc and ORT effectiveness globally
Acceptability	Integration into CB-IMCI Community engagement	(Unknown): Low uptake of ORT and zinc suggested low acceptability although may have been due to private access (ORT) and frequent stock-outs (zinc)
Feasibility	Leveraging of partner and donor support: WHO, UNICEF, USAID PPP Integration into IMCI	(+/-): ORT and zinc program implemented but with limited coverage
Effectiveness and Coverage	Private sector engagement (PPP) Donor-funding	(-): Following the integration of ORT into CB-IMCI in 2003, children with diarrhea who received ORT decreased from 33% in 1997 to 26% in 2005.[7] (+/-): In 2016, 20% of children who had diarrhea received ORT, of which, 21% had received ORS in

	Leveraging of partner and donor support: WHO, UNICEF, USAID	packet or liquids. While uptake was not high, availability was better. (-): In 2009, zinc was added to CB-IMCI and between 2010 and 2011, 0.3% of diarrhea cases were treated with zinc supplements; the rate only increased to 7% in 2016.[81]
Fidelity	Training	Not found.
Sustainability	Integration into essential medicines list	(-): As of 2012, Senegal imported ORS with no plans to begin local production.[83] (-): Evidence of lack of national coverage and low uptake also threatened sustainability. (-): Poor coordination of zinc and ORT program.
Equity	Focus on equity: free distribution of ORS	(+/-): In 2016, low rates of ORS uptake in both urban (8%) and rural areas (6%) due to low national coverage (equity).[82] Same for wealth quintiles (Figure 22).

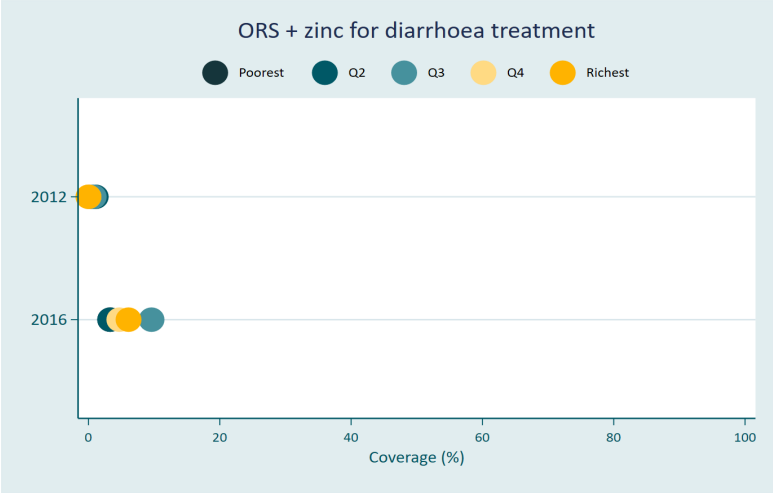


Figure 22: Coverage and Equity Outcome: ORS and Zinc for Diarrhea

4.1.3.2 Rotavirus Vaccination

Table 16: Rotavirus Vaccination Key Implementation Strategies

Implementation Strategies
• Data-based decision-making • Leveraging of broader vaccines system strengthening work (technical group and supply chain) • Stakeholder engagement: New Vaccine Introduction Working Group • Data-driven prioritization • Integrating into existing eHIS and vaccine cards • M&E • Leveraging donors for funds, supplies, and systems and ensuring national commitment • Supply Chain Strengthening • TOT and supportive supervision • Community and other stakeholder engagement including professional societies and consumers • Use of mass media • Integration into existing vaccine monitoring and supervision efforts • Focus on equity

EXPLORATION

In 2009, WHO recommended rotavirus vaccine introduction globally. Following this recommendation, between 2011 and 2015, GAVI made a decision to provide a number of countries – including Senegal – with support through an initial grant and an ongoing co-financing mechanism to introduce the vaccine.[84] Senegal's introduction of rotavirus vaccine was delayed because the country prioritized the introduction of PCV which GAVI had also recommended for introduction about the same time. This prioritization process was largely based on disease burden data and country vaccine capacity and was coordinated by the New Vaccines Technical Working Group convened at the introduction of Hib in 2004 (see Hib, below).

The MOH led the technical working group with a range of key stakeholders including partners (e.g. WHO, UNICEF, and USAID), and independent experts – pediatricians, epidemiologists, public health experts, bacteriologists, and immunologists. In speaking of the leadership of the MOH and the specific role of partners in the working group, a KI explained that "*the partners have no deliberative voice. In the secretariat, they are there represented… but they do not vote, they only can give technical advice.*" Other factors influencing the prioritization process included Senegal's limited capacity to expand its logistics and cold chain capacity, and also to conduct the needed trainings to facilitate the simultaneous introduction of rotavirus vaccine and PCV.

PREPARATION

In preparation for introducing rotavirus vaccine in 2014, Senegal began to apply WHO's recommendations for the introductions of new vaccines including planning and budgeting, calculating vaccine supplies required, and assessing its cold and supply chain capacity.[85] This work was done with support from GAVI (funding and technical support) and the working group (technical support).

As a result, a national strategy document was developed outlining the rotavirus implementation plan with clearly defined conditions such as cold chain capacity requirements, a communication plan, and a training guide for frontline health workers detailing storage conditions, eligibility, administration processes, and potential adverse effects. The communication plan included a specific section for how to access hard-to-reach areas.

The communication plan formed the basis for multiple engagements with health workers, caregivers (mainly mothers), and professional organizations like the SOSEPED (*Societe Senegalaise de Pediatrie*, the Senegalese Society of Pediatricians). There were poster, radio, and television campaigns, as well as community outreach and launch ceremonies. These engagement activities built on existing acceptance of immunization programs in Senegal due to a longstanding practice of community engagement as a key part of EBIs' introduction and implementation in the country. One KI explained, "*In Senegal the advantage is that people have confidence in immunization programs and even when there is a new introduction…they accept to take it.*"

Redesign of existing routine Immunization data collection tools was also undertaken, including integration of rotavirus vaccination into eHIS and vaccination cards. This was done in synergy with similar work to prepare for PCV introduction (see PCV, below). One major adaptation for the introduction of rotavirus vaccine was the disaggregation of vaccination data by sex to be able to track gender equity, reflecting a focus on equity.[12]

Key informants reported high quality of the preparation phase, explaining that "The plan had gone as planned. There were no major changes as I said because there was a preparation work that was well done and that allowed us to have less unexpected events."

IMPLEMENTATION

In November 2014, a year after the introduction of PCV, monovalent rotavirus vaccine (Rotarix vaccine, which covers the most common serotypes in Senegal[12]) was introduced nationwide into the immunization program of Senegal with funding from GAVI. As detailed in the strategic plan *Programme Elargi de Vaccination*, designed in preparation for the introduction of rotavirus vaccine and PCV, the rollout and implementation of the rotavirus vaccine program was/is co-financed by GAVI which provides most of the funding while the Government of Senegal, WHO, and UNICEF split the remaining cost of US$0.20 per dose. Senegal's contribution to the co-financing agreement increased to US$0.26 per dose by 2016, at the end of the study period. Other partners including WHO, UNICEF, and USAID (which provided mainly technical support) helped to facilitate the initial introduction of rotavirus vaccine.

Initial training started with central-level led trainings for regional- and district-level managers. The district-level managers, with support from their regional supervisors, cascaded the one-day trainings to frontline health workers. Each district was allocated one week to complete trainings of all health facility staff within the district. Following the trainings, supportive supervisory visits were carried out by district-level

managers, to monitor and supervise the initial introduction of rotavirus vaccine at facility level and subsequent supportive supervision visits were adapted to reflect the introduction of the new vaccine.

Supply chain assessments carried out in the preparation phase informed the procurement and repairs of equipment, at central and subnational levels, to meet identified gaps. These equipment procurement and repair activities occurred at the same time for rotavirus vaccine and PCV, with GAVI support.

After the introduction of rotavirus vaccine, Senegal's rotavirus-caused diarrhea sentinel surveillance system which had been set up two years prior to the introduction of the vaccine (in 2012), monitored its impact with support from partners. A nationwide post-introduction evaluation was also conducted to assess adverse events and coverage which found high acceptability for the vaccine.

Table 17: Rotavirus Vaccination Implementation Strategies and Outcomes

Implementation Outcomes	Implementation Strategy	Evidence
Appropriateness	Data-based decision-making: data use to identify disease burden	(+): A study in Dakar showed that in pre-vaccine times, the proportion of rotavirus-positive diarrhea hospitalizations was 42%.[86] (+): Senegal introduced monovalent Rotarix vaccine which covers the most common serotypes in Senegal.[12]
Acceptability	Community and other stakeholder engagement including professional bodies (SOSEPED) and consumers. Use of mass media.	(+): Coverage of rotavirus vaccine was 83% in 2015 and 93% in 2016, just two years after introduction. (+): Post-introduction evaluation found high acceptability.
Feasibility	Leveraging broader vaccines system strengthening work (New Vaccine Introduction Working Group). Prioritization of PCV introduction over rotavirus vaccine introduction based on disease burden data and factors such as Senegal's ability to expand its logistics and cold chain capacity and conduct the needed trainings to facilitate the simultaneous introduction of both vaccines. Leveraging support (financial and technical) from donors for the initial	(+): Rotavirus vaccine rolled out and high coverage achieved.

Implementation Outcomes	Implementation Strategy	Evidence
	introduction and implementation of rotavirus vaccine program in Senegal.	
Effectiveness and Coverage	Data systems redesign: integrating rotavirus vaccine into eHIS and vaccination cards. Supply chain strengthening for rotavirus and vaccines broadly.	(+): Proportion of rotavirus-positive diarrhea hospitalizations significantly declined, falling from 10% in 2015–16 and 17% in 2016–17.[86] (+): Coverage of last dose of rotavirus vaccine increased from 83% in 2015 to 93% in 2016.[7] Rotavirus hospitalizations declined (above).[86]
Fidelity	Data use to monitor implementation. HR strengthening through both training (TOT) and supportive supervision.	Data on quality of implementation of rotavirus vaccination program unavailable for the team to review.
Cost		(+):In 2014, it was estimated that rotavirus vaccination could avert 1.5 million cases of rotavirus and 6,500 child deaths from 2014 to 2033.[87]
Sustainability	Integration into existing vaccine efforts e.g. supportive supervision, to reflect rotavirus vaccine introduction.	(+): Rotavirus vaccine training modules integrated into routine Immunization trainings in Senegal, for newly recruited health workers and annual refresher trainings. Regional-level managers support districts in carrying out these training sessions. (+): Senegal's increasing contribution to the co-financing of rotavirus vaccine from US$0.20 per dose in 2014 to US$0.26 per dose by 2016.[12] (+): The budget allocated by the MOH for vaccines also increased from 950 million CFA to 3.117 billion CFA from 2013 to 2017.
Equity	Focus on equity: integrating sex to data collection tools and communication plan focus on hard-to reach areas. Communication plan focus on hard-to-reach areas.	Data on equity of rotavirus vaccine coverage (wealth quintiles and geographic) in Senegal were unavailable for the team to review, but overall coverage is quite high at 93%.

SUSTAINMENT

Rotavirus vaccine training modules were integrated into routine immunization trainings in Senegal, for both newly recruited health workers and annual refresher trainings for existing health workers. Regional-level managers supported districts in carrying out these training sessions.[12] In addition, Senegal's contribution to the co-financing of rotavirus vaccine increased from US$0.20 per dose in 2014 to US$0.26 per dose by 2016. In 2018, KIs noted that with the support of GAVI, plans were being made to reassess the budget for rotavirus vaccine implementation in Senegal, for the new strategic plan for 2019-2023. The budget allocated by the MOH for vaccines also increased from 950 million CFA to 3.117 billion CFA from 2013 to 2017, to ensure the funding of all vaccines.

4.1.4 Other Pneumonia Interventions

4.1.4.1 Pneumococcal Vaccination

Table 18: Pneumococcal Conjugate Vaccine Key Implementation Strategies

Implementation Strategies
• Data use for decision-making • Leveraging of broader vaccines system strengthening work e.g. New Vaccine Introduction Working Group • Data-driven prioritization • Data systems redesign e.g. integrating PCV into eHIS and vaccination cards • M&E • Surveillance • Leveraging of existing systems e.g. pediatric bacterial meningitis surveillance system. • Leveraging donors for supplies and systems and ensuring national commitment • Supply chain strengthening for PCV and vaccines broadly • TOT and supportive supervision • Community and other stakeholder engagement including professional societies, mass media and consumers • Focus on equity • Increase in budget

EXPLORATION

In 2000, GAVI began supporting the introduction of PCV into the immunization programs of developing countries (including Senegal) and WHO recommended its introduction in 2007.[11] Between 2007 and 2008 a surveillance study was commissioned (with support from the Pfizer and Pasteur Institute in Paris) to inform recommendations for which PCV vaccine type would be most suitable for Senegal's epidemiological context. The study was designed to measure nasopharyngeal pneumococcal carriage and pneumococcal infection in children under 5 years and identify the serotypes responsible for the majority of under-5 pneumococcal infections in Senegal. This study, conducted at the Albert Royer/Fann Children's Hospital in Dakar, found a high rate of carriage and disease caused by Streptococcus pneumoniae serotypes targeted by the PCV13, to a lesser extent by PCV10 vaccine types, and both higher coverage compared to the PCV7.[11] This informed the decision to delay introducing the PCV vaccine because, although GAVI proposed to introduce PCV10 to Senegal, there was a shortage of PCV13, which was more appropriate for the local context based on this research.

PREPARATION

Following the study, the process of preparing for the introduction of PCV13 began with the reconvening of the New Vaccines Technical Working Group described in the rotavirus section. Similar to the process of introducing the rotavirus vaccine, Senegal's introduction of PCV13 involved applying WHO's recommendations for preparations for introducing new vaccines including planning and budgeting, calculating vaccine supplies required, and assessing its cold and supply chain capacity.[88] This work was combined with the preparation for rotavirus vaccine and also involved developing a communication plan, training guides, and adaptations of data systems, as detailed in the strategic plan *Programme Elargi de Vaccination*.

Senegal increased its budget line for vaccines and consumables and committed to raise the budget by 15% between 2012 and 2015, to accommodate the introduction of PCV.[12] During preparations for introducing PCV13, cold chain assessments revealed that Senegal did not have the capacity to receive the PCV13 vaccines, so introduction of the vaccine was delayed from an initial start date of 2012 until 2013.

IMPLEMENTATION

In 2013, Senegal became the 34th out of 73 GAVI-eligible countries to introduce PCV13 into its routine immunization program.[89,90] Similar to rotavirus, the rollout and implementation of PCV was co-financed by GAVI- providing most of the funding, and the Government of Senegal, WHO, and UNICEF splitting the remaining cost of US$0.20 per dose.

Similar to rotavirus vaccine, initial training started with central-level led trainings for regional- and district-level managers. The district-level managers with support from their regional supervisors cascaded the one-day trainings to frontline health workers. Each district was allocated one week to complete trainings of all health facility staff within the district. Following the trainings, supportive supervisory visits were carried out by district-level managers, to monitor and supervise the initial introduction of rotavirus vaccine at facility level and subsequent supportive supervision visits were adapted to reflect the introduction of the new vaccine.

Supply chain assessments carried out in the preparation phase informed the procurement and repairs of equipment, at central and subnational levels, to meet identified gaps. These equipment procurement and repair activities occurred at the same time for rotavirus vaccine and PCV, and were done with GAVI support.

Similar to rotavirus vaccine, the communication plan developed during preparation formed the basis for multiple initial engagements with health workers, caregivers (mothers), and professional organizations. Mass media campaigns, community outreaches, and launch ceremonies were also employed. These engagement activities, similar to those done for rotavirus vaccine, leveraged existing acceptance of immunization programs in Senegal.

After the introduction of PCV, Senegal's existing pediatric bacterial meningitis surveillance system (in existence since 2002) monitored its impact.[91] One year after introduction, an evaluation found that acceptability was very high because mothers understood the benefit of the vaccine despite shortages of communication material (e.g. posters) at district and regional levels.[12] This high acceptability corroborated findings from KIs regarding ownership and acceptance of vaccination programs in Senegal (see Section 5. Cross-Cutting Contextual Factors Facilitating Under-5 Mortality Reduction). The evaluation also found that there were only minimal challenges with the trainings conducted for the introduction of the vaccine and there were issues with the analysis of vaccination data and cold-chain management (cold chain storage capacity and temperature regulation).[12] However, according to KIs, these issues did not impact the quality of vaccine delivery because of the use of vaccine vial monitors which mitigated cold chain management challenges by helping with the identification of heat-exposed vaccines and frozen vaccines.

Table 19: Pneumococcal Vaccination Implementation Strategies and Outcomes

Implementation Outcomes	Implementation Strategy	Evidence
Appropriateness	Data-based decision-making: study at the Albert Royer/Fann Children's Hospital in Dakar used as basis for selecting PCV13	(+): Senegal's introduction of PCV13 as opposed to PCV10 or PCV7, informed by a study which identified the Streptococcus pneumoniae serotypes mainly responsible for pneumonia infections in under-5s; ensured the appropriateness of the intervention.[11]
Acceptability	Community and other stakeholder engagement including professional bodies (SOSEPED) and consumers Use of mass media	(+): A post-introduction evaluation showed acceptability was very high; mothers understood the benefit of the vaccine despite communication material shortages (e.g. posters) at district and regional levels.[12] (+): High coverage also reflected acceptability
Feasibility	Leveraging broader vaccines system strengthening work e.g. New Vaccine Introduction Working Group, eHIS, vaccination cards, and supply chain. Data-driven prioritization of PCV introduction over rotavirus vaccine based on disease burden data and other factors Leveraging support (financial and technical) from donors and partners for the initial	(+): KIs reported high levels of rigor and quality of the preparation phase. (+): A post-introduction evaluation of PCV was conducted one year after introduction and found that there were very few challenges with the trainings.[12] (+): PCV13 achieved high coverage rates.

Implementation Outcomes	Implementation Strategy	Evidence
	introduction and implementation of PCV program in Senegal Budget line for vaccines and consumables increased and commitment to raise the budget by 15% between 2012 and 2015, to accommodate the introduction of PCV Leveraging of existing systems: pediatric bacterial meningitis surveillance system	
Effectiveness and Coverage	Data systems redesign: integrating PCV into eHIS and vaccination cards Supply chain strengthening for PCV and vaccines broadly	(+): PCV immunization coverage among 1-year-olds in Senegal rose from 81% in 2014, reaching 93% by 2016.
Fidelity	M&E TOT and supportive supervision Surveillance	(-/+): A post-introduction evaluation of PCV was conducted and found issues with analysis of vaccination data and cold-chain management. These did not impact the quality of vaccine delivery; vaccine vial monitors mitigated cold chain management challenges, helping with identification of heat-exposed or frozen vaccines.
Sustainability	Integration into existing vaccine efforts e.g. supportive supervision, to reflect PCV introduction	(+): PCV training modules incorporated into routine immunization trainings in Senegal; regional-level managers support districts in carrying out these training sessions. (+/-): Senegal's contribution to PCV co-financing, estimated to increase to US$0.35 per dose by 2016 (though that did not happen due to rising exchange rates).[12] (+): The budget allocated by the MOH for vaccines increased from 950 million CFA to 3.117 billion CFA from 2013 to 2017.
Equity	Focus on equity: Communication plan focus on hard-to-reach areas	Data on equity of PCV coverage (wealth quintiles and geographic) in Senegal not found.

SUSTAINMENT

Similar to rotavirus vaccine, PCV training modules have been incorporated into routine immunization trainings in Senegal, for both newly recruited health workers and annual refresher trainings for existing health workers. Regional-level managers support districts in carrying out these training sessions. In addition, Senegal's contribution to the co-financing of PCV was estimated to increase to US$0.30 per dose by 2016 at the end of the study period, though due to rising exchange rates that did not take place.[12] At the time of this study, with the support of GAVI, plans were being made to reassess the budget for PCV implementation in Senegal, for the new strategic plan for 2019-2023. The budget allocated by the MOH for vaccines also increased from 950 million CFA to 3.117 billion CFA from 2013 to 2017, to ensure the funding of vaccines.

See Section 4.2 Other Vaccine-Preventable Diseases for Haemophilus Influenzae Type B Vaccination.

4.1.5 Other Malaria Interventions

In 1995, Senegal developed a National Malaria Control Program. In 1997, Senegal received funding from WHO as part of a plan to accelerate malaria control. At the same time, malaria control was also being addressed as part of the World Bank's efforts to combat endemic diseases in Senegal. Between 2000-2016, in addition to the CB-IMCI and FB-IMCI programs, Senegal used a number of other strategies to further reduce malaria cases and transmission through implementation of indoor residual spraying (IRS), intermittent preventive treatment (IPT), and insecticide-treated nets (ITNs). These interventions are discussed below.

Figure 23: Malaria Incidence per 1000 in Senegal (2013) (Source: Daniels et al 2017)

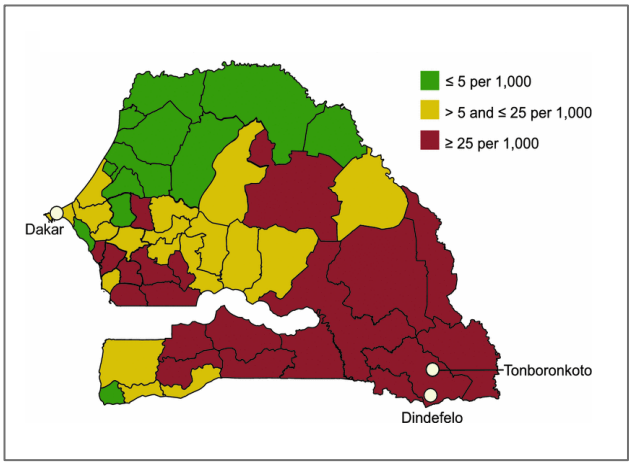


Figure 23, from the National Malaria Control Program in Senegal, shows the pattern of malaria incidence in 2013.[92] The northern region had the lowest incidence of malaria at ≤5 cases per 1,000 of the population, while the central region and Dakar had incidences of between 5 to 25 cases per 1,000 of the population. The southern and southeastern region had the highest malaria incidence with 25 or more cases per 1,000. This geographical diversity was supported by data from DHS 2016 which also found substantial differences in malaria prevalence across regions, with highest prevalence in the greater southern region (3.6%) while the central and northern regions had lower prevalence at 0.6% and 0.2%, respectively.[2] Overall, research conducted in 2018 explained that malaria incidence dropped in Senegal between 2010 and 2017, though the data suggested otherwise because of improvements in surveillance and increased ability to detect cases.[93]

Table 20: Other Malaria Interventions Key Implementation Strategies

Implementation Strategies
• Data use for decision-making • Piloting • Leveraging of donor and partner support • Mass campaigns and distributions and door-to-door strategy • Subsidization of commodities • Private sector engagement (PPP) • Integration of program training modules into existing National Malaria Control Program training • Local research • Data-based adaptation of international guidelines to reflect local context • Social marketing, community and other stakeholder engagement through mass media and door-to-door • Data-based adaptations to program • Supply chain strengthening • Training • M&E • Supervision • Setting up community systems to address non-compliance • Leveraging of existing systems and structures: malaria committee, CHW system • Development of policies, guidelines, and protocols

4.1.5.1 Insecticide-Treated Nets

EXPLORATION

Insecticide-treated nets had been used in Senegal pre-1998 but were mainly provided by small-scale donor-supported initiatives. A government-led ITN program was introduced to Senegal in 1998 in partnership with RBM Partnership (formerly Roll Back Malaria) with support from USAID and Global Fund. The ITNs program was introduced based on WHO recommendations. The program decided to adopt a strategy of selling nets at a subsidized cost (to ensure access) through agreements between private sector net distributors and facility health committees.[70]

PREPARATION

Preparation activities for the introduction of the subsidized ITNs included social marketing activities through pharmacies, petrol stations, and various other small-scale community-level vendors to promote the nets. An ITNs module for CHWs was also incorporated into routine National Malaria Control Program trainings.

IMPLEMENTATION

Between 1998-2008, Senegal implemented its ITNs program by selling subsidized nets. Social marketing activities employing both in-person and mass media campaigns, also used during the preparation phase,

were used to engage communities, to increase the sales of ITNs at pharmacies and other vendors. The nets were sold for 500CFA (approximately US$0.88 in 2008[22]) at health facilities and 1000CFA (approximately US$1.76 in 2008[22]) at pharmacies.

According to KIs, a significant strategy associated with success in Senegal's malaria program (including the ITN program) was community engagement through awareness-raising campaigns involving a variety of door-to-door and community-wide outreach activities. The community engagement strategy employed by the malaria program in Senegal was referred to as "ABCD" (*Atteindre les Bénéficiaires de la Communauté à travers les Districts* – Reaching Community Beneficiaries across Districts). This strategy was implemented under the coordination of the district management teams, district head medical officers, and district health education and health information officers, with support from donors such as Global Fund and USAID.

Donor coordination was also identified by KIs as an important strategy associated with the success of Senegal's National Malaria Control Program (including ITNs). The malaria committee at the MOH led the coordination of all programs under the National Malaria Control Program including annual strategic planning and budgeting. This committee included a multi-disciplinary team involving all actors at the national level as well as key MOH departments and services, academics, researchers, partners, civil society, UN agencies, and others. Although this committee was set up before the President's Malaria Initiative (PMI) began supporting Senegal, PMI became a key member of the committee once it began to provide support for malaria programming in Senegal.

Across the malaria program in Senegal, routine data collection and surveys including the DHS and Malaria Indicator Survey, were used to monitor important indicators such as care-seeking rates and preferences for available malaria treatment options. The proportion of under-5 children who slept under an ITN the night prior to the DHS survey increased from 7% in 2005 to 35% in 2010 just before the national campaign (described below) and to 67% in 2016. Household ownership of ITNs increased from 20% in 2005 to 63% in 2010 and 82% in 2016.[70]

ADAPTATION DURING IMPLEMENTATION

By 2007, Senegal introduced mass distributions of nets, for free, in addition to sales of subsidized nets to ensure universal coverage. This decision reflected WHO's recommendation for free large scale distributions as a useful strategy for malaria control as well as the selection of Senegal as a PMI country in 2007.[70] A needs assessment and a quantification and costing exercise, led by the National Malaria Control Program and supported by Global Fund in collaboration with other partners, the National Pharmacy, and district and regional health teams, were carried out to facilitate this introduction. Additionally, a pilot of the ITN free distribution program was done in the districts of Saraya and Velingara wherein ITNs were distributed to pregnant women and children under 5 in the two districts. This pilot was conducted in collaboration with Peace Corps and World Vision and was extended to four high malaria transmission regions (Sedhiou, Kolda, Kédougou, and Tambacounda).

Capacity building efforts involved training of relais communautaires by nurses (including a 15-day practicum). According to KIs, these trainings provided useful skills for program implementation, ensuring efficiency and effectiveness at the service delivery level, data analysis, and decision-making during implementation. Trainings were repeated, just before mass distributions were conducted. The PMI supported supply chain assessments and strengthening activities.

Mass distribution campaigns involved wide distribution of the nets to all households aiming for nets in all sleeping spaces, or a minimum of one net to two individuals in the household. According to KIs, Senegal decided to conduct mass campaigns every two years based on locally-produced data which suggested that the lifespan of the mosquito nets used in Senegal was two years versus the WHO recommended three years.[70]

In 2009, the MOH started its first nationwide campaign targeted at children under 5 (given their higher risk) and distributed 2.2 million long-lasting insecticide-treated nets (LLINs). In 2010, Senegal began distributing LLINs to all of its population, starting in three districts, and by 2013, these nets had been distributed nationwide with a total of 6.9 million nets. Between July 2013 and November 2014, Senegal again distributed more nets (3.9 million) nationwide to further ensure universal coverage.[70]

In addition to population-wide mass distributions, in 2012, with support from the PMI, facility-based distribution of nets was integrated into the health system and was carried out throughout the year to maintain the high coverage among pregnant women, achieved during mass campaigns. The pregnant women received free nets during ANC.

Senegal began school-based distributions to further increase coverage in 2012. This adaptation was introduced in two pilot regions, Ziguinchor and Louga. In 2014, due to this strategy's success, it was scaled up to two additional regions, Matam and Saint-Louis. Following the introduction of the strategy, utilization of ITNs by children under 5 in Senegal increased from 7% in 2006 to 55% in 2015 and 67% in 2016.[70]

Table 21: ITN Implementation Strategies and Outcomes

Implementation Outcomes	Implementation Strategies	Evidence
Acceptability	Subsidization of commodities. Social marketing, community and other stakeholder engagement through mass media and door-to-door.	(+): Household ownership of ITNs increased from 20% in 2005 to 82% in 2016.[2,23,94] Data on purchase of subsidized nets were unavailable for the team to review for the period of study.
Feasibility	Private sector engagement (PPP). Piloting.	(+): In 2012, ITNs were rolled out nationwide in Senegal.

Implementation Outcomes	Implementation Strategies	Evidence
	Leveraging of donor funding. Integration of program training modules into existing National Malaria Control Program training. Data-based adaptation of international guidelines for local context. Leveraging existing CHW system. Leveraging of existing systems and structures, e.g. malaria committee. Supply chain strengthening.	
Effectiveness and Coverage	Data-based decision-making: Senegal's decision to distribute nets every two years. Mass campaigns and distributions (including school-based distributions). Subsidization of commodities. Data-based adaptations (introduction of free distributions). Mass media.	(+): Decline in the prevalence of malaria from 6% in 2008 to 1.2% in 2014 among children under 5.[95] This decline may not be solely attributed to ITNs but may reflect other interventions.[2,23,94] (+): The proportion of children under 5 who slept under an ITN the night prior to the DHS survey rose from 7% in 2005 to 35% in 2010 just before the national campaign and to 67% in 2016.[9] (+): Household ownership of ITNs increased from 20% in 2005 to 82% in 2016.
Fidelity	Training. M&E.	(+): See coverage on the proportion of children under 5 who slept under an ITN, above. (-): In 2016, research found that the distribution of nets in some regions, e.g. Dakar and Thies, was delayed during the National Malaria Program's mass distribution campaign.[9] The report did not mention the reason for the delay.
Equity	Mass campaigns and distributions. Subsidization of commodities.	(+/-): Figure 24 shows increases in overall use and differences in mosquito nets use across wealth quintiles between 2005-2016

Implementation Outcomes	Implementation Strategies	Evidence
	Free distribution to priority populations.	with the poorest quintiles (at 4% in 2005 and 63% in 2016) using the nets more often than the wealthiest quintile (at 6% in 2005 and 46% in 2016).[39]

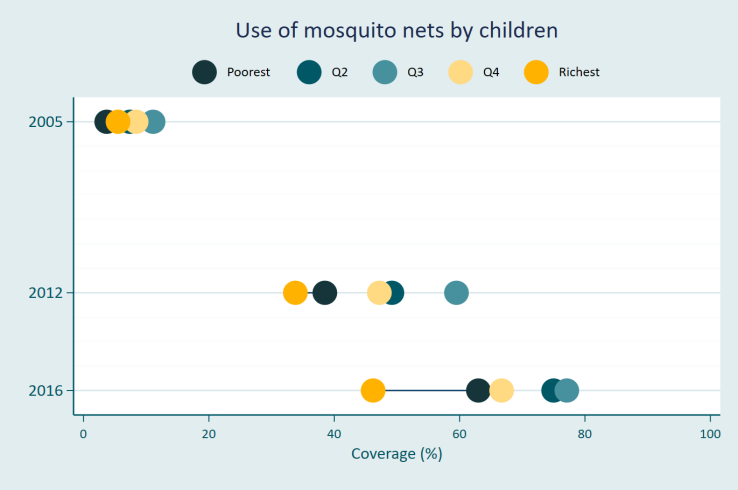


Figure 24: Equity Outcome: Use of Mosquito Nets by Children Across Wealth Quintiles in Senegal (2005-2016) (Source: Victora, et al 2018)

SUSTAINMENT

The ITNs program continued to experience challenges. For example, in 2016, after the study period ended, research found that the distribution of nets in some regions, e.g. Dakar, was delayed during a mass distribution campaign. The report did not mention the reason for the delay.

4.1.5.2 Intermittent Preventive Treatment for High Risk Groups

EXPLORATION

In 2000, the Africa Summit on malaria held in Abuja, Nigeria, recommended that at least 60% of pregnant women be covered by Malaria in Pregnancy interventions (including IPT for pregnant women), by 2005. Senegal was one of the countries that committed to this target.

In 2005 a randomized, placebo-controlled, double-blind trial in Niakhar, Fatick region led by the parasitology laboratory at Cheikh Anta Diop University, found that giving chemo-prophylactic malaria treatment (one dose of SP and one dose of artesunate) to children under-5 reduced the incidence of malaria by 86%.[96] According to KIs, the results of this study were taken up by the National Malaria Control Program and used to design the children's IPT program (also seasonal malaria chemoprevention), with support from the Global Fund and district health teams.

PREPARATION

Preparations for the IPT for pregnant women program began in 2005 in Senegal and were led by the National Malaria Control Program. IPT for pregnant women was integrated into the National Malaria Control Program policy and Senegal's Reproductive Health policy and guidelines were developed based on WHO standards.[97] Clinical performance standards were also developed to ensure quality of implementation.

In 2006, the preparation phase for the children's IPT program in Senegal began with the development of policies, guidelines, protocols, and data collection tools to track the intervention. These were done by the National Malaria Control Program, with the support of Global Fund (funding and technical support), USAID (technical support), and help from UNICEF to estimate the numbers of eligible children. Preparations for the children's IPT program also included the development of "refusal case management committees" which were set up each year before the interventions began. The refusal committees in coordination with the National Malaria Control Program, were designed to resolve cases of IPT refusal within the community.

Preparations also included a pilot study in Tivaoune (Thies), which was selected to ascertain the feasibility of the children's IPT program in both rural and semi-urban areas (both of which were present in Tivaoune). Tivaoune was also selected because of its high incidence of malaria. The aim of the pilot was to ascertain the feasibility of the various possible strategies for implementing the program including frequency of drug administration (CHW supervision of all or some of the drug administration sessions) and the best delivery method (facility-based versus door-to-door). For the pilot, CHWs were trained for one day on different areas including communication, side effects, and record-keeping.

According to research conducted after the pilot study, it provided evidence for the feasibility, effectiveness, and acceptability of the door-to-door strategy as opposed to other options such as fixed posts within communities and health-facility.[98] Further, the pilot provided evidence for the increase of the lower age limit for children eligible for the children's IPT program from 2 to 3 months (because of the reduced risk of younger infants) as well as for the increase of the upper limit of eligibility from 5 years to 10, in 2009 (given changing malaria epidemiology).[98]

IMPLEMENTATION

In 2003, Senegal began its IPT for pregnant women program, providing SP via directly observed therapy at ANC sessions.[99] Pregnant women were also reached through a door-to-door campaign strategy using CHWs as part of efforts to reach high-risk groups (both pregnant women and children, see below). A 2014 study of malaria in pregnancy interventions in Senegal including IPT for pregnant women found that although clinical performance standards were developed to ensure quality of implementation, inadequate supervision as a result of human resources, financial, and logistical challenges, limited the quality of implementation.[97]

As planned, the seasonal children's IPT program began in 2008 before WHO recommendations in 2012 and was implemented by the National Malaria Control Program and supported by Global Fund, USAID, and UNICEF.[100] The initial implementation began in Mbour (Thies region), Bambey (Diourbel region), and Fatick (Fatick region), which were all similar to Tivaoune (as described above). Implementation began in nine rural and semi-urban health post catchment areas and increased to 46 in 2010.

Drawing from the lessons of the pilot study, the children's IPT program leveraged the existing CHW system (relais communautaires) and employed a door-to-door campaign strategy to deliver prophylaxis to high-risk groups once a month over the course of five days for four months during the rainy season. The first day, the CHWs gave the treatments directly to children aged 3 months to 10 years who were home, and the other days they gave the dose to the mother or other members of the household to administer to the child.

The children's IPT program employed a similar community engagement strategy to that used by the ITN program. The children's IPT program ensured the buy-in of community chiefs and deputy chiefs, district councils, and heads of community groups such as youth associations and women associations. In addition, before each intervention, CHWs were trained for one day by health post nurses (under the supervision of district health teams) on how to present the medicines to the families, the mode of administration, and community engagement to prepare for the campaign. District management teams were responsible for implementation at the operational level. They were composed of a doctor, social worker, midwife, senior health technician, managerial staff, health planner, and chief of the hygiene brigade.[101] The refusal committee members took part in the community engagement component of the training. These trainings were led by the head nurses at the district health posts. District and regional management teams were also trained on how to manage the CHWs. The National Malaria Control Program provided overall oversight for the program through supervision of the regional teams.

Data utilization was core to the children's IPT program. Although WHO recommendations influenced the determination of high-risk areas in Senegal, malaria incidence, entomology, rainfall, and other environmental data provided by the National Agency for Civil Aviation and Meteorology and other sources were used to adjust these criteria to determine changes in areas eligible for treatment. The number of eligible children was estimated with support from UNICEF and used as the denominator to determine coverage at the end of the intervention. The implementing teams also used monitoring tools to track daily progress.

Nonetheless, there were challenges with the implementation of the children's IPT program. A study of the initial implementation between 2008-2010 found that excess SP was given to mothers by CHWs; CHWs were not routinely checking for side effects; and treatment of children above the age of 10 occurred. Trainings were done to reinforce treatment guidelines as a result of these findings.[98]

ADAPTATION DURING IMPLEMENTATION

The children's IPT program was adapted in Senegal, for feasibility and to increase coverage. In 2013, the formulation of the medication used for the program was changed so that it was more easily administered to different age groups requiring different doses. Further adaptations included the expansion of the program to four regions in the South (Sedhiou, Kolda, Tamba, and Kédougou) to reflect the increasing malaria incidence in these areas. As one KI explained, "*Areas considered high-risk areas have changed. It is concentrating more and more towards the southern zone. Since 2000, there is a strong north-south gradient. It already existed but it's getting worse.*"

Table 22: IPT Implementation Strategies and Outcomes

Implementation Outcomes	Implementation Strategy	Evidence
Appropriateness	Data use for determining eligibility of regions where malaria incidence is highest. Data use for expanding high-risk age group and seasonal approach	(+): High malaria incidence in south and southeast regions where IPT was started (Figure 23). Seasonal use for children also reflected the patterns of disease.
Acceptability	Door-to-door strategy. Community engagement. Setting up community systems to address non-compliance.	(+): See below for children's IPT coverage data which suggested high acceptability. (+): See below for IPT for pregnant women coverage data which also suggested high acceptability.
Feasibility	Piloting. Leveraging donor and partner support: funding, technical support, data generation. Leveraging the existing CHW system. Data-based adaptations to program.	(+): Implementation was conducted and expanded.
Effectiveness and Coverage	Door-to-door strategy. Free distribution of medications. Other community engagement. Integration into existing CHWs. Data-use for adaptation: changing the age bounds.	(+): Coverage of IPT for pregnant women rose from 65% in 2010 to 88% in 2016. While coverage of at least two doses rose from 12% in 2005 to 39% in 2010 and 60% in 2016. (+): Between 2008-2010, 92% of eligible children received all three scheduled courses.[98]

Implementation Outcomes	Implementation Strategy	Evidence
Fidelity	Training and supervision. Development of guidelines and protocols. M&E.	(-): A 2014 study of malaria in pregnancy interventions in Senegal found clinical performance standards were developed to ensure quality of implementation, but inadequate supervision from human resources, financial, and logistical challenges, limited the quality of implementation.[97] (-): A 2018 paper found that 59% of health facilities have guidelines for IPT for pregnant women.[99] (-): The same paper found that 52% of facilities reported stock availability of SP, a drop from 76% in 2014.[99] (-): A study of the initial implementation of IPT for children between 2008-2010 found excess SP was given to mothers by CHWs. Training was done to reinforce treatment guidelines.[98] The same study found that in 2010, CHWs were not routinely checking for side effects and treatment of children above the age of 10 occurred.
Sustainability	Integration into national policy.	(+): Integration of IPT for pregnant women into National Malaria Control Program policy and Senegal's Reproductive Health policy. (-): A 2018 study found ongoing challenges with IPT for pregnant women in Senegal; the National Malaria Control Program policy and Senegal's Reproductive Health policy state dosage for IPT for pregnant women, but do not specify the timing of the first dosage.[102] (-): The children's IPT program continues to rely on donors

Implementation Outcomes	Implementation Strategy	Evidence
Equity	Setting up community systems to address non-compliance, e.g. "refusal case management committee." Door-to-door strategy.	(+): A study of the initial implementation of IPT for children between 2008-2010 found no evidence of disparities in coverage for children irrespective of mother's educational level or wealth quintile.[98]

SUSTAINMENT

In 2013, WHO recommendations on the number and timing of doses for IPT for pregnant women was changed so that all pregnant women would get at least three doses of SP at one-month intervals beginning from their second trimester of pregnancy, at every ANC session. This recommendation was reflected in the National Malaria Control Program policy and Senegal's Reproductive Health policy. However, a paper published by USAID and the Maternal and Child Survival Program in 2018 after the study period ended showed that there were ongoing challenges including that the National Malaria Control Program policy and Senegal's Reproductive Health policy which state the dosage for IPT for pregnant women but do not specify that the first dosage should be given at the earliest possible time, during the second trimester.[102]

The children's IPT program continued to run in the south and southeastern regions in Senegal as a seasonal, vertical program with support from donors and partners – USAID, Global Fund, and UNICEF. The government's support of the IPT program was mainly through the recruitment and remuneration of CHWs (who were government employees).

4.1.5.3 Indoor Residual Spraying

EXPLORATION

WHO recommended IRS as a key vector-control intervention for both controlling and eliminating malaria. In 2006, WHO released a position statement to recommend the scale-up of IRS as a means to achieving the malaria-related Millennium Development Goals (MDGs), by 2015.[103]

PREPARATION

To prepare for the introduction of IRS, Senegal chose to roll out the program in the northern region which, while an area of relatively low malaria morbidity (Figure 23), was susceptible to seasonal peaks in malaria incidence.[9] This decision was made in collaboration with PATH (the implementing partner) and USAID (the donor). An IRS steering committee was also set up including representatives from the National Malaria Control Program, Cheikh Anta Diop University, the National Directorate of Environment and Agriculture, the national hygiene service, the IRS implementing partner (PATH), and the PMI.

IMPLEMENTATION

Senegal introduced IRS in 2007 in one district – Richard Toll – in the northern region and scaled up to three and then six (out of 75) districts in 2010.[104] These districts were Nioro, Vélingara, Guinguinéo, Koumpentoum, and Malem Hodar, and they were prioritised by the National Malaria Control Program for various reasons including because they were high-transmission areas during peak malaria seasons (raining seasons). The program was implemented by PATH (with funding from USAID) in collaboration with the National Malaria Control Program and with support from the PMI. The program leveraged existing CHWs – agents de santé communautaire and deltamethrin (a pyrethroid) was used initially.

Donor coordination and community engagement activities for the implementation of IRS were the same as that for ACT while trainings for IRS were conducted differently but leveraged on the system put in place by the National Malaria Control Program for ACT. The program also monitored insecticide resistance in partnership with local institutions such as the Cheikh Anta Diop University, the pest control service, and the Pasteur institute of Senegal.[9]

ADAPTATION DURING IMPLEMENTATION

Senegal adapted its IRS program based on data. For example, in 2013, the IRS steering committee decided to discontinue IRS in Guinguinéo and Nioro because data indicated that malaria rates had dropped so much (with incidence in 2012 at 5/1,000). In 2015, the committee then decided to restart IRS activities in Nioro because malaria incidence had increased.

In 2015, Senegal switched from pyrethroid-based insecticides because of resistance among anopheline mosquito populations, to non-pyrethroids only. This change reflected results from yearly evaluation studies assessing the effectiveness of pyrethroid-based insecticides on local mosquitoes which found increasing resistance to deltamethrin.[9] Also, in 2015, the country strategy changed to focal spraying – spraying only within districts where the malaria incidence was at least 30/1,000. This adaptation was introduced as a more cost-effective approach than blanket spraying. Koumpentoum, Koungheul, Malem Hodar, and Nioro districts were selected. After the first year of spraying using the focal spraying approach, the approach was assessed and it was found to cost slightly more than blanket spraying.[9]

The coverage of IRS among households increased from 3% in 2006, to 9% in 2010–11, and to 12% in 2012–13. It then decreased to 9% in 2014, and to 5% in 2016.[13,23] Senegal also continued to monitor insecticide resistance to determine plans for adaptation.[9]

SUSTAINABILITY

Responding to data showing a drop in malaria, in 2016, after the study period ended, Senegal began discussions around discontinuing IRS due to its low cost-effectiveness (versus ITNs and other preventive strategies) in a moderate endemicity, low mortality setting. As one KI explained, "*there was some discussion about the relevance of the intervention, as you know four districts alone can easily take a lot of millions.*"

Table 23: IRS Implementation Strategies and Outcomes

Implementation Outcomes	Implementation Strategy	Evidence
Acceptability	Community engagement.	(Unknown): Low coverage suggested poor acceptability but may have reflected limited scope of IRS program
Feasibility	Piloting. Leveraging donor and partner support. Leveraging existing systems: training on National Malaria Control Program for ACT, leveraged existing CHW cadre	(+): Senegal introduced IRS in 2007 in one district, and scaled up to three and then six (of 75) districts in 2010,[104] evidence of feasibility as the EBI was rolled out successfully and national scale had not been planned from the onset. (+/-) Localized spraying in higher risk areas turned out to be costly
Effectiveness and Coverage	Data-use to determine program setting: selection of high-transmission areas during peak malaria seasons and to discontinue or continue IRS in certain districts. Data-based switch of insecticide used.	(Unknown): Coverage of IRS among households increased from 3% in 2006 to 12% in 2012-2013 before decreasing to 9% in 2014, and 5% in 2016.[13,23] (+): IRS regimen changed to reflect resistance to regional compounds Overall levels of parasitemia fell, although attribution solely to IRS was not possible (see also ITN and IPT).
Fidelity	Training and supervision. M&E.	Data on the quality of implementation of IRS in Senegal were unavailable for the team to review.
Cost	Data-use to determine program setting: for cost-efficiency, and to discontinue or continue IRS in certain districts. Data use for adaptation: switch from deltamethrin and switch to focal spraying.	(-): One KI explained: "there was some discussion about the relevance of the intervention, as you know four districts alone can easily take a lot of millions."

4.2 Other Vaccine-Preventable Diseases

Table 24: Other Vaccine-Preventable Diseases Key Implementation Strategies

Implementation Strategies
• National policy and planning • Set-up of systems and structures • Leveraging existing systems and structures • Leveraging existing programs • Supply chain strengthening • Surveillance • Vaccination campaigns/supplementary immunization activities (SIAs) • Data systems redesign, e.g. integrating Pentavalent into eHIS and vaccination cards • M&E • Leveraging donors and partners for technical and financial support and data • Training and supportive supervision • Community and other stakeholder engagement

In 1992-3, vaccination coverage (with the exception of BCG at 84%) remained a challenge in Senegal with DHS data showing only 49% of children aged 12-23 months had received all eight basic immunizations (BCG, three doses of diphtheria-pertussis-tetanus [DPT], measles, and three doses of polio).[105] 1997 DHS figures were unavailable for the team to review. By 2005, coverage increased to 59% and by 2016, to 70%, with an increase in the number of vaccines in the national guidelines and reduction in inequity.[82] Strategies and approaches are described below (see Neonatal EBIs section for discussion on tetanus vaccine).

In 2000, Senegal's immunization program provided seven vaccinations for children: oral polio vaccine, DPT vaccine, yellow fever, BCG, and measles vaccine.[12] From 2000 to 2016, Senegal introduced six new vaccines to the national immunization program, including hepatitis B vaccine, Hib, rubella vaccine, injectable polio vaccine (removing oral polio vaccine), rotavirus vaccine, and PCV. These vaccines were introduced in response to WHO and GAVI recommendations and available support, and as a reflection of available national data on disease burden.[12,107,108]

Strategies used by the MOH to increase vaccination rates included national policy and planning, building on existing systems and programs, assessment and strengthening of supply chains, national guidelines and training materials, budget advocacy for increased government spending, surveillance and SIAs.[109,110] The MOH also developed a series of comprehensive multiyear immunization plans for 2007-2011, 2012-2016, and 2017-2022.

4.2.1 Meningococcal

EXPLORATION

In 2001, GAVI collaborated with the Meningitis Vaccine Project, a partnership established between WHO and PATH with core funding from the Bill and Melinda Gates Foundation to develop a new group A meningococcal conjugate vaccine in less than 10 years.[111] MenAfriVac was officially introduced in 2010 and in September 2011, GAVI approved Senegal's plans to introduce MenAfriVac.[112]

PREPARATION

Preparatory activities in Senegal including the design of an introduction plan were still ongoing (during primary data collection) and expected to be completed by 2019, in time for introduction in 2020. Some of this delay was due to financial challenges. However, in 2012, MenAfriVac was used for a preventive vaccination campaign in eight regions of Senegal which were considered to be the most likely at risk for a meningitis outbreak. Since the campaign in 2012, there have been no further outbreaks of meningococcal meningitis in Senegal.

4.2.2 Haemophilus Influenzae Type B (Hib) Vaccination

EXPLORATION

Through the late 1980s and 90s, 50% of high-income countries had introduced Hib vaccine into their immunization programs. However, the high cost of the vaccine and limited understanding of Hib disease burden limited expansion into LMICs. In 2000, when GAVI was established, it immediately began a program to increase Hib use globally through its New Underused Vaccine Support program. This was followed by a global four-year GAVI grant of US$37 million in 2005 to improve Hib uptake, and WHO's recommendations for all countries to include Hib in their immunization programs.[21]

PREPARATION

Senegal's MOH New Vaccines Technical Working Group was convened for the introduction of Hib and led preparatory activities. Support (financial and technical) was available from GAVI, USAID, UNICEF, and WHO for the preparation phase which included the development of protocols and guides. Similar to the standardized approach described in the rotavirus vaccine and PCV sections, supply chain systems were assessed and strengthened, indicators for Hib vaccine were integrated into the eHIS and vaccination cards, and community and other stakeholder engagement activities formed a key part of preparation also.

IMPLEMENTATION

With funding support from GAVI, the MOH introduced Hib conjugate vaccine into its immunization program in July 2005 as a part of the pentavalent vaccine (Diphtheria, Tetanus, Pertussis, Hepatitis B, and Hib).[113] Health workers (facility and CHWs) were trained and supervised.

Challenges in implementation were found. For example, a post-introduction evaluation of Hib conjugate vaccine in 2006 found significant problems with the cold-chain, with vaccines exposed to temperatures outside the 2-8 degree Celsius temperature range recommended for storage.[113] The post-introduction evaluation informed supplementary cold chain management training.

Hib3 immunization coverage among 1-year-olds in Senegal increased from 18% in 2005 to 89% in 2010, and to 93% by 2016.[114] The coverage of all three doses of pentavalent vaccine increased from 80% in 2010-11 to 90% in 2016. However, gaps in equity based on wealth for pentavalent coverage persisted with 80% coverage among the lowest quintile compared to 100% for the wealthiest quintile. Following the introduction of Hib vaccine, the number of hospitalized Haemophilus Influenzae meningitis cases in the Dakar Region fell by 98% from 2002 to 2008. Deaths rate due to meningitis among children under the age of 5 decreased from 91 (in 2000) to 53 deaths per 100,000 population in 2016 although the proportional contribution to U5M did not change (4% to 5%).[42] The adjusted vaccine effectiveness for ≥2 doses was 96% (95% confidence interval, 68%–99%).[113]

Table 25: Hib Vaccination Implementation Strategies and Outcomes

Implementation Outcomes	Implementation Strategy	Evidence
Acceptability	Community and other stakeholder engagement	(+): See coverage data below.
Feasibility	Set-up of New Vaccine Introduction Working Group. Leveraging donor and partner support: funds and technical support for the development of protocols and guides, coordination of staff trainings.	(+): Hib introduced and achieved high coverage.
Effectiveness and coverage	Data systems redesign: integrating Hib vaccine (pentavalent) into eHIS and vaccination cards.	(+): Hib3 immunization coverage among 1-year-olds increased substantially from 18% in 2005 to 93% by 2016.[114] Coverage of all three doses of pentavalent vaccine increased from 80% in 2010-11 to 90% in 2016. (+): Death rates due to meningitis among children under 5 decreased from 121 to 53 deaths per 100,000 from 1990 to 2016, though the proportional contribution to U5M did not change (4% to 5%).[42] (+): Hospitalized Haemophilus influenzae meningitis cases in the Dakar Region fell by 98% from 2002 to 2008. The adjusted vaccine

Implementation Outcomes	Implementation Strategy	Evidence
		effectiveness for ≥2 doses was 96% (95% confidence interval, 68%–99%).[113]
Fidelity	Development of protocols and guides. Trainings and supervision. M&E.	(-): A post-introduction evaluation of Hib conjugate vaccine in 2006 showed that at all levels of the cold-chain, vaccines were exposed to temperatures outside 2-8 degree Celsius, the recommended temperature range for storage.[113]
Equity	Integrated into routine vaccine schedule	(+/-): Figure 25 shows high coverage rates of Hib3 for all wealth quintiles in Senegal in 2016, though rates were lower among the poorest (at 80% compared to 100% for the wealthiest quintile).[39]

SUSTAINMENT

The MOH began to consider self-funding Hib vaccine because GAVI funding stopped. Also, strategies including integration into national vaccination program, eHIS, and vaccination cards supported sustainability. The budget allocated by the MOH for all vaccines increased from 950 million CFA to 3.117 billion CFA from 2013 to 2017 to ensure the funding of vaccines.

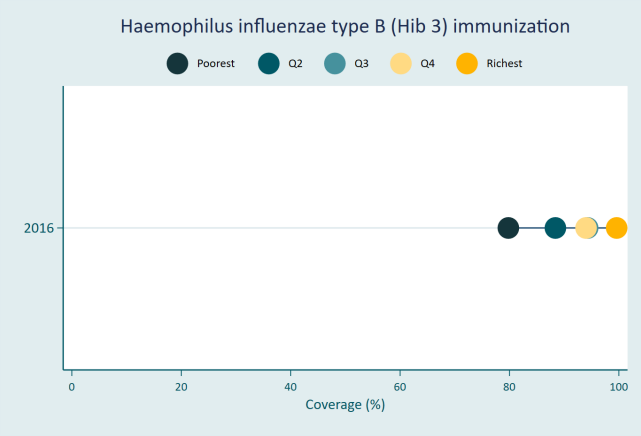


Figure 25: Equity and Coverage Outcome: Hib3 Vaccine in Senegal across Wealth Quintiles (2016) (Source: Victora, et al 2018)

4.2.3 Measles Vaccination

IMPLEMENTATION PRE-2000

Measles vaccine was one of the vaccines introduced at the inception of Senegal's Expanded Program on Immunization (EPI), in 1986.[7] Although it was initially introduced in a limited number of districts, by 1987 it was scaled up nationally, as part of routine immunization. As a result, coverage was initially low – at only 20% in 1986 – and rose to cover slightly more than half (57%) in 1992/3.[115] 1997 DHS data for measles coverage were unavailable for the team to review.

ADAPTATIONS DURING IMPLEMENTATION AFTER 2000

In 2001, Senegal implemented a multi-year strategic plan (2001-2008) for accelerated measles control to interrupt and ultimately eliminate measles in Senegal. This plan was followed by the introduction of catch-up SIAs in 2003, targeted at 9-59 month old children, every 3-4 years, in accordance with the WHO/UNICEF measles strategic plan.[116]

In 2002, Senegal also established a laboratory-based surveillance system for measles, at the MOH and the Institut Pasteur de Dakar.[115] According to KIs, the establishment of this surveillance system reflected the government's commitment to interrupting and ultimately eliminating measles virus transmission in Senegal. Leveraging existing polio surveillance systems, the measles surveillance system employed the existing network of agents de santé communautaires and relais communautaires who were trained on key community case identification criteria which they were required to monitor within the community and report possible cases to the coordinating district nurse. The coordinating nurses, usually at the district health posts, were also trained on case definition and referred identified potential cases to the surveillance focal person within the district who then collected samples (with accompanying notification forms) and sent them to the regional, and eventually the central levels (Institut Pasteur de Dakar), for testing. One of the KIs, speaking to the effectiveness and efficiency of the surveillance system, explained that *"measles is one of the most monitored diseases in Senegal because there is routine surveillance with weekly notifications that are received every day, even if it is zero case everyone notifies zero cases. In the same way, as soon as there is a case, the notification circuit is very clear and people are trained on it, so that for measles we have a very efficient monitoring system that is currently implemented."*

However, while Senegal's measles vaccination coverage generally improved from pre-2000 figures, it has remained mostly static, ranging from 76% in 2005, to 82% in 2010/11, and 81% in 2016.[7] (KIs noted that actual research exploring the reasons for the static coverage of measles vaccination had not been conducted, as at 2019, after the study period ended.)

The surveillance system found an increase in cases including an outbreak in 2009 with most specimens analyzed from Dakar and with continuous virus transmission from late 2009 to early 2010 (Figure 26).[115] According to KIs, the outbreak was attributed to a delay in financing for measles campaign in 2009. In response to these challenges, a number of strategies were introduced by Senegal including a Communications for Development (C4D) plan, developed by UNICEF in collaboration with the Government of Senegal to address vaccination coverage gaps. Senegal also rolled out vaccination campaigns in response to the outbreaks which included top-level information-sharing meetings and micro-planning of vaccination routes, schedules, and supervision teams at the district level. These responsive vaccination campaigns lasted for 10 days and targeted areas with low vaccine coverage, and areas where cases were reported. Similar to other vaccine efforts, agents de santé communautaires and relais communautaires implemented these campaigns and were compensated per campaign. Through this approach, the measles vaccination was provided to 54,993 children aged 9 to 59 months in the risk and low coverage areas, but still only achieving a coverage rate of only 55.9%.[117]

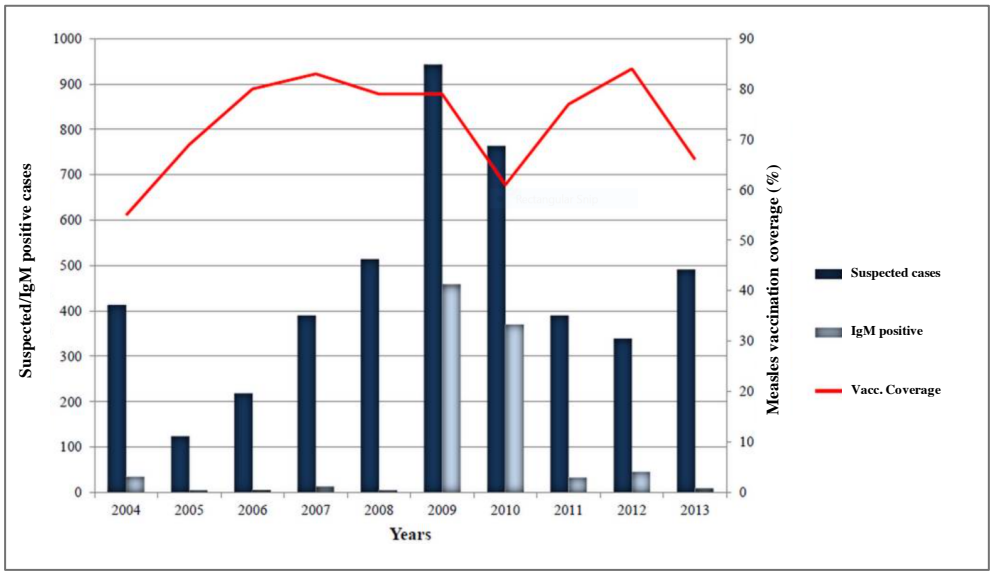


Figure 26: Suspected Cases of Measles Vs. Positive Cases Identified through the Surveillance System and Measles Vaccination Coverage (2004-2013) (Source: Dia et al 2015)

In 2014, reflecting Senegal's focus on elimination of measles, a second dose of measles was introduced to ensure immune protection among children. Also in 2014, with support from GAVI, Senegal introduced the measles-rubella (MR) vaccine to address cases of congenital rubella, by adding the rubella vaccine to the second dose of the measles vaccine.[118] In 2015, the incidence of measles was 58 and 159 in 2016. In 2017, after the study period ended, there were 109 measles deaths (0.135 of total deaths in Senegal).[119]

Table 26: Measles Vaccination Implementation Strategies and Outcomes

Implementation Outcomes	Implementation Strategy	Evidence
Acceptability	Community and other stakeholder engagement including top-level information sharing and micro-planning	(Unknown): Overall coverage data suggested high acceptability; low coverage of outreaches suggested otherwise. The low coverage of outreaches may have been due to other barriers besides poor acceptability. Information identifying the causes for relatively low coverage was not identified.
Feasibility	Leveraging existing programs and systems: Polio surveillance systems and CHW system. Leveraging donor and partner support: funds and technical support.	(+/-): Overall high coverage achieved though below target. (-): Low coverage of outreach suggested low feasibility.
Effectiveness and Coverage	Vaccination campaigns; SIAs. Surveillance.	(+/-): Senegal's measles vaccination coverage generally improved from pre-2000 figures but has remained mostly

Implementation Outcomes	Implementation Strategy	Evidence
		static, ranging from 76% in 2005, to 82% in 2010/11, and 81% in 2016.[7] (-): Even in targeted areas where outbreaks occurred, coverage remained low.[117] (+): One KI spoke to the effectiveness and efficiency of the surveillance system: "…measles is one of the most monitored diseases in Senegal because there is routine surveillance with weekly notifications that are received every day, even if it is zero case everyone notifies zero cases."
Fidelity	Trainings and supervision. M&E.	Data on assessment of quality of implementation of measles vaccination program were not available for the team to review.
Equity		(+/-): The measles vaccination program in Senegal continued to experience challenges with equity, with gaps in coverage slightly increasing between wealth quintiles from 71% and 81% for the lowest and highest quintiles respectively, in 2005, to 72% and 90% for the lowest and highest quintiles respectively, in 2016 (Figure 27).[7,39] Overall, coverage was relatively stable.

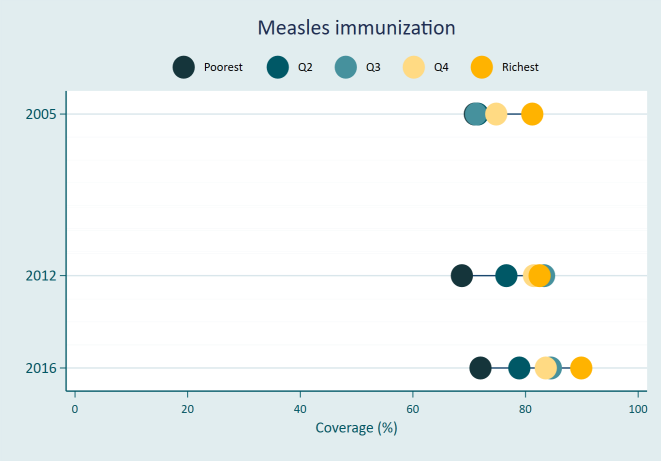


Figure 27: Equity and Coverage Outcome: Measles Vaccination in Senegal Across All Wealth Quintiles (2005-2016) (Source: Victora, et al 2018)

4.3 HIV: Antiretroviral (ARV) for Prevention of Mother-to-Child Transmission and Treatment for Infants and Children

Senegal began a rapid and intensive prevention – and later a treatment – campaign after its first AIDS case was discovered in 1986. These efforts led to the creation of the National AIDS Control Program in 1990 (which became the National AIDS Council in 2001) with direct reporting lines to the office of the Prime Minister. The National AIDS Control Program was mandated to provide oversight and coordinate all policy and decision-making around HIV/AIDS, including defining guidelines, leading and ensuring advocacy and partnerships, and ensuring adherence to set HIV/AIDS-related ethics and regulations.[120,121] Over the years, Senegal's AIDS prevention and treatment initiatives focused on increasing the number of voluntary counselling and testing centers, improving access to treatment for people living with AIDS (PLWA), setting up sentinel surveillance centers, and promoting condom use and later treatment as prevention. All of these efforts have been reflected in Senegal's maintenance of a low HIV prevalence rate (below 2%) for its general population, though higher rates were seen in vulnerable groups such as men who have sex with men and commercial sex workers.[122] As shown in Table 9, while the rates remained low, performance and coverage indicators for many of these services relevant to prevention of mother-to-child transmission (PMTCT), and treatment in children, also remained low. For example, the proportion of women with knowledge of PMTCT was well under 50% despite an initial increase from 22% in 2005 to 37% in 2010, declining to 28% by 2016. Early infant diagnosis increased only slightly, from 9% in 2008 to 10% in 2010 and 13% in 2016.[123,124]

Table 27: HIV Program Key Implementation Strategies

Implementation Strategies
• National leadership and accountability • Leveraging of existing programs • Data driven adaptation of interventions and available treatments • Surveillance • Adaptation of international policies and treatment guidelines for local context • Leveraging of donor funding • Leveraging of partner support • Focus on equity • Community engagement • Stakeholder engagement • Training • Recruitment of staff • Data-based prioritization

EXPLORATION

In 1996, the 11th International Conference on AIDS in Vancouver ended with recommendations on the effectiveness of antiretroviral therapy (ART). African leaders convened in Dakar, Senegal for the international scientific consultation in September 1997, to assess capacity for distribution and define treatment protocols. The International Conference on AIDS & Sexually Transmitted Diseases in Africa was

convened three months later to discuss gaps in knowledge around ART, as well as the capacity of countries including Senegal to sustain the financial, human, and physical asset requirements for maintaining lifelong follow-up necessary for proper adherence to ART.

Senegal had a concentrated epidemic with low overall prevalence and higher rates among commercial sex workers and men who have sex with men. In 1998, Senegal became the first sub-Saharan African country to establish an ARV distribution program, the Senegalese Antiretroviral Drug Access Initiative (ISAARV), without donor support.[122] ISAARV was under the management of the National AIDS Control Committee and initially focused on adults.

In the preparation phase, a team of doctors, virologists, social workers, pharmacists, CSOs, and PLWA designed ISAARV treatment protocols, ethical guidelines, and legal frameworks based on international best practices. Four committees were created to lead the development of treatment plans, as well as clinical monitoring protocols, ethical guidelines, and legal frameworks, required for the successful implementation of the adult ISAARV program.

1. The control and monitoring committee, responsible for overall direction and management of the program, financial and human resource management, evaluation of initial clinical and public health effects of the program.
2. The medical committee, responsible for monitoring adverse reactions, defining enrolment criteria, and adapting therapeutic protocols. They also provided expert opinions on the accuracy of patients' treatment regimens.
3. The welfare committee, responsible for monitoring and ensuring access to the program for those who needed it the most. This committee also ensured adherence.
4. The drugs and reagent management committee, responsible for liaising with drug dispensaries and wholesalers as well as overall supply chain management.

Between 1998-2000, the committees met monthly and implemented a pilot test of the adult ARV program to assess the effectiveness, feasibility, and acceptability of the program with support from the Institute of Research for Development at the Office of Overseas Scientific Research, France.

In 2000, with the lessons learned from the pilot of the adult ART program, Senegal began to make plans to expand the program, fostered by the increased availability of donor funds for HIV-treatment programs in sub-Saharan Africa following the call to action at the 13th annual International Conference on AIDS in Durban, increased funding through the new President's Emergency Plan for AIDS Relief (PEPFAR) and the Global Fund, and the drop in cost of ARV treatment by 75% (from an initial yearly cost of US$7,000-10,000). Senegal's plans were detailed in its 2000-2003 HIV/AIDS action plan and included the opening of new non-teaching hospital sites to expand treatment, extension of ARV treatment to children, and inclusion of PMTCT patients.

Other partners involved in promoting this initiative included the MOH, the Department of Infectious Diseases at Fann University Hospital Center, the Outpatient Treatment Center dependent on this service,

the Department of Medicine at the Main Hospital, and the Sidak Project which provided technical support and M&E support.[125]

PREPARATION

Pediatric Treatment

The committees initially set up to lead the development of the adult ISAARV program were reconvened to design the program for children. Preparation for rolling out ISAARV for children also involved community engagement by CSOs to increase acceptance of the program as one KI explained: *"…we carried out advocacy by explaining that children [will not] pay for antiretrovirals. Our focus was that children do not have to pay and that they must have access to medicines. So, we argued that it would not be fair to give treatment to adults and to let children die*."

PMTCT

Led by the same committee which provided oversight for preparations for the treatment for the pediatrics component, and with support from UNAIDS, WHO, and UNICEF, preparations for introducing PMTCT in Senegal included community engagement activities to increase awareness of the availability of the services. Other preparations included the development of PMTCT protocols and guidelines.

IMPLEMENTATION

Pediatric Treatment

In July 2000, the government extended ISAARV to children. Criteria included a combination of symptoms and CD4 count based on WHO recommendations.[126] Senegal began scale-up of its pediatric HIV treatment program with a heavy focus on Dakar because of its high HIV rates, with plans to spread to the other regions. Prescription and drug dispensary sites started to operate in the pediatric wards of three health facilities in Dakar assigned as treatment sites for children: Albert Royer Children's Hospital, Principal Hospital, and Guediawaye Health Centre. The maternity wards of Le Dantec Teaching Hospital, Principal Hospital, and Guediawaye Health Centre were assigned as treatment sites for pregnant women. The number of ARV-prescribing doctors for both pediatric and adult patients on the ISAARV program increased from 9 in 1998 to 24 in 2002.[126] ISAARV staff were trained during the initial roll out of ISAARV for children upon expansion in 2001-2002, and more staff were recruited and trained with support from World Bank and Global Fund. These training workshops lasted three days and focused on screening, diagnosis, counseling, prescribing, and dispensing methods.

PMTCT

In 2004, Senegal introduced its protocol for PMTCT, which involved oral treatment (with Zidovudine) for the mothers within the 34th-36th week of pregnancy and oral treatment every three hours during childbirth or intravenously where necessary.[127] The newborn received treatment for one week. According to KIs, research support from the Institute of Research for Development at the Office of Overseas Scientific Research, France, was important for generating data during the initial implementation of the

program. Senegal initially introduced PMTCT in Dakar given the higher prevalence of HIV and by 2006, PMTCT was scaled up to 11 of the 14 regions in Senegal.[127]

Although Senegal began carrying out HIV sentinel surveillance among pregnant women attending ANC in 1989, based on WHO/UNAIDS recommendations, between 1989-2004, it was extended to all 14 regions in Senegal. By 2011-2012, ANC sentinel surveillance was also conducted in 45 out of 198 total sites which were generally representative of pregnant women in Senegal.[128]

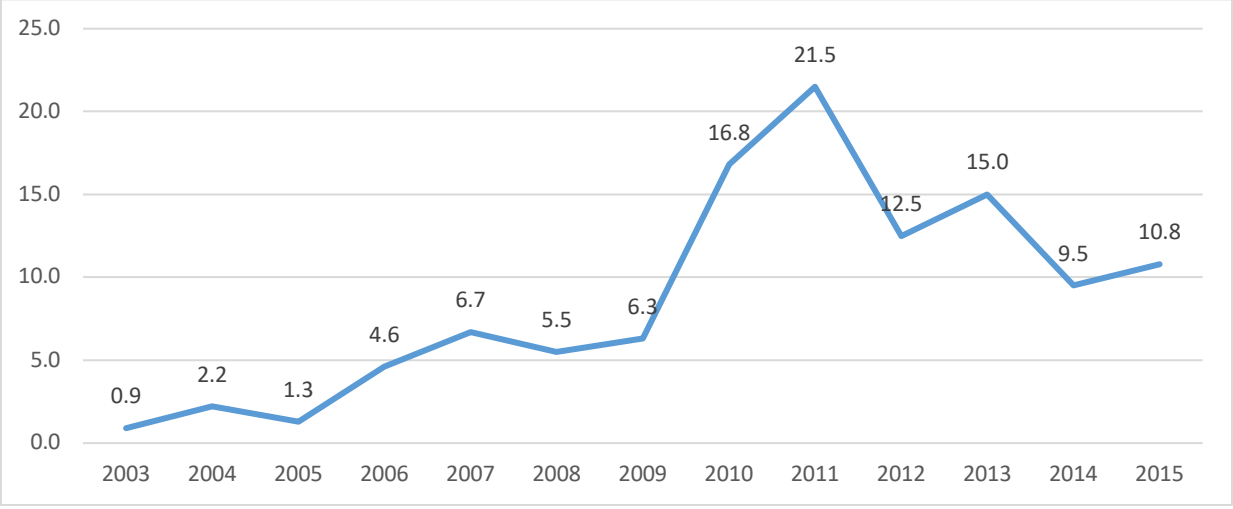
The political will to provide treatment for HIV/AIDS in Senegal was evident in the government's allocation of significant funds to the ISAARV program (Table 28). Although donors supported with funding for other HIV initiatives, they were mainly geared towards prevention, the main focus of partners and donors at the time.[126]

Table 28: Financial Contributions (in CFA Franc Millions) of the Government of Senegal and Development Partners to HIV Programs (1998-2001)

	1998	1999	2000	2001
State (Total)	375	460	525	1290
Amount Contributed by Donors (Mainly for Prevention)	1165	2430	1997	2156
ISAARV (State) (Percentage of State)	250 (66%)	250 (54%)	300 (57%)	600 (46%)

The success of the pilot for the ISAARV for adults program, in providing evidence for its feasibility, as well as the increase of donor funds for HIV treatment efforts globally, led to the increase of funds for HIV programs (including ISAARV) post-2001-2002. Figure 28 shows the overall trend of HIV-funding for Senegal, by the Global Fund, which increased from US$0.9million to US$10.8 million. These funds were essential for the expansion of the program to include children.[129]

Figure 28: Global Fund's Financial Contributions to Senegal's HIV Program (US$million) (2003-2015) (Global Fund 2018)



ADAPTATION DURING IMPLEMENTATION

In 2003, Senegal switched from subsidized treatment to free HIV care for all. By 2007, the initiative was extended to all of the country's 11 regions. Voluntary testing services were made available in all 56 health districts.

In 2004, PMTCT services were scaled-up in Senegal's capital, Dakar, reflecting a change to a strategy to eliminate mother-to-child transmission (MTCT) of HIV. In 2012, Senegal adopted the WHO's B+ option, of systematic triple therapy for HIV-positive pregnant women for life with breastfeeding and ARV prophylaxis for their infants.[130]

These adaptations were associated with some improvement in indicators such as the percentage of HIV-positive pregnant women receiving ARV treatment, which increased from 23% in 2010 to 48% in 2013 and 57% in 2016, although a large gap remains. New cases of children (aged 0-14) with HIV also remained at <1000 from 2003-2016 with the number of HIV-exposed children who were uninfected increasing from 15,000 in 2003 to 30,000 in 2016. PMTCT coverage also increased from 23% in 2010 to 57% in 2016.[131]

Table 29: HIV Implementation Strategies and Outcomes

Implementation Outcomes	Implementation Strategies	Evidence
Acceptability	Stakeholder engagement: selected committee to develop policies and guidelines. Community engagement. Adaptation of international policies and treatment guidelines for local context.	(Unknown): Generally low coverage (e.g. HIV+ children receiving ART) suggested low acceptability though could have reflected challenges with implementation
Feasibility	Leveraging ISAARV program for adults. Engaging stakeholders for community engagement (CSOs). Building on partnership for research support (for example, Institute of Research for Development, France).	(+/-): PMTCT and ARV for pediatrics program implemented nationwide though with challenges

Implementation Outcomes	Implementation Strategies	Evidence
	Leveraging donor funding and increased allocation of government funding for HIV.	
Effectiveness and Coverage	Recruitment of staff. Data driven adaptation of interventions and available treatments. Data driven prioritization: focus on Dakar.	(-): HIV-testing at ANC and receipt of results remained low, from 32% in 2005 to 52% in 2016. The percentage of women with knowledge of PMTCT was 22% in 2005 and 28% in 2016.[7] (-): Early infant diagnosis increased from 9% in 2008 to 13% in 2016.[123,124] Early infant diagnosis remains low due to its expense, requiring sophisticated laboratories and trained technicians.[123] (+/-): The rate of HIV-positive pregnant women receiving ART increased from 23% in 2010 to 57% in 2016, though a large gap remained. (-): New cases of children (ages 0-14) with HIV remained below 1,000 from 2003-2016; the number of HIV-exposed children who were uninfected increasing from 15,000 in 2003 to 30,000 in 2016.[131] (+): MTCT rate was 5% in 2010.[132] (+): ISAARV (including the program for children) was extended to all of the country's regions. (+/-): 2015 data showed only 25% of children ages 0-14 years were receiving treatment.[133] While low, this increased from 2.6% in 2005 and 1.7% in 2010.[133]
Fidelity	Recruitment of staff. Training.	(-): According to a 2014 study, lack of training and supervision continued to be a key shortcoming of PMTCT in Senegal.[134]

Implementation Outcomes	Implementation Strategies	Evidence
	National leadership and accountability: National AIDS control program's reporting lines to Prime Minister. Surveillance.	
Equity	Free treatment for all.	(-): In 2015, regional disparities were identified in HIV testing amongst pregnant women with higher testing rates in Kolda (97%) and Kédougou (112%) and lower testing rates in regions like Sédhiou (49%), Dakar (56%), and Matam (60%).[132]

SUSTAINMENT

Senegal made efforts to integrate PMTCT programs in a broader number of facilities by providing integrated services for maternal, newborn, and child health and reproductive health.[134] However, according to a study conducted in 2014, availability of HIV testing and ARV drugs was not consistent at the program sites. Lack of training and supervision continued to be the key shortcomings that needed to be addressed for the complete and quality integration of prevention of mother-to-child HIV transmission into maternal health services to achieve the national goal of elimination of MTCT and the global goals to end the epidemic.[134] Specific data on the number of facilities which provided pediatric HIV care and PMTCT services were unavailable for the team to review. However, a paper written in 2010 mentioned that PMTCT services were available in most health facilities in Senegal.[135] Additionally, donors were supporting this work less and less because of very low prevalence compared to other regions.

4.4 Malnutrition Interventions

Senegal's MOH classified children under 5 as malnourished based on three anthropometric indices: stunting (height-for-age), wasting (weight-for-height), and underweight (weight-for-age). These indicators are important measures of the health status of under-5s and were the focus of U5M reduction activities in Senegal pre-2000 and between 2000-2016. Severe acute malnutrition is a direct cause of U5M. Stunting is associated with increased U5M and longer-term morbidity as well as severe acute malnutrition. In Senegal, stunting increased from 20% in 2005 to 27% in 2010-2011, dropping to 17% in 2016 (Table 9) while wasting was at 9% in 2005, 10% in 2010-2011, and 7% in 2016. Similar trends were seen for underweight data, with 14% of children underweight in 2016, down from 18% in 2010-2011 but with fluctuations in the years in between.[7] Much of Senegal's nutrition efforts between 2000-2016 focused on addressing malnutrition broadly; mainly through the Community Nutrition Program (CNP) in the 1990s and later through the Nutrition Enhancement Program (PRN) (an adaptation of the CNP) in the 2000s.

Table 30: Broader Nutrition Efforts Key Implementation Strategies

Implementation Strategies
• National leadership and accountability • Data use for decision-making • Leveraging of donors and partners • Piloting • Integration into existing programs and structures e.g. CHWs • Private sector engagement (PPP) • Stakeholder engagement • Community engagement • Multi-sectoral approach • Training • Policy development e.g. Policy Letter on Malnutrition (2001-2015) • Supervision and M&E with district responsibility

IMPLEMENTATION PRE-2000

According to KIs, although Senegal had historically implemented nutrition initiatives, a number of factors influenced the decision to prioritize them in the 1990s:

1. Recognition of the correlation between malnutrition indicators and overall U5M; with 30%, 9%, and 18% of stunted, wasted, and underweight children, respectively, in Senegal in 1992-1993.[7]
2. Increased donor interest in nutrition program and corresponding availability of donor funds.

However, in 1994 the devaluation of the CFA Franc, Senegal's currency, was the tipping point which spurred Senegal's government to begin the preventive CNP as a way to mitigate the negative influence of the devaluation on citizens' and especially, children's nutrition. The CNP focused on a variety of community nutrition activities which included growth monitoring, behavior change communication, and efforts to enhance food security. It targeted poor urban and peri-urban areas, providing much of its services at community nutrition centers as well as through routine community-wide health promotion activities. The CNP was implemented by the Agence d'Exécution Travaux d'Intérêt Public (AGETIP), a private organization established in 1989 by the Government of Senegal with support from the World Bank, to lead the execution of development projects in Senegal. AGETIP led the identification and training (using MOH-designed modules) of two relais communautaires per village/local authority to implement the CNP at community level, as well as the contracting with supervisors (community project managers and micro-entrepreneurs) to manage the community nutrition centers.

Monitoring and evaluation was a key component of the CNP. AGETIP, in collaboration with the supervisors and with oversight from the MOH, was in charge of conducting monthly supervision visits to monitor and evaluate implementation. These visits ensured the relais communautaires' compliance with their training, standards, and service protocols. AGETIP collected routine M&E data and transmitted them to the supervisors of the programs, at regional and central levels (MOH). Other broader data collection

initiatives like the DHS regularly tracked nutrition-related indicators such as rates of stunting, wasting, and underweight children, a key focus of the CNP.

The CNP also engaged the community throughout the lifecycle from conceptualization to implementation of the program. This led to strong commitment by the communities and leaders which translated to high turnout to community-wide activities. For example, a KI who was part of the implementation of the CNP, describing the role of community engagement as a key driver of mothers' turnout for monthly community-based weighing sessions, said: "*We should also pinpoint the extraordinary community ownership of CNP activities and the community mechanism that enabled us to conduct any type of intervention in the community*."

However, the effectiveness and efficiency of the CNP was limited by the decision to implement the program through AGETIP, alongside the relative absence of a national-level body to lead the implementation of the program with the MOH only in a coordinating role. As a result, the CNP was discontinued in 2000.[136]

IMPLEMENTATION AND ADAPTATION AFTER 2000

In 2001, the gaps identified with the implementation of the CNP led to the establishment of the *Cellule de Lutte contre la Malnutrition* (CLM), the Malnutrition Control Cell, a national-level body responsible for coordinating and providing oversight for malnutrition control and prevention programs across all sectors. It was housed in the office of the Prime Minister and reflected the government's multi-sectoral approach to addressing the issue of malnutrition in Senegal, for example inclusion of the Ministry of Education which took part in all its meetings and collaborated on school-based malnutrition programs. This strategy was associated with Senegal's successes with addressing malnutrition.[136] One KI, describing the multi-sectoral approach in Senegal, explained that "*Here in Senegal, this multi-sectoral approach is an asset for us. It enables different stakeholders to work together to identify interventions, find synergies and complementarities. That's an important aspect, and I don't think that there are as many countries worldwide that have achieved such feat. This multi-sectoral approach is so entrenched that recently the Government of Senegal has developed a multi-sectoral nutrition strategic plan. Twelve sectors worked together to identify sectoral action plans that constitute this multi-sectoral nutrition action plan*."

In 2001, with support from the World Bank the CLM carried out an assessment of the achievements and challenges of the CNP to inform the design of the planned Nutrition Enhancement Program. A process evaluation conducted throughout the lifetime of CNP showed that the rate of underweight among children recruited into the program was 73% as opposed to the targeted 90% (low fidelity in recruitment criteria). The evaluation also identified poor adherence to service delivery criteria (for example, regarding eligibility for rations and food supplements) and low recovery rates (at only 61%).[137] Further, the final assessment of the achievements and challenges of CNP showed that there were insufficient local structures such as women's groups involved in the implementation of the program. As a result, the PRN was designed to address these challenges through capacity building of local structures to manage basic

nutrition services within communities, capacity building to improve service delivery, and establishment of local committees for monitoring interventions.

The PRN began with a programmatic focus similar to the CNP (growth monitoring, health promotion, and behavior change communication), but without active case finding and support. However, in 2007, following a joint statement by WHO, the World Food Program, the UN System Standing Committee on Nutrition, and UNICEF calling for community-based management of severe and acute malnutrition and use of ready-to-use therapeutic food to combat severe and acute malnutrition among children,[138] the PRN began screening for and managing acute malnutrition amongst under-5s within communities. This strategy was adopted to proactively identify malnourished children or those who were at risk of being malnourished and providing the needed support and treatment within the community setting. This adaptation began with a pilot in the Velingara district, Kolda region – a predominantly rural area in the south of Senegal with high rates of acute malnutrition – and spread to other regions. Key informants also noted that this adaptation to the PRN reflected multiple studies which revealed that acute malnutrition in Senegal was increasing.

Senegal set up Recovery and Nutritional Rehabilitation Centers (*Centres de Récupération et d'Education Nutritionnelles*, or CREN) to treat severely malnourished children who required in-patient care (usually lasting approximately 10 days). CREN were implemented in the health structures (hospitals and centers), providing basic health education and receiving about 600 to 700 malnourished children per year.[139] This adaptation to the PRN meant that relais communautaires identified malnourished children and treated them at community level while the severely malnourished were referred to the recovery and nutritional rehabilitation centers. These centers also held demonstration sessions to teach mothers how to prepare nutritious meals. Management of severely malnourished children at these centers was monitored by the district nutrition focal person with reporting lines to the CLM. Addition of the community-level management of malnutrition to the PRN was also accompanied by government-led advocacy activities to increase donor funding of screening and management of acute malnutrition activities. According to KIs, increases in donor funding and adaptations to the protocol for treating cases of acute malnutrition strengthened this new addition to the PRN. Key informants also added that the success of the integrated program ensured that there was no need for a separate program focused solely on managing severe acute malnutrition.

A number of other factors also helped these efforts. According to KIs, availability of funding was a major factor associated with the success of PRN once implemented. Senegal annually committed increasing funds to the CLM for the implementation of the PRN, with approximately 200 million CFA of direct funding to nutrition allocated in 2002 increasing to 3 billion Francs in 2017. Additionally, World Bank became a major funder of nutrition programs in Senegal in 2001 with other donors including UNICEF, Spanish Agency for International Cooperation (AECID), African Development Bank (AfDB), and USAID supporting PRN activities.

In Senegal, donors and implementing partners also collaborated in a range of key activities including identifying areas that needed focused interventions and funding. According to KIs and existing research, this coordination was important for the successes experienced within the nutrition sector in Senegal.[136] Between 2001-2011, much of this coordination was overseen by the CLM through regular stakeholder meetings to align on strategic plans and the policy development agenda. Key informants explained that the coordinating efforts of the CLM was key to the adaptation of the CNP design to the PRN in 2001.

Multiple policies and strategies were also developed to facilitate the implementation of nutrition initiatives in Senegal. For example, in 2002 the *Lettre de politique de nutrition* (nutrition policy letter) was introduced to identify the main objectives for nutrition between 2001-2015. In 2015, Senegal also began the implementation of the national policy for the development of nutrition which had an increased focus on multi-sectoral collaboration and further emphasized the institutionalization of nutrition in different sectors.

In 2011, Senegal joined the Scaling Up Nutrition (SUN) movement, a global initiative formed as a result of the 2009 World Summit on Food Security, to coordinate global efforts to support countries in developing and implementing programs which address the underlying causes and manifestations of malnutrition.[140] According to KIs, joining the SUN further improved the CLM's donor and other stakeholder coordination efforts, within the nutrition space, leading to reduced duplication of donor efforts, as well as better alignment on ongoing interventions and areas to focus on for future funding.

Besides routine programmatic M&E efforts, which involved direct data gathering from communities and district leaders, broader data collection initiatives including DHS were used to track nutrition indicators. Impact evaluations of the PRN and CNP found limited reduction of stunting prevalence as a result of the CNP but "improved uptake of vitamin A, deworming, use of bed nets, iron supplementation, malaria prophylaxis, and ORS for diarrhea were observed after implementation" of the PRN.[141] Moreover, children who were part of the intervention were less likely to be underweight.[141]

Overall, the PRN improved on the reach of the CNP. The PRN rapidly expanded the initial coverage of the CNP from 14 local (mainly urban and peri-urban) communities to approximately 400 (almost all) communities across all the regions of Senegal. Program coverage increased as part of the second phase of the PRN, which began in 2007 and lasted until 2014, as part of a multi-sectoral approach.[141]

Nonetheless, the percentage of stunted, wasted, and underweight children under 5 generally remained largely unchanged between 2005 and 2016. Stunting increased from 20% in 2005 to 27% in 2010-2011, and dropped to 17% in 2016 while wasting was at 9% in 2005, 10% in 2010-2011, and 7% in 2016. Similar trends were seen in data for underweight.[7]

Table 31: Malnutrition Implementation Strategies and Outcomes

Implementation Outcomes	Implementation Strategy	Evidence
Appropriateness	Data-based decision-making: identification of disease burden.	(+): In 1992-1993, 30%, 9%, and 18% of children were stunted, wasted, and underweight, respectively, in Senegal.[7] (+): The CNP began in 1994, as Senegal's government tried to mitigate the negative influence of currency devaluation on the population.
Acceptability	Integration into existing CHW system. Community engagement. Multisectoral engagement.	(+): Process evaluation of CNP: turnout for community weighing activities was high; 92% of children attended six of seven weighing sessions.[137] (+): One KI mentioned that "this multi-sectoral approach is an asset for us. It enables different stakeholders to work together to identify interventions, find synergies and complementarities."
Feasibility	Private sector engagement (PPP). Leveraging of donor and partner support: World Bank, AECID, UNICEF, and USAID. Multisectoral engagement.	(-): The effectiveness and efficiency of CNP was limited due to AGETIP's limited reach and the absence of central-level implementation leadership. CNP was discontinued in 2000.[136] (+): The success of the integration of community-based management of malnutrition into PRN ensured that there was no need for a separate program in Senegal focused solely on managing severe acute malnutrition.[136]
Effectiveness and Coverage	Data use for adaptation (for example, introduction of ready-to-use therapeutic food). Pilot of CMAM in Velingara district. Adaptation (to active case finding and treatment).	(+/-): The rate of stunted, wasted, and underweight under-5s generally remained unchanged between 2005 and 2016.[7] The progress had links with the involvement of CHWs. (+): Overall, the PRN improved on the reach of the CNP. The PRN expanded the initial coverage of the CNP from 14 (mainly urban and peri-urban) communities to 385 (across all the regions).[142] (+): 91% of children who took part in monthly growth promotion sessions showed sufficient weight gain.[143]

Implementation Outcomes	Implementation Strategy	Evidence
Fidelity	National leadership and accountability (CLM and SUN movement). Training relais communautaires, community project managers, and micro-entrepreneurs of the CNP and PRN. M&E and supervision.	(+): In 2014, PRN was shown to adhere strictly to the principles and standards outlined in the implementation manual of the program.[144] (+): The proportion of caregivers who recognized two or more danger signs in sick children increased from 55% to 77%.[143] (+): CLM had a strong system of monitoring which highlighted regular progress. Chronic malnutrition has decreased from 29% to 21% between 2000 and 2015.[142]
Sustainability	Policy development	(+): In 2015, Senegal implemented the national policy for the development of nutrition which had an increased focus on multi-sectoral collaboration and further emphasized the institutionalization of nutrition in different sectors. (+): The PRN switched from the CNP's initial unsustainable approach of paying community project managers, micro-entrepreneurs, and relais communautaires, to a system of incentivization by stipends. (+): Approximately US$1.8 million was spent by the Government of Senegal on PRN (phase 1), increasing to 23.4 million (phase 2).[143] (+): By 2016, PRN was a nationally owned program with local authorities fully managing basic nutritional services.[143]
Equity		(-): In 2005, the percentage of stunted and underweight children under 5 in the lowest wealth quintile was 30% and 21%, respectively, while that of the highest quintile was 8% and 5%, respectively. In 2016, this proportion decreased for stunting but not for underweight in the lowest wealth quintile and unchanged in highest wealth quintile.[39] Wasting did not have much inequity and remained unchanged (Figures 29-31).

SUSTAINMENT

To ensure sustainability, the PRN switched from the CNP's initial unsustainable approach of paying community project managers, micro-entrepreneurs, and relais communautaires to a system of incentivization with stipends. For example, community project managers who were initially paid 50,000 CFA Francs for their services began receiving stipends of 5,000 CFA Francs each and a shared piece of land to cultivate crops which they could sell for some profit. This change was accompanied by moving community nutrition centers from rented spaces to less expensive community-owned options, e.g. homes of community leaders. According to a KI, this made the PRN operate *"at lower costs to make the intervention sustainable and able to spread to mainly rural areas because CNP was implemented in urban and peri-urban areas. A low level of remuneration… led to a reduction in costs."* The Government of Senegal spent approximately US$1.8 million for PRN activities (phase 1) and 23.4 million in phase 2.[143]

By 2016, after the study period had ended, PRN was a nationally-owned program in which local (district) authorities had full responsibilities of managing basic nutritional services.[143]

Figure 29: Equity and Coverage Outcome: Percentage of Wasted Children in Senegal across all Wealth Quintiles (Source: Victora, et al 2018)

Figure 30: Equity and Coverage Outcome: Percentage of Stunted Children in Senegal across all Wealth Quintiles (Source: Victora, et al 2018)

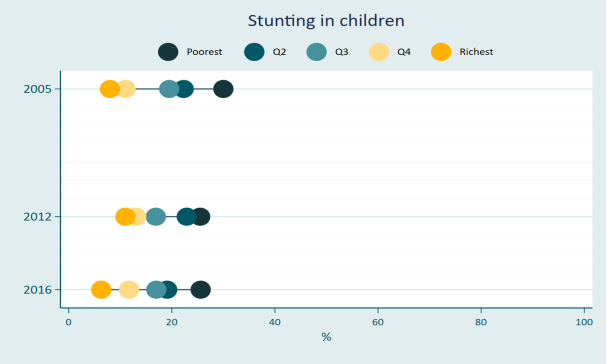
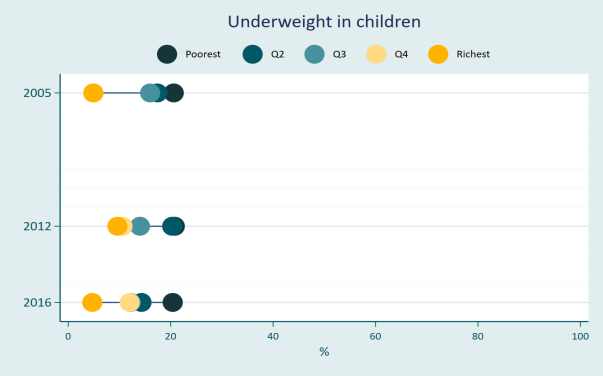


Figure 31: Equity and Coverage Outcome: Percentage of Underweight Children in Senegal across all Wealth Quintiles (Source: Victora, et al 2018)



4.5 Vitamin A

Table 32: Vitamin A Supplementation Key Implementation Strategies

Implementation Strategies
• Data-based decision-making • Leveraging of existing programs • Leveraging of donor funding • Free distribution

IMPLEMENTATION PRE-2000

Vitamin A deficiency is an underlying determinant of child mortality, increasing risk of morbidity and mortality from common causes of death, including respiratory problems, measles, and diarrheal diseases. Several studies carried out in different countries also demonstrated that vitamin A supplementation (bi-annual treatment with high-dose capsules) significantly reduces mortality among children 6-59 months of age. WHO and UNICEF recommend setting up programs to supplement vitamin A in all countries with infant and child mortality rates higher than 70 per 1,000 live births.[145]

Much of Senegal's vitamin A supplementation efforts pre-2000 involved providing a high dose of vitamin A to children through a routine delivery model at facilities as a component of the IMCI program. In 1994, vitamin A supplementation was expanded to semi-annual national campaigns implemented by CHWs, as part of measles or polio campaigns, with support from WHO and UNICEF standards, for children aged 6-59 months of age.

ADAPTATION DURING IMPLEMENTATION AFTER 2000

Post-2000, through the CB-IMCI program and PRN, Senegal organized semi-annual campaigns and micronutrient promotion days where vitamin A capsules were distributed for free to all children. Other broader micronutrient supplementation through food fortification efforts in Senegal focused on women of reproductive age, for example, the Senegalese Committee for Fortification of Micronutrient Foods, established in 2010 with the financial support of Global Alliance for Improved Nutrition's grant, the Micronutrient Initiative, and Helen Keller International.

The proportion of children aged 6–59 months who received vitamin A supplements, though high, was the same in 2010 and 2016 (at 78%) although increased during the intervening years.[13,23] In 2018, after the study period ended, vitamin A supplementation was integrated into a routine process in the health facilities for children aged 12-59 months who were receiving de-worming treatment.

Table 33: Vitamin A Implementation Strategies and Outcomes

Implementation Outcomes	Implementation Strategy	Evidence
Appropriateness	Data-based decision-making: data use to identify disease burden.	(+): Vitamin A is recommended in all countries e.g. Senegal, where vitamin A deficiency was a public health concern.[146]
Feasibility	Leveraging of existing programs. Leveraging of donor funding.	(+/-): Vitamin A supplementation program implemented and with high coverage.[146]
Effectiveness and Coverage	Free distribution. Integration into campaigns and into nutrition and CB-IMCI program.	(+): Coverage was the same in 2010 and 2016 (at 78%) but with fluctuations in between.[13,23]

4.6 Neonatal Interventions

Between 2000-2016, the reduction in neonatal mortality in Senegal was less dramatic than overall U5M, declining by 44%, from 36 per 1,000 live births in 2000 to 20 per 1,000 live births in 2016 (Figure 32).[38] However, as with overall U5M reduction, the decline occurred across wealth quintiles, with some closing of the gaps in mortality rates (Figure 33).[39] We reviewed EBIs based on period of risk: antenatal, during delivery, and post-delivery.

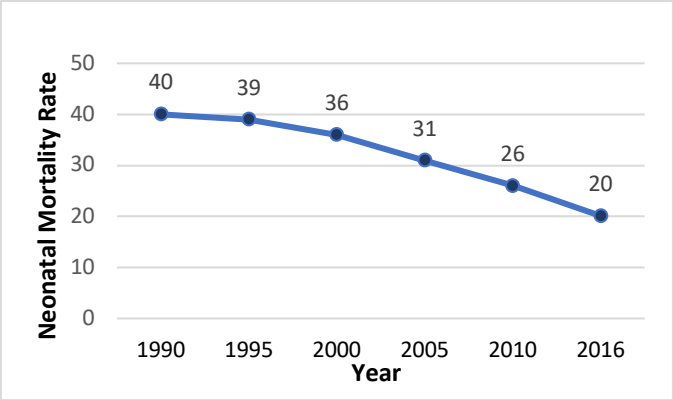


Figure 32: Neonatal Mortality Rate in Senegal (1990-2016) (Source: IHME 2018)

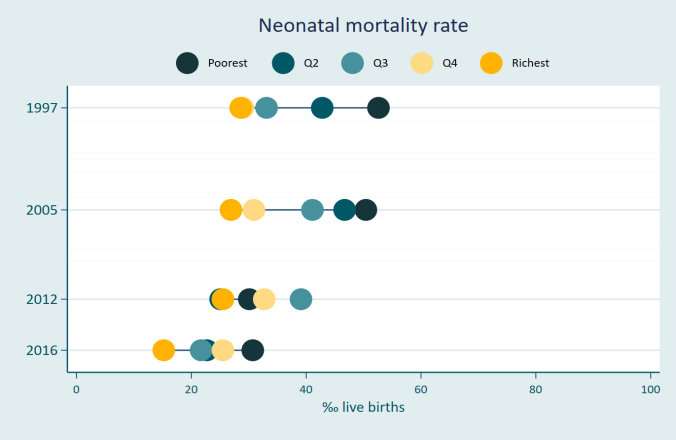


Figure 33: Equity Analysis of Neonatal Mortality Rate in Senegal (1997-2016) (Source: Victora, et al 2018)

4.6.1 Improving Antenatal Care Services, Access, and Uptake

4.6.1.1 Improving Access to Antenatal Care

Table 34: ANC Key Implementation Strategies

Implementation Strategies
• Leveraging of existing programs • Leveraging of existing systems and structures • Training • Supervision • Leveraging partner support • Focus on equity

The percentage of women who attended at least one antenatal care (ANC) session was high through the 1990s (83% in 1997) and increased after 2000 to 96% in 2016.[13,23,147] However, attendance of 4+ ANC sessions, the standard prescribed by WHO during that time period, was relatively low over the whole period (13% in 1992, 40% in 2005, and 53% in 2016).[13,23,105,147,148]

Senegal's efforts to improve 4+ ANC access between 2000-2016 were mainly indirect, leveraging broader community-level interventions aimed at strengthening the community health system in general. USAID/Senegal's Programme Santé/Santé Communautaire I and II (2006-2011 and 2011-2016) was the main program focusing on community-health strengthening between 2000-2016. There were other donor-implemented interventions focused on improving ANC access, however, following a pattern in other interventions, they were not scaled-up because of funding challenges. For example, the Community-based Maternal and Newborn Health and Nutrition project in Kolda region.

Programme Santé/Santé Communautaire I and II and Bajenou Gokh (see also Community Health Program in Section 2)

EXPLORATION

USAID/Senegal's Programme Santé/Santé Communautaire I (2006-2011) was instrumental in strengthening community health structures in Senegal, by working to equip existing networks of health huts, recruiting a team for each health hut including relais communautaires and matrones, and providing the minimum health care package at health huts and in the community. This minimum package included wound dressing, disinfection, treating diarrhea, acute respiratory diseases, and malaria cases. Additionally, in some huts where trained matrones operated, deliveries were handled and the matrones provided contraceptive products (initial offer of pills). However, the Programme Santé/Santé Communautaire I was also key in identifying gaps in maternal, newborn and child health at community level through a situation analysis, finding that women were reluctant to access needed care because of language barriers in communication with health workers.[149] As a result, Senegal decided to introduce a new cadre of CHWs, the bajenou gokh.

PREPARATION

Preparation for introducing the bajenou gokh included a needs assessment supported by partners like USAID, Plan International, and Child Fund under the leadership of the MOH. USAID also provided technical support with the development of management tools, as part of preparations.

IMPLEMENTATION

As noted in the Community Health Program section, in 2009, as part of the Programme Santé/Santé Communautaire I, Senegal introduced a new cadre of CHWs, bajenou gokh (meaning godmother in Wolof). Their sole responsibility was to provide maternal, neonatal, and child health services at the community level to facilitate the reduction in maternal, newborn, and child deaths by promoting antenatal consultation visits, attending births in the health facilities, doing postnatal (PNC) visits, encouraging child immunization, referring malnourished children for services, promoting family planning, and discouraging gender-based violence. The bajenou gokh were introduced to leverage Senegal's culture of respect for older women and their role in influencing maternal and child care-seeking behaviors. As a result, communities mainly selected grandmothers for the role of bajenou gokh because of their reputation and credibility. Their activities involved health promotion with a focus on early pregnancy detection, encouraging care-seeking behaviors including ANC amongst pregnant women, and discouraging social norms that act as barriers to accessing ANC, such as hiding pregnancies.[150] Bajenou gokh carried out their activities in collaboration with relais communautaires through home visits. Theoretically, the relais communautaires worked under the supervision of the bajenou gokh. Each bajenou gokh managed a team of relais communautaires. Whenever the relais communautaires encountered challenges such as reluctance of a pregnant woman to attend ANC sessions, they consulted the bajenou gokh who would intervene to solve the problem.

The bajenou gokh program was financially supported by USAID. The bajenou gokh were trained for two to three days by the MOH and supervision visits were conducted with support from partners such as USAID. Further details of this training and supervision were unavailable for the team to review. The bajenou gokh were not paid for their services, although they received some incentives such as mobile phones during the organization of promotional and preventive health activities, as well as a per diem and transportation reimbursement during training activities. Key informants did note that the main motivator for the bajenou gokh was the recognition they received within their respective communities.

As of 2014 there were 3,406 bajenou gokhs, fewer than the goal of 12,000 required to reach the target of 1 per 100 households.[56]

ADAPTATION DURING IMPLEMENTATION

In 2014, bajenou gokhs were integrated into community village watch and warning committees which were set up as part of the Programme Santé/Santé Communautaire I. These committees comprised of the village chief, women's groups, youth associations, religious leaders including parish priests and Imams, and agents de santé communautaires. In 2016 these committees were rolled out in 13 of 14 regions in

Senegal. The community village watch and warning committees played a key role in resolving cases of missed vaccinations and antenatal sessions within communities and notification of neonatal and maternal deaths among other activities. Bajenou gokhs were integrated into these committees because of their role in ensuring ANC attendance and ensuring reduction in home deliveries within the communities.

Table 35: Programme Santé/Santé Communautaire I and II and Bajenou Gokh Implementation Strategies and Outcomes

Implementation Outcome	Implementation Strategy	Evidence
Acceptability	Leveraging existing social norms: Senegal's culture of respect for older women and their role in influencing maternal and child care-seeking behaviors.	Not found
Feasibility	Leveraging broader community-health system strengthening work: Programme Santé/Santé Communautaire. Leveraging donor support: USAID. Leveraging partner support: USAID support with development of management tools.	(+/-): Bajenou gokh program implemented although achieved low coverage.
Effectiveness and Coverage	Focus on equity: home visits, community village watch, warning committees.	(-): In 2014, there were 3,406 bajenou gokhs, fewer than the 12,000 required to reach the target of one per 100 households.[57] (+): The proportion of women who attended at least one ANC session was high through the 1990s (83% in 1997), and increased after 2000 to 96% in 2016.[2] (-): Attendance of 4+ ANC sessions was very low in the 1990s (13% in 1992), and continued to be relatively low after 2000 (40% in 2005 and 53% in 2016). According to KIs, these persistently low ANC4+ levels resulted from factors including cultural norms and late access to ANC which limited the timeframe for accessing 4+ ANC sessions during pregnancy.
Fidelity	Training and supervision.	Not found.

Implementation Outcome	Implementation Strategy	Evidence
Equity	Focus on equity: home visits, community village watch, warning committees.	(+): Attendance of at least one ANC session was high for both urban and rural residents in 2016 (96% and 94%, respectively) although attendance had also been high in 2005 (96% and 88%, respectively) when Programme Santé/Santé Communautaire I began. (+): Attendance at at least one ANC session was high for both the highest (100%) and lowest (91%) wealth quintiles in 2016. These levels were stable for the highest quintile from 2005 (97%) when the Programme Santé/Santé Communautaire I began. Attendance for the lowest quintile showed improvement from 2005 (76%).[39] (Figure 34 and 35.) (-): Although there was an overall increase, ANC4+ access between 2005-2016 among urban and rural residents did not converge. (-): In 2005, the percentage of women in the lowest wealth quintile who attended 4+ visits was 29%; for the highest wealth quintile it was 63%. In 2016, the percentage of women who attended 4+ visits was 35% for the lowest quintile and 74% for the highest.[39]

SUSTAINMENT

The successes of the Programme Santé/Santé Communautaire I led to the development of the Programme Santé/Santé Communautaire II in 2011 with an added focus on sustainability and transfer of ownership of the program to the Government of Senegal.

Figure 34: Equity and Coverage Outcome- ANC (at least one visit) (1997-2016) (Source: Victora, et al 2018)

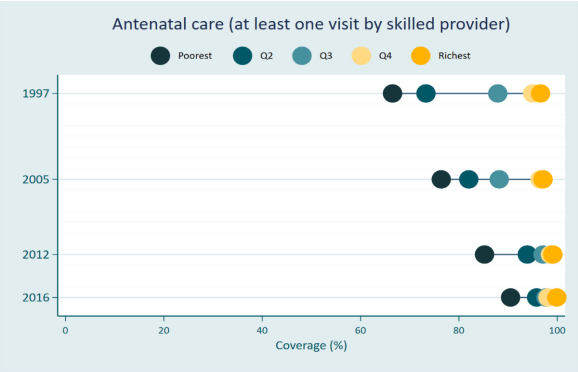
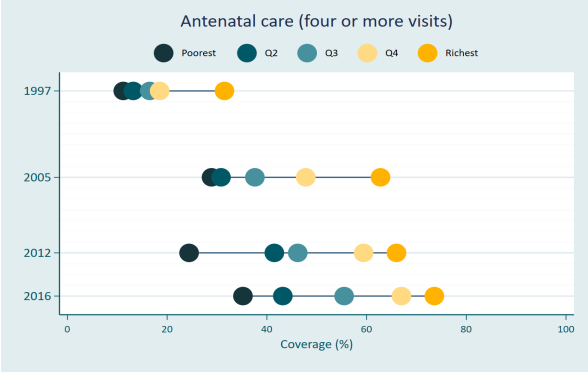


Figure 35: Equity and Coverage Outcome- ANC4+ (1997-2016) (Source: Victora, et al 2018)



4.6.1.2 Maternal Tetanus Vaccination

Table 36: Maternal Tetanus Vaccination Key Implementation Strategies

Implementation Strategies
• Data-based decision-making • Adaptation of global programs for local context • Leveraging of donor and partner support • SIAs • Focus on equity

EXPLORATION

In 1999, the Maternal and Neonatal Tetanus Elimination (MNTE) Initiative was launched by UNICEF, WHO, and United Nations Population Fund (UNFPA). The aim of MNTE was to reduce cases of neonatal tetanus to less than one case per 1,000 live births in all districts within countries including Senegal that had not achieved the standard for elimination at the time of launching.

IMPLEMENTATION

As part of the EPI program, Senegal adopted a high-risk approach in the identified high-risk areas. This involved immunization campaigns to administer three properly-spaced doses of tetanus toxoid (TT) vaccine to all women of reproductive age.[153] The vaccines were administered through SIAs.

ADAPTATION DURING IMPLEMENTATION

The plan for supplying vaccines and supplies was developed using target population data during preparation, adjusted based on consumption rates during implementation. As a result, tetanus vaccination coverage improved: the percentage of women receiving at least two doses of TT (TT2+) rose from 45% in 2000, to 67% in 2005, and 84% in 2015. Tetanus protection at birth increased from 62% in 2000 to 69% in 2010, and 82% in 2016. Neonatal deaths per 100,000 attributable to tetanus decreased from 770 to 74 between 2000-2016.[7,38] All districts in Senegal reached their goal of less than one case of neonatal tetanus per 1000 live births by 2009.[152]

Table 37: Maternal Tetanus Vaccination Implementation Strategies and Outcomes

Implementation Outcomes	Implementation Strategies	Evidence
Appropriateness	Adaptation of global programs for local context: MNTE.	(+): Senegal was one of the countries which had not reduced its number of neonatal tetanus cases to less than one per 1,000 live births in all districts.

Implementation Outcomes	Implementation Strategies	Evidence
Feasibility	Data-based decision-making: yearly plan developed for providing vaccines and supplies based on data. Data-based adaptation of implementation plan. Donor and partner support.	(+): After program implementation the goal of less than one case per 1,000 live births was achieved.
Effectiveness and Coverage	Data-based decision-making: yearly plan developed for providing vaccines and supplies based on data. SIAs.	(+): The proportion of women receiving at least two doses of TT (TT2+) was 45% in 2000 and 84% in 2015. (+): All districts in Senegal reached their goal of less than one case of neonatal tetanus per 1000 live births by 2009.[152] (+): The proportion of newborns protected at birth increased from 62% in 2000 to 82% in 2016.[13] (+): The number of cases of neonatal tetanus decreased from 33 to 16 between 2003 and 2009 and during the same period the number of districts with high risk for maternal and neonatal tetanus decreased from 14 to 2. (+): Neonatal deaths per 100,000 attributable to tetanus decreased from 770 to 74 between 2000-2016.[38]
Equity	Focus on equity: identification of high-risk districts for maternal and neonatal tetanus.[151]	(+): In 2016, there was no difference in the rate of newborns protected at birth between rural and urban areas.[13]

SUSTAINMENT

All districts in Senegal reached their goal of less than one case of neonatal tetanus per 1000 live births by 2009.[152] Tetanus toxoid continued to be provided to women attending ANC sessions in Senegal for free.

4.6.1.3 Iron and Folic Acid Supplementation

Table 38: IFA Supplementation Key Implementation Strategies

Implementation Strategies
• Integration into policy • M&E • Focus on equity

IMPLEMENTATION

Senegal had a universal iron and folic acid (IFA) supplementation policy for pregnant women for several decades.[154] A number of pilot projects had also tested delivery of IFA supplements through CHWs and shown this to be successful in increasing compliance; however, this delivery approach as of 2019, after the study period ended, had not been scaled up.[155] Further, randomized control trials in Senegal had shown that giving supplements for free during ANC visits was more effective than giving prescriptions.[156,157] However, IFA supplements were not provided for free as of 2018.

The percentage of women in Senegal who received iron tablets or syrup at ANC was 91% in 2005 and 95% in 2016.[7] SPA 2012 and 2016 data showed that 85% and 84% of health facilities stocked iron or folic acid in 2012 and 2016, respectively. Earlier data were unavailable for the team to review. According to DHS 2016 data, out of 849 observed ANC visits, health care providers gave or prescribed IFA tablets in 87% of cases.[2]

Table 39: IFA Implementation Strategies and Outcomes

Implementation Outcomes	Implementation Strategy	Evidence
Feasibility		(+): SPA 2012 and 2016 data showed that 85% and 84% of health facilities stocked iron or folic acid in 2012 and 2016, respectively.
Effectiveness and Coverage	Integration into policy: The National Health Development Plan (2009–2018) included universal coverage of IFA supplements for all women seeking ANC from public facilities. Senegal's Policies, Standards, and Protocols in Reproductive Health recommended IFA supplementation starting at the	(+): The percentage of women who received iron tablets or syrup at ANC was 91% in 2005 and 95% in 2016.[7] (+): The prevalence of anemia among pregnant women decreased from 71% in 2005 to 61% in 2010-2011.[23] (-): Figure 36 shows overall low IFA supplementation coverage despite high rate of distribution at ANC. The low coverage can be

Implementation Outcomes	Implementation Strategy	Evidence
	first ANC visit in the first trimester.	explained women's preference for syrup over tablets, with some saying IFA made them ill.
Fidelity	M&E.	(+): According to DHS 2016 data, out of 849 observed ANC visits, health care providers gave or prescribed IFA tablets in 87% of cases.[13]
Equity	Focus on equity: The National Health Development Plan (2009–2018) included universal coverage of IFA supplements for all women who seek ANC from public facilities.	(+): In 2005 and 2016, there were no major differences in proportions of rural and urban women who received iron tablets or syrup at ANC: 87% rural and 95% urban in 2005; 93% rural and 97% urban in 2016.[2] (+): In 2005, IFA supplementation was 38% for the lowest quintile and 50% for the highest. In 2016, it was 49% for the lowest and 56% for the highest quintile, respectively (Figure 36).[39]

SUSTAINMENT

The National Health Development Plan (2009–2018) included universal coverage of IFA supplements for all women seeking ANC from public facilities. Senegal's Policies, Standards, and Protocols in Reproductive Health recommended IFA supplementation starting at the first ANC visit in the first trimester.[154] According to KIs, some issues with IFA supplement compliance included women experiencing vomiting after taking the medicine while others preferred to take syrup, but not pills.

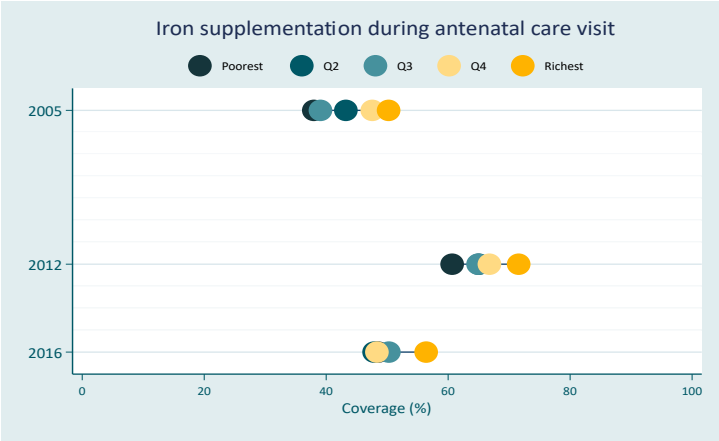


Figure 36: Equity and Coverage Outcome-IFA Supplementation in Senegal (2005-2016) (Source: Victora, et al 2018)

4.6.1.4 Other Components of Antenatal Care

As part of efforts to reduce maternal and neonatal mortality or health complications, Senegal adopted guidelines for six screening tests to be conducted during the first ANC visit, regardless of gestational age. These tests included blood group and Rhesus factor (BG/RH), hemogram/blood count (BC), Emmel Test (TE) to screen for sickle cell anemia, syphilitic serology, HIV serology (initiated by provider), and

protein urine test. An evaluation of adherence to the screening guidelines conducted across 16 health facilities in 10 of the 14 regions in Senegal, with data collection from February 2013 to July 2014, determined that complete adherence was only the case for 49.2% of pregnant women. Identified reasons for non-adherence to the guidelines included lack of guidelines, insufficient number of trained midwives and doctors, non-inclusion of providers in development, revision, and implementation of the guidelines, and poor dissemination of the guidelines to providers. Specific reasons cited for not ordering screening tests included "sparing women [from] unnecessary expenses," and a disconnect between the "practical norms" of midwives and the "official norms" (guidelines).[158] Factors associated with adherence to the guidelines included ANC1 at earlier gestational age, location in Dakar, and higher compensation for midwives. The number of midwives in a facility was not associated with lack of adherence, but quality and capacity of the workforce was identified as an important factor. The authors concluded that financial motivation was an important factor for quality of services delivered.[158]

4.6.2 Improving Child Birth Delivery Services, Access, and Uptake

4.6.2.1 Facility-Based Delivery

Table 40: Facility-Based Delivery Key Implementation Strategies

Implementation Strategies
• Piloting • Rapid scale • Focus on equity • Stakeholder engagement • Community engagement • Financial planning • Data system strengthening • M&E

EXPLORATION

Facility-based delivery in Senegal was low through the 1990s, at 47% in 1992 and 49% in 1999, mainly because of the low levels of facility-based deliveries among rural residents: 30% in 1992 and 32% in 1999.[105,148] However, post-2000, rural rates of facility-based delivery began to improve, rising to 47% in 2005, though still lagging behind urban rates of facility-based delivery (89% in 2005).[13,23,147] Similarly, while modest improvements in facility-based delivery occurred in the lowest wealth quintile in Senegal (24% in 1997 to 30% in 2005), there were still large gaps compared to the highest wealth quintile (94% in 2005).[13,23,105,147,148] Earlier data were unavailable for the team to review.

The Government of Senegal, recognizing that equity gaps in facility-based deliveries among wealth quintiles and rural and urban residents were mainly caused by financial barriers to accessing maternity care services, introduced the Free Delivery and Caesarean Policy (FDCP) in January 2005.[159]

PREPARATION

In preparation for rolling out the policy, the MOH established a coordinating committee to oversee its implementation. The committee had representatives from the departments of planning, primary health care, finance, and reproductive health, as well as from hospitals and district-level health facilities. Other preparation activities included developing data collection tools for use at facility level, sensitization of local stakeholders (women, community leaders), and estimation of average costs for normal deliveries: US$11 for the actual delivery and US$4 for the usual two-day stay.

FDCP was piloted in 2005 in the five poorest regions of the country (Kolda, Ziguinchor, Tambacounda, Matam, and Fatick) to identify the feasibility of the policy among the poorer wealth quintiles.[160] Among these four regions, two (Matam and Tambacounda) were included for their hard-to-reach populations. As a result, a cadre of midwives was introduced as part of the Itinerant Midwives Project to implement the pilot in the hard-to-reach areas. FDCP exempted health care users from fees for normal deliveries at the health post and health center level, and for Caesareans at the regional hospital level. It applied only to public health facilities, excluding private and traditional facilities. Under the FDCP, the cost of deliveries was offset in the form of kits that contained basic supplies that were delivered through the Central Medical Stores. The kits were meant to replace user payments at the point of care.

A 2006 evaluation of the pilot of the policy found that the number of facility deliveries at the health post and health center level rose by 77% between 2004 and 2006 for FDCP regions, while increasing 19% in non-FDCP regions. The increase of deliveries was not associated with deteriorating quality of care, marked by a steady fresh stillborn rate (3.3% in 2004 and 3.1% in 2005).[160] The FDCP also led to a 49% increase in referrals from health posts between 2004-2005.[159]

The 2006 study found a number of implementation challenges. The number of normal delivery kits supplied in the first year of the program was 26,000 less than were required. At the same time, more kits were provided to facilities for Caesarean sections than necessary. Overall, the number of delivery kits was not found to be relative to the population of regions: the region of Tambacounda received three times as many kits per capita than Kolda in 2005. These problems can be linked to a lack of needs assessments for the population of pregnant women seeking ANC. Further, users reported still paying for items that should have been free.[161]

IMPLEMENTATION

In January 2006, the FDCP was extended to the remaining regions in Senegal, except Dakar. The Caesarean section rate remained steady at 4% in 2005, 5% in 2010, and 5% in 2016, and the maternal mortality rate per 100,000 live births fell from 488 in 2000 to 315 in 2015, an annual reduction rate of 2.9%.[162]

ADAPTATION DURING IMPLEMENTATION

The department of primary health at the MOH led the process of implementation initially, but the reproductive health department took over in 2006. In 2012, FDCP was rolled out in Dakar.

Table 41: Facility-Based Delivery Implementation Strategies and Outcomes

Implementation Outcomes	Implementation Strategy	Evidence
Acceptability	Stakeholder engagement. Community engagement: sensitization of women and community leaders.	(+): See effectiveness and coverage data below.
Feasibility	Piloting. Financial planning.	(+): By 2006, FDCP had been scaled-up to all regions in Senegal except Dakar. (+): In 2012, FDCP was rolled out in Dakar.
Effectiveness and Coverage	Rapid scale. Removal of user fees.	(+): Facility-based deliveries increased steadily, from 49% in 1999 to 77% in 2016.[82] (+): By 2006, FDCP had been scaled-up to all regions in Senegal except Dakar and by 2012, FDCP was rolled out in Dakar. (+/-): The fresh stillborn rate remained steady at 3.3% in 2004 and 3.1% in 2005.[161] (+): The maternal mortality rate per 100,000 live births fell from 488 in 2000 to 315 in 2015, an annual rate of reduction of 2.9%.[162] (+/-): The Caesarean section rate remained steady at 4% in 2005, 5% in 2010, and 5% in 2016.
Fidelity	M&E. Data system strengthening.	Not found.
Equity	Piloting: introduction of itinerant midwives to facilitate pilot in hard-to-reach areas. Focus on equity: introducing FDCP first to the five poorest regions.	(-): The increase in facility-based births was greater in rural areas (32% in 1999, 47% in 2005, 65% in 2016) compared to urban areas (83% in 1999, 89% in 2005, 94% in 2016), with decrease in equity gap from 51% to 29%. Equity gaps remained. A smaller decrease in the equity gap was seen based on wealth quintiles: 64% in 2005 (30% versus 90%) to 53% in 2016 (44% versus 97%) (Figure 37).[39]

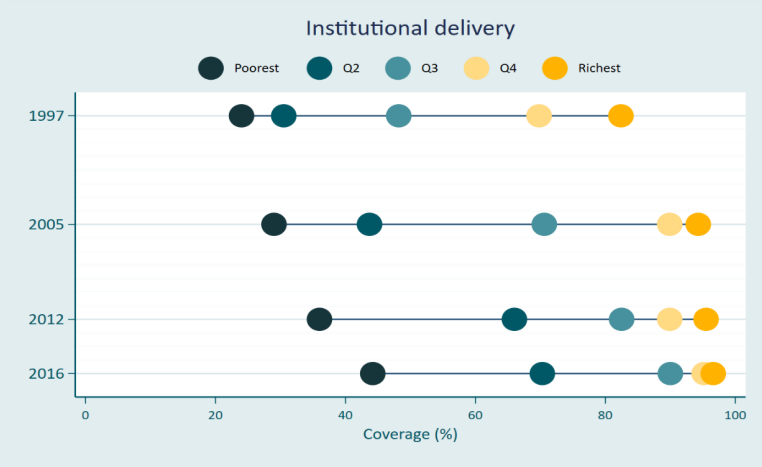


Figure 37: Equity and Coverage Outcome: Facility-Based Delivery in Senegal (1997-2016) (Source: Victora, et al 2018)

4.6.2.2 Neonatal Resuscitation

Table 42: Neonatal Resuscitation Key Implementation Strategies

Implementation Strategies
• Use of data to understand disease • Training • M&E • Adapting global guidelines for local context • Piloting • User fees

According to the UN Commission on Life-Saving Commodities, neonatal resuscitation devices including neonatal mask and bag, a suction device, and a training mannequin, are essential devices for reducing neonatal deaths.[163] Senegal's efforts to address birth asphyxia and birth trauma as a neonatal cause of death involved the introduction of neonatal corners which focused on neonatal resuscitation skills and equipment.

EXPLORATION

Prior to 2006, basic equipment for neonatal resuscitation in Senegal was regularly available only at regional hospitals and occasionally at health centers, but not at health posts.[164] In 2006, in an effort to reduce neonatal mortality due to asphyxia, the MOH decided to equip health centers and health posts with basic equipment for newborn care and train their staff to provide essential neonatal care.

PREPARATION

Efforts to increase availability of resuscitation equipment involved providing health centers and health posts with ventilation masks and bags, an aspirator delivering a maximum pressure of 100 mmHg, and aspirator tubes. The equipment was kept in neonatal corners, known as Yeksinaa Jegesina. Health

facilities were expected to replenish their supply of aspirator tubes by means of user fees that covered the purchase price of the tube with up to a 10% profit margin. The intervention was initially rolled out in three pilot districts: Ziguinchor, Thiès, and Louga. An evaluation conducted in 2009 to assess the condition and use of the equipment in health posts, centers, and regional hospitals, with the help of regional chief medical officers and district medical officers, found that most hospitals, health centers, and health posts were equipped with ventilator bags and masks (87%) and aspirators (85%). Aspirators were appropriately maintained in more than 90% of facilities. Stock-outs of aspirator tubes were not common among all facilities, though they were most frequently reported at the health center level (25% reported stock-outs in the six months preceding survey). The study also found that in approximately half of surveyed facilities, the equipment was not used, mainly due to health staff turnover or the district management teams failing to train new providers in the use of the equipment.[164]

As a result of the findings of the pilot, a scale-up plan was developed for neonatal corners nationwide and for the transfer of responsibilities for supply of equipment such as aspirator tubes to the National Pharmacy. By 2019, after the study period ended, KIs mentioned that neonatal corners had been rolled out nationwide in Senegal.

IMPLEMENTATION

In an effort to train more health care workers in neonatal resuscitation following the findings of the evaluation, Senegal's MOH led and coordinated a national plan (with the support of USAID) to leverage the Helping Babies Breathe (HBB) alliance and began implementing the HBB curriculum by 2013 nationally.[165] However, according to KIs, implementation of the HBB in Senegal experienced challenges due to lack of coaching, absence of standards for neonatology units, and limited M&E.

Table 43: Neonatal Resuscitation Implementation Strategies and Outcomes

Outcomes	Implementation Strategy	Evidence
Appropriateness	Use of data to understand disease.	(+): Deaths due to birth asphyxia and birth trauma accounted for 11,250/100,000 neonatal deaths in 2000 (23% of all neonatal deaths), although this decreased to 10,117/100,000 neonatal deaths (24%) and 7,286/100,000 by 2015 (27%) – a decrease of 35%.
Acceptability	Adaptation of existing training and guidelines to reflect local context. Stakeholder engagement.	Not found
Feasibility	Piloting. User fees.	(+): Neonatal corners rolled out nationwide. (+): Low rates of stock-outs generally.

Outcomes	Implementation Strategy	Evidence
Effectiveness and Coverage	Training.	(+/-): Although still generally low, the percentage of facilities that carried an aspiration tube increased from 40% in 2012-2013 to 51% in 2016. (+): By 2019, KIs mentioned that neonatal corners had been rolled out nationwide in Senegal. (+): According to SPA data, resuscitation was performed at 68% of facilities in 2012-2013 and remained constant by 2016 (64%). (+/-): In 2015, 60% of providers reported ever receiving training for resuscitation; 32% reported receiving continuing education in the 24 months preceding the SPA survey. There were no major differences between providers working at different levels of health facilities. The greatest proportion of providers that received any training (61%) were at health posts and the lowest (53%) were at health centers. (+): A drop in death rates due to asphyxia (see above) suggests effectiveness.
Fidelity	Training. M&E.	(-): A 2009 evaluation of facilities provided resuscitation devices showed the equipment was not used in approximately half of facilities.[164] (-): Although the HBB program had been rolled out, it continued to experience challenges due to lack of coaching for health workers, absence of standards for neonatology units, and limited M&E, according to KIs.

4.6.3 Care for Premature/Low Birth Weight Neonates

EXPLORATION

A retrospective assessment of neonatal deaths at Dakar University Teaching Hospital between 1994 and 2003 found that 66% of neonatal deaths were due to a birth weight of or less than 2,500 grams and that the most frequent cause of neonatal mortality was premature birth (49%).[94] One study carried out in 1998-1999 on maternal risk factors and low birth weight (LBW) in Senegalese teenagers identified that the risk factors related to LBW infants in Senegal included low weight gain during pregnancy, fewer ANC visits, and kidney-related syndromes during pregnancy.[166] Transfer issues including delays in transportation of LBW infants to higher levels of care was also identified in a 1998-1999 study as an area of concern for neonatal mortality.[167]

Recommendations of these studies included monitoring and improvement of nutritional behavior during pregnancy, organizing a perinatal network in Dakar, better organization of neonatal transport, and improved attendance at ANC visits.

4.6.3.1 Kangaroo Mother Care

Kangaroo mother care (KMC) was included in a package of community-based newborn care introduced around 2013 with technical and financial support from WHO and UNICEF. As of November 2013, 116 health workers had received KMC-related training in 22 health centers and seven hospitals, with the long-term plan introduce KMC to around 1,000 health centers nationwide.[168] A retrospective study conducted from July 2011 to July 2013 at Albert-Royer National Children Hospital Center in Dakar found that KMC for LBW infants was highly effective in Senegal's context, with the recommendation of national scale-up.[169] Findings from this study were integrated into the action plan for the newborn in Senegal, though in 2019, after the study period ended, KIs mentioned that it had not been implemented.

4.6.3.2 Clean Cord Care (including Chlorhexidine)

As of 2019, after the study period ended, the policy on cord care in Senegal was to apply nothing. Also, according to KIs, although Senegal had earlier expressed interest in introducing chlorhexidine for cord care, this decision was changed and chlorhexidine was not on the Essential Medicines List.[170]

4.6.3.3 Management of Neonatal Sepsis

According to KIs, the most commonly encountered germs in neonatal sepsis in Senegal was Escherichia coli and the most commonly used antibiotics were third-generation cephalosporins and aminoglycosides in combination. Key informants also noted that a study on hygiene in maternity using the wash-and-clean tool was being conducted as of 2019, after the study period ended, to strengthen the prevention of sepsis in neonates.

4.7 Common Implementation Strategies

Senegal implemented many EBIs using a range of implementation strategies. Some of the EBIs shared the same strategies; while other strategies were more specific to individual interventions. While a number of these were important to facilitating feasibility and ultimate coverage, others were underused and contributed to lower coverage and potentially poor quality.

1. Pilot testing prior to national scale-up
    - Prior to scaling a new EBI, testing took place on a pilot level, with expansion and adaptation of processes after pilot. This contributed to acceptability and feasibility and at times fidelity when initial approaches were found to fall short.
        - Examples: FB-IMCI, CB-IMCI, ITNs, FDCP.

2. Leveraging a strong community-based care delivery system
    - Senegal's CHWs, with multiple cadres, were used to implement a number of key EBIs through community engagement, sensitization, and direct care delivery. This contributed to acceptability and ease in broader scale-up.
        - Examples: Agents de santé communautaires, relais communautaires, and matrons for CB-IMCI, bajenou gokh for community-based maternal and child health care.

3. Leveraging existing programs and systems
    - New activities often built on existing systems saving time and resources.
        - Examples: ITNs leveraged broader malaria systems, PCV leveraged existing pediatric bacterial meningitis surveillance system, measles leveraged polio surveillance system.

4. Engagement and coordination of implementing partners and donors
    - Bringing donors and implementing partners together with MOH officials, staff, and researchers to review published evidence and explore feasibility before implementing new EBIs. This worked very well when the MOH or national eldership was engaged. It was less successful in ensuring donor coordination between smaller-scale and time-limited projects and national goals of coverage and sustainability.
        - Example: IMCI working group, including representatives from the MOH, academics, and service providers.
    - Leveraging partners and donor capacity. This helped to accelerate the implementation of a number of EBIs.
        - Examples: FB-IMCI, HIV.

5. Adaptation of interventions to local setting
    - Most EBIs underwent adaptation of implementation components including training and protocols. This contributed to appropriateness, acceptability, feasibility, and at times effectiveness and coverage.

6. Community engagement and sensitization
    - This was done through a number of approaches but typically included engaging mothers and community leaders. This was critical particularly for new strategies for implementing EBIs or new EBs (new vaccine, supplements, HIV) and contributed to acceptability and coverage.
        - Example: engaging religious leaders and village chiefs.

7. Integrating equity focus into policy and implementation
    - Key items were distributed for free to ensure access for all; special plans were rolled out for hard-to-reach areas, reflecting known geographic inequity.
        - Examples: free distribution of ORS, CB-IMCI program grew out of the need to ensure better access for the more rural and hard-to-reach populations, introduction of another cadre of CHWs – DSDOMs, home-based care providers – to reach

underserved areas, integrating 'sex' to data collection tools, communication plan focus on hard-to reach areas for rotavirus vaccine and PCV.

8. Removal of user fees or free access for many EBIs
    - Examples: Facility-based delivery, IMCI, vaccinations, ITNs.

9. Data systems strengthening
    - Example: integration of new vaccines (e.g. PCV, rotavirus) and FB-IMCI into eHIS.

10. Data use for decision-making
    - This included use of HMIS data, the wealth of facility and population surveys, and results from piloting or ongoing program evaluations. Examples:
        - Data use to understand disease, to ensure appropriateness of EBI, such as the decision to introduce Rotarix and PCV13.
        - Data use for prioritization and feasibility such as the introduction of PCV before rotavirus and focus of HIV program on Dakar.
        - Data use for M&E and supervision for all EBIs, including FB-IMCI, ITN, IPT, etc.
        - Data use for adaptation for cost and effectiveness including FB-IMCI and CB-IMCI (ACT and RDTs).
        - Surveillance to identify where adaptation of implementation strategies was needed or new approaches, such as FB-IMCI, PCV, measles.

11. Supply chain strengthening
    - This worked well when it was systemic, e.g. supply chain strengthening for PCV, rotavirus vaccine occurring simultaneously, and less well when it involved strengthening a single component of an integrated program, e.g. CB-IMCI.

12. National leadership and accountability
    - This was key to implementing very high priority EBIs.
        - Examples: HIV, nutrition.

5 Cross-Cutting Contextual Factors Facilitating Under-5 Mortality Reduction

We identified a number of contextual factors critical to implementing the EBIs associated with the drop in U5M in Senegal. These factors were important in creating the environment and providing the support that contributed to the country's direct or indirect success or represented barriers to success in achieving equitable and quality coverage (see Section 6. Cross-Cutting and Remaining Challenges).

At the national level, these facilitating contextual factors ranged from strong leadership and accountability which were reflected in goal- and priority-setting, ownership of U5M EBIs, data availability and use, and the roles of the donors and availability of financial and non-financial resources to address U5M. Many of these factors, while mostly driven by the central level, were reflected subnationally as well.

Global contextual factors formed the basis for much of Senegal's goals and priorities around U5M reduction and led to availability of donor funding which the country leveraged for its U5M reduction efforts. In addition, KIs identified contextual factors related to implementing partners which were largely driven by global and country priorities.

5.1 Effective Leadership and Control: Setting Clear Goals and Policies

As most KIs noted, effective leadership and control was a key facilitating factor of U5M reduction in Senegal between 2000-2016. While leadership was most active and effective nationally, many KIs reported that the responsibility, accountability, and leadership cascaded to the ministry, subnational, local, and individual levels. The strong leadership and commitment resulted in local authority ownership of the intervention outcomes and willingness to continue adapting to challenges. One KI, speaking about the factors which facilitated Senegal's success in reducing U5M, explained: *"…that's why the first thing I would like you to consider is leadership. When you have a political leader, president, prime minister, who believes that health today is a fact of development, you definitely get more support.*" This commitment to effective leadership was often reflected in key policies and strategies such as the action planning meetings at all levels from district up to central levels, the Government's investment in U5M initiatives, and oversight provided by non-MOH ministries (for example, quarterly technical and financial supervision that the Ministry of the Interior provided to NGOs and CSOs).

Senegal's strong leadership influenced setting clear goals and priorities, which most KIs identified as key facilitators related to U5M reduction. The goals and priorities were reflected in specific policies and plans developed and/or implemented in Senegal within the same time period. Each year, the MOH issued a national health system performance report produced based on data from DHS and the Routine Health Information System Management through the Direction of Planning, Research and Statistics.[171] The goals were also data-driven and adapted to meet emerging needs. For example, one KI, speaking about the development of the National Plan for Health and Social Development explained: "*The old strategic plan had everything we needed, documentation and technical support. Now, there are new priorities because*

we said that we have reduced mortality with the target diseases of vaccination, malaria, and diarrhea. There are new priorities emerging, when we look at the numbers, we have a new epidemiological profile, we are in the process of readjusting and readapting." Some of these policies and plans included:

1. Integrated Health Development Program (PDIS, 1997–2002)

The PDIS was the first phase of the National Plan for Health and Social Development (PNDS, 1998–2007) and was adopted in 1997. The goals of PDIS included managerial and financial improvement in public health system; reduction of mortality rate of infants, juveniles, and mothers; reduction of birth and population growth rates with the help of better management and supply of reproductive health services; and encouraging family planning, functional literacy, and school enrollment for girls.[172]

2. Package of Integrated Nutrition Activities (Paquet d'Activités Intégrées de Nutrition, PAIN, 1998)

With support of USAID, UNICEF, and World Bank; the Office of Nutrition in the MOH developed and adopted the PAIN as a national strategy in 1998, to have a specific focus on preventive nutrition strategies such as exclusive breast feeding. The PAIN functioned as a guide and checklist to support implementation of nutrition activities at various health contact points. Initial implementation of the program began at health facilities and community levels in Koungheul and Sokone, and after three months of "intense" implementation, an assessment was performed to measure the progress of the plan and identify ways of scaling-up to other areas. A key legacy of the PAIN program was the development of a training manual for trainers of CHWs (for example, head nurses at district health posts) on nutrition program delivery and management.[173]

3. National Plan for Health and Social Development (PNDS, 1998-2008)

This plan was implemented in two phases, 1998-2002 and 2004-2008, and aimed to improve different aspects of Senegal's health sector through institutional reforms, better service performance, and care and prevention. The strategic objectives of the PNDS included improvement in the legal and statutory framework within the health sector, increase in accessibility to services, better quality of care, development in human resources, and supporting reproductive health programs, amongst others.[174]

4. Free Delivery and Caesarean Policy (FDCP, 2005)

As discussed in the facility-based delivery section, Senegal rolled out the FDCP in 2005 with the aim to address the financial barriers to accessing maternity care services and increase the number of facility-based deliveries.[175] Under the FDCP, all normal deliveries at health posts and centers and Caesareans at district and regional hospitals were free. The government subsidized normal delivery and surgical kits to health facilities to reduce out-of-pocket expenditure. In addition to surgical kits, the health facilities received US$50 for simple caesareans and US$70 for complicated caesareans.[175]

5. Second National Plan for Health and Social Development (PNDS-II, 2009–2018)

Senegal rolled out PNDS-II in 2009 and expanded it on the successes of the first PNDS.

Other policies, plans and programs which facilitated U5M reduction efforts in Senegal between 2000-2016 included:

1. Poverty Reduction Strategy Paper I (PRSP-I) (2003-2005) and PRSP-II (2006-2010): These strategies focused on mobilizing resources and guiding Senegal's redirection towards development.[176]
2. National Policy for Economic and Social Development (NSESD) (2013–2017)[177]: This policy aimed at building on the successes and lessons learned from PRSP-I and PRSP-II to ensure sustainable development and economic growth, and ultimately move Senegal forward towards becoming an emerging economy. A such this targeted providing food security, improving health care and nutritional status, and providing access to drinking water and sanitation.[176] With better socioeconomic conditions, a bigger portion of the population used the services of the private sector.
3. Universal Health Coverage Strategic Plan (2013-2017): This plan aimed to strengthen health policies for vulnerable groups in the country and provide health coverage for people employed in informal and rural sectors.[178] It incorporated elements of coverage expansion and risk pooling. The four strategic pillars of the plan included:
    - Reforming the social health insurance organizations (institutions de prévoyance maladie) covering employees of the formal sector and their families;
    - Expanding health coverage for informal and rural sector employees through CBHI organizations, and state and local governments' financial support;
    - Strengthening existing policies that exclude pregnant women from paying for care;
    - Implementing a new policy that provides free care for children under the age of 5 years.179

At the UN event in September 2017, Macky Sall, the President of Senegal announced that the Universal Health Coverage plan led to an increase in coverage of health services in Senegal.[180]

Most KIs also noted the critical influence of global goals and priorities (and donors) on Senegal's priority-setting processes in the work to reduce U5M. These factors included historical global commitments and programs such as the launch of the EPI in 1974 and the declaration of Alma-Ata in 1978, adopted by all WHO member states and according to KIs, underpinned much of the community health and immunization initiatives in Senegal which contributed to U5M reduction. In addition, most KIs mentioned that more recent efforts such as the collaboration between GAVI, World Bank, and International Monetary Fund's Highly Indebted Poor Countries Initiative to predicate countries' access to GAVI funding on achievement of immunization coverage goals, also facilitated U5M reduction in Senegal.

Other global initiatives such as the establishment of the Global Fund in 2002 to leverage and attract funds to address HIV/AIDS, malaria, and tuberculosis, and PEPFAR, also had implications for improving U5M figures in Senegal, according to KIs. The UN's 8 MDGs and 17 SDGs to reduce disease, hunger, poverty, and illiteracy, amongst other goals, facilitated Senegal's commitment to reducing U5M between 2000 and 2016.[181] For example, Senegal adopted health policies to ensure managerial and financial improvement in its public health system; reduce the mortality rate of infants, juveniles, and mothers; reduce the birth and population growth rate; and ensure overall management and supply of reproductive health services, in response to the MDG to reduce child mortality by two-thirds between 1990 and 2015.[172,181,182]

5.2 Donor and Implementing Partner Resources

Donor and partner funding was a major facilitator of Senegal's successes in U5M reduction. Various multilateral organizations such as World Bank, GAVI, Global Fund, the PMI, and USAID, invested in Senegal's U5M initiatives between 2000-2016. In speaking of the role of donors' and partners' support in the scale-up of FB-IMCI in Senegal, a KI explained that: "*It's thanks to the conjunction of all [these donors and partners] that IMCI experienced a very large scale."* When coordination was not strong or the support was limited in time, some KIs also mentioned that it created disruptions in the implementation of programs, for example with the initial implementation of FB-IMCI.

Beyond funding, these donors and partners were key collaborators, technical advisors, and implementers of U5M reduction activities in Senegal. KIs also noted that the increased focus of implementing partners on U5M-related issues in the period between 2000-2016 was due to donors' focus and funding of U5M initiatives. As one KI from an implementing partner explained: *"This is globally and I think also, all partners have been focusing on that aspect [U5M] in Senegal, particularly because of donors. All our programs are around improving maternal and child health…Donor support in Senegal really is making it a priority in Senegal. And I think the other partners also…we are following what was communicated at the global level."* Further, KIs emphasized the importance of the political will and engagement of Senegal's government in U5M reduction as a key influencer of the implementing partner goal-setting process. For example, a KI said: *"I think it's on both sides, the country is engaged at the national level through the political will, setting goals. The country has also aligned itself, engaged internationally…The country was very interested and demanding [so] partners joined."* Another KI said: "*We align with the Plan for Emerging Senegal and the PNDS, everything we do, we align with those, making sure that our objectives, everything we do aligns."* This collaboration in goal-setting was reflected in implementing partners' increased focus on neonatal mortality after 2016 following the MOH's recommendation to address the relatively slower decline of neonatal mortality in Senegal (Table 2).

5.3 Donor Coordination and Multi-Sectoral Approach

Most KIs mentioned coordination and collaboration amongst the MOH, implementing partners, donors, and other ministries, as a major facilitator of U5M reduction in Senegal, though there were some failures with a number of projects not scaled-up or sustained. For example, donor-funded stand-alone ORS programs in Senegal post-2000 did not reach scale due to limited coordination which restricted government's funding and caused stock-outs of ORS (see ORT in Section 4).

The main coordination forum for the different stakeholders working within U5M reduction was the Reproductive, Maternal, Newborn, and Child Health (RMNCH) cluster. The MOH headed the forum, which met monthly, and the members included partners involved in RMNCH work such as UNICEF, WHO, World Bank, UNFPA, and Japan International Cooperation Agency. The cluster developed an annual workplan to identify areas to focus advocacy efforts and address emerging priorities. The cluster was made up of child survival and IMCI technical committees. They also collaborated to set the policy agenda within the RMNCH space. The RMNCH cluster ensured that issues relating to U5M were presented at the larger health partners' meetings held every two months and annual reports were generated at the end of each

year. The RMNCH cluster also held an annual steering committee meeting where non-health stakeholders (Ministry of Education, Ministry of Labor, Ministry of Youth, Ministry of Womens Affairs, and the Army) were invited. These ensured a comprehensive approach to addressing RMNCH issues including U5M reduction.

The health partners' meeting was a more general platform for all stakeholders within the health sector to plan and design interventions, address resource mobilization issues, and essentially align with broader plans for the country. While the Ministry of Economy, Finance and Planning was a key part of the health partners' meeting, there was reduction of duplicity of efforts in implementing interventions as one KI described it: *"…because there are many stakeholders, we need to pool resources according to needs and priorities. If two stakeholders are in the same area, we are better pooling them instead of coming in the same area do the same work without knowing each other's programs."*

5.4 Community Engagement and Activism

Multiple advocacy initiatives contributed to ensuring accountability in U5M reduction in Senegal. They include:

1. Dokh Ak Sa Gokh: A social movement in Senegal aimed at helping citizens critically analyze budgets for effective participation in decision-making processes. Dokh Ak Sa Gokh enabled citizens to understand the implications of funding limitations and consequently, helped to reduce conflicting relationships between citizens and local governments. In fact, this movement was launched by "Y en A Marre" Movement, meaning "It's Enough." The "Y en A Marre" Movement began as a rap movement before engaging in politics to promote good governance. They played a key role in the political changeover by preventing the Parliament from passing laws judged as unconstitutional. It generated the Movement of June 23rd. By raising citizens awareness, the movement engaged in paying special attention to how local affairs were managed in various areas, including education and health.

2. The Pan-African Institute for Citizenship, Consumers and Development: A Senegalese CSO which produced evidence on insufficiencies and gaps in the Universal Health Coverage program and service delivery at community level in Senegal. They trained a network of citizens nationally, to effectively communicate with other community members on Universal Health Coverage, to collect opinions and assess health facilities. They then drafted assessment reports and disseminated them every two months through the media and to decision-makers countrywide. As a result of the initiative, the government increased the budget allocation for Universal Health Coverage from US$9.5 million in 2013 to US$11.3 million in 2014, and to US$47.3 million in 2015. This group also led efforts to convince the government to regularly disseminate policy-related information to citizens.[183]

5.5 Country and Local Ownership

Key informants noted the importance of ownership of interventions across Senegal, as a key facilitator of U5M reduction activities. For example, when asked about the main steps to achieving Senegal's exemplar U5M results, one KI said: *"The first step is to involve people [ensure ownership]... It's the silver bullet*

triggering all the initiatives carried out in Senegal." This sense of ownership was reflected at national and community levels, mainly fostered by the government's efforts and through explicit strategies of implementing partners to engage them in developing and implementing EBIs. According to KIs, other contributors to this sense of ownership at community level included the government's move to decentralize the health system (see Decentralization in Section 2) and the status associated with delivering care within the community level.

5.6 Strengthening Community Health Systems and Structure

USAID supported ChildFund to implement one of the key facilitators of U5M reduction in Senegal between 2000-2016 through the "Programme Santé/Santé Communautaire (PSSC) I and II." The program supported the MOH's strategy to integrate interventions for improving community health services by extending access to services, encouraging community participation in health care delivery, improving effectiveness of services, and making governance and management more effective at community level. (See Improving Access to ANC in Section 4.)

5.7 Data Availability, Quality, and Use

Senegal has a long history of valuing data and has been conducting standard DHS since 1986.[52] The National Agency of Statistics and Demography (ANSD) in Senegal collects and presents data on different sectors, including the health sector. The data are usually collected in partnership with the MOH and the Ministry of Economy, Finance and Planning. The collected data are used to monitor and evaluate the implementation of multiple national programs including EBIs aimed at U5M reduction, against predefined performance and coverage indicators.[184] Other useful data sources for monitoring and evaluating U5M reduction programs in Senegal include the Multiple Indicator Cluster Survey and National Nutrition Survey, and the facility survey (SPA) amongst others.

Senegal's strong surveillance system across program areas, including IMCI and vaccines, was also an important factor in its successes at reducing U5M. For example, the National Malaria Control Program's surveillance system's identification of Chloroquine resistance in 2003 led to the switch to SP and AQ for malaria treatment. In 2012, surveillance was key in facilitating the switch from Cotrimoxazole to Amoxicillin for treating pneumonia and deciding to introduce PCV13 as opposed to PCV10 or PCV7, in 2008.

KIs also mentioned the importance of data in designing, planning, and piloting U5M EBIs that were fit-for purpose in Senegal, before scale-up. One KI explained that pilot data were used to "*see the costs of implementation; see where to scale-up; evaluate all the needs that must be available first, quantify everything; [and] know which particular actors must be trained and supervised."*

Between 2000 and 2016, there was a push for improved data use and quality by implementing partners to understand program challenges, successes, progress, efficiency, and effectiveness. One KI from an implementing partner explained that *"…there have always been efforts to analyze data and to show where we have challenges and how we can improve it. But I think maybe [in] 2000, there was a need to*

reach our target and improve how we made sure we were progressing. There was this idea of having monthly quarterly meetings to analyze data and make it constant [and understand] what [and] why we didn't meet our targets."

Key informants also mentioned that the culture of data use at the subnational level in Senegal was a key driver of U5M reduction. For example, all cadres of CHWs affiliated with a health hut collected routine data on their activities and submitted them to their supervising nurse at health posts every month for compilation. District-level quarterly data review meetings took place to review data from all health posts and CHWs within the district to understand operational-level challenges and how to improve them. Similar to the district level, regional meetings were held quarterly to review all regional-level data. District chief medical officers represented their districts at these meetings. Partners, and occasionally the MOH, participated in the regional data review meetings. At both district-level and regional-level meetings, DHS data were reviewed whenever they were published and formed the basis for action-planning.

5.8 Supply Chain

As part of efforts for the introduction of new vaccines, beginning with Hib in 2004, Senegal carried out supply chain strengthening, through its New Vaccines Technical Working Group, which included assessment of storage and logistics capacity, and addressing identified gaps. These efforts were critical to the successes of PCV and rotavirus vaccines in 2013 and 2014, respectively (see rotavirus vaccination, PCV, and Hib in Section 4). While this was successful for vaccines, there were challenges of having equipment and supplies (for example neonatal resuscitation equipment).

Figure 39: People With at Least Basic Drinking Water Services

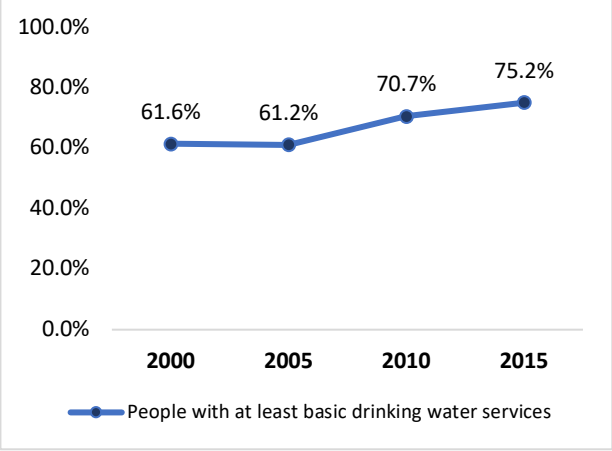
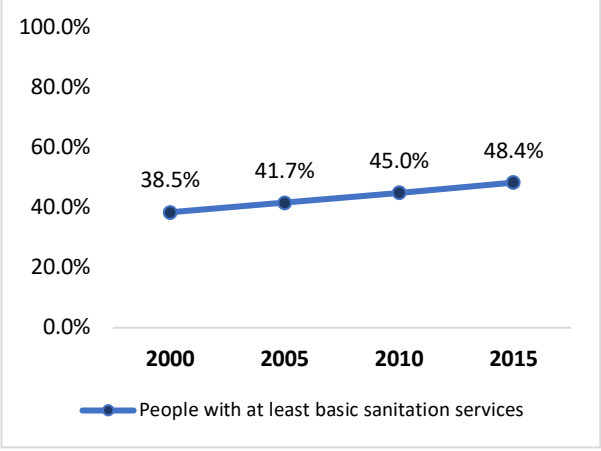


Figure 38: People With at Least Basic Sanitation Services



In 2012, Senegal was one of eight "pathfinder" countries that expressed interest in developing a plan to accelerate coverage of the 13 UN Commission commodities. The list included ORS, pediatric Amoxicillin, Zinc, corticosteroids, and antibiotics for preterm labor, amongst other commodities. This expression of interest reflected below average availability of these commodities, where SPA data (2012-2013) reported that only 37% of health facilities had intrauterine devices in stock and 25% had emergency contraception

equipment and supplies. In 2013, the RMNCH Trust Fund supported Senegal with a one-year catalytic investment to aid in the gap analysis based on available national plans in order to optimize the alignment of existing and new funds to increase coverage.[185] After Senegal completed the analysis, the Trust Fund supported implementation interventions including revision of essential medicines list, scale-up of the electronic Logistics Management Information System to 62 districts, improvement of supply chain management trainings, development of key tracking indicators for commodities, improvement of post-market surveillance to ensure the quality of medications throughout the supply chain, integration of medications into user-fee exemption strategies to combat financial barriers, and evaluation of the potential for local production of medications to encourage private-sector involvement.

An evaluation in 2015 found several positive developments, including an updated essential-medicines list; a network of health workers and district and regional teams trained on supply chain management; and procurements of necessary vehicles to improve distribution of essential commodities.[186]

Nonetheless, Senegal continued to experience stock-outs of life-saving drugs despite multiple initiatives to address this challenge (see CB-IMCI in Section 4).

5.9 Water, Sanitation, and Hygiene

The MOH's efforts to improve U5M-related indicators between 2000-2016 were complemented by corresponding improvements in sanitation and water facilities. In 2012, the total water, sanitation, and hygiene (WASH) expenditure was about US$91 million. This investment was an important facilitator because studies had shown that a 1% increase in access to improved sanitation reduced infant mortality by a rate of two infant deaths per 1,000 live births.[187] In Senegal, people with basic drinking water services increased from 61.6% in 2000 to 75.2% in 2015 (Figure 38) and access to sanitation services increased from 38.5% in 2000 to 48.4% in 2015 (Figure 39).[188,189]

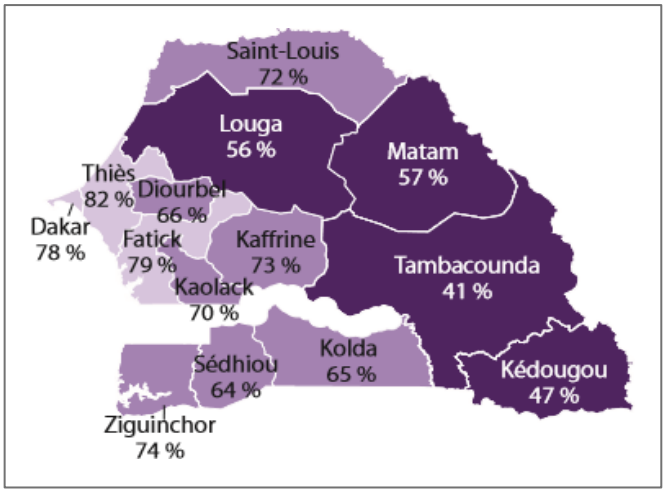
Despite efforts within the WASH sector, challenges remained. As a result, the Government of Senegal made 24 commitments at the 2014 Sanitation and Water for All High-Level Meeting, to address them. The commitments ranged from increasing financing to focusing on equity (the human right to water and sanitation), legislation to make water and sanitation affordable for all, and gender mainstreaming within the WASH sector by 2015.[190]

5.10 Conflict and Hard-To-Reach Areas (Barrier)

According to KIs, before 2000 and between 2000-2016, the Casamance conflict (in the south and southwest) described in the Introduction limited the coverage and reach of U5M reduction EBIs. After the ceasefire in 2014, coverage and reach of U5M reduction EBIs remained unchanged (from DHS 2005) as reflected in Figure 40 from DHS 2016 showing the percentage of children 12-23 months who received all eight basic immunizations at 74% in Ziguinchor, 64% in Sedhiou, and 65% in Kolda. KIs explained that although the conflict was mainly latent, areas experiencing unrest were left out of the health system information collection

Multiple KIs also mentioned the hard-to-reach nature of the southeast as a major factor limiting the coverage and reach of U5M reduction EBIs within the area, with consequently higher U5M rates (Figure 6). According to the KIs, the difficult terrain of the southeast led to a reluctance of partners and health workers to work in the area. The persistent challenges in the southeast are also reflected in Figure 40, which shows the Kedougou (47%) and Tambacounda (41%) still performing the worst amongst all the regions in Senegal on percentage of children 12-23 months who received all eight basic immunizations.[147]

Figure 40: Percentage of Children 12-23 Months Who Received BCG, Measles, Yellow Fever, 3 Doses of Pentavalent and 3 Doses of Polio (Source: DHS 2016)



6 Cross-Cutting and Remaining Challenges

A number of gaps which still impede U5M reduction efforts in Senegal include:

1. Although Senegal adopted important policies, they were not always reflected at the service delivery level. For example, FDCP evaluations revealed that users still paid for items which they had to receive for free (see Facility-Based Delivery in Section 4).

2. As noted, ongoing issues of inaccessibility to health care for populations in hard-to-reach areas (such as the southeast) because of unavailability of human resources was a challenge. In these areas, data quality has also been poor, making it difficult to monitor and provide services. For example, the Kedougou district in the southeast (a gold-producing area with ongoing conflict) has experienced constant fluctuations in population, which affects routine M&E of U5M programs and larger scale data collection efforts such as the DHS survey.

3. The KIs also mentioned lack of consistent availability of key equipment at health facilities, with implications for neonatal mortality figures, and identified it as an ongoing challenge. As one KI explained, *"neonatal mortality has always remained high, probably linked to lack of infrastructure, and insufficient equipment."* Since 2016, Senegal increased its focus on neonatal mortality reduction with an accompanying improvement in ensuring equipment availability at facilities including equipment for neonatal corners.

4. Key informants mentioned that Senegal's ongoing dependence on donor funding for much of its U5M reduction programs, with its implications for the sustainability of key programmatic activities like supervision, remains a challenge. A KI explained that *"the first constraint for sustainability of the intervention is once the partner stops their financial support, it is difficult to supervise because the resources used for the supervision are generally given by the partners."* This also continued to result in pilot or smaller scale projects which do not always reach national coverage, even when effective.

5. Although one of the key facilitators of U5M reduction in Senegal in the period between 2000 and 2016 was availability of financial support from the government, donors, and partners, some funding gaps in Senegal impeded U5M reduction efforts, mainly due to competing priorities on the part of donors and implementing partners. One KI explained that *"it happened that we had a need but we did not automatically have funding for the activity. The activity can be postponed for several months or even several years… It is true that most needs are funded but there are some that are not. It is not because they are not important but sometimes funding is not available and it also depends on the mission of the partners and their priorities."*

6. At the population level, the government has continued to work to reduce the large out-of-pocket spending by expanding the Mutuelle de Santé (community health insurance) scheme, in addition to providing a number of free services for women, children under 5, and people over 60. However, a substantial proportion of the population, mainly in rural communities, have continued to lack access to care because they cannot afford the costs. In 2010-2011, most women (94%) and men (92%) interviewed had no medical coverage.[23] With the introduction of the Universal Health Coverage program in 2014, the government started to address the challenge of health care costs.

7. Senegal has continued to experience challenges with equity of coverage of important EBIs. For example, the regional disparity in HIV testing among pregnant women, as well as wealth quintile disparities in stunting and underweight.

7 Transferable Knowledge for Other Countries

There were a number of replicable strategies from Senegal that would be relevant for other countries looking to accelerate decline in U5M, learning from Senegal's successes and challenges. These included building a strong community health program, which was used to integrate multiple initiatives and expand access and community engagement; building on existing health system capacity through integrating new initiatives; generating local evidence to inform implementation of new EBIs; planning and adapting for equity; and consulting and engaging with stakeholders. Other strategies included multi-sectoral collaboration to address health and health-related determinants, investment in health, planning for sustainability, and private sector engagement.

Areas of strength and recognized challenges:

1. Develop and/or ensure CHW program with standardized education, management, and accountability systems that involve community members and health professionals

Community health workers were repeatedly noted as key implementers of U5M EBIs in Senegal with multiple EBIs incorporated into their scope of work. The success of the CHWs was related to the strong governance structure that involved the nurses at health posts for education and supervision as well as participation of community members, who chose the CHWs among respected members of their community and funded the building of health huts. Senegal's adaptability to current needs and demands, including introducing and adjusting CHW remunerations for motivation and sustainability (such as for PRN and the malaria component of CB-IMCI) and introducing additional cadres (bajenou gokh and DSDOM), were also key to its success.

2. Integrating new initiatives by building on existing health system capacity while strengthening the underlying health system

Integration of new initiatives into existing structures and previous initiatives was important to reduce risk for vertical projects and duplication of work, while providing resources to increase overall capacity. This was at the local and subnational care delivery level and the central level for protocols, policies, and management. Notable examples of this included:

- CB-IMCI was integrated into the existing community health system involving three existing cadres of CHWs – agents de santé communautaires, matrones, and relais communautaires.
- Integration of additional diseases into existing surveillance systems. For example, the measles surveillance system leveraged existing polio surveillance systems and employed the existing network of agents de santé communautaires and relais communautaires.

3. Strengthening and building existing health information systems to assess need and monitor effectiveness and coverage of new EBIs

- Prior to the national move to ACT, Senegal spent two years doing a pilot in one district (Oussouye), led by the Cheikh Anta Diop University, which was selected because it was a Health and Demographic Surveillance Site and could support the collection of surveillance data

throughout the pilot testing. A one-year pilot test of RDTs in Senegal was carried out in the same district as well, to leverage the existing surveillance system.

- After the introduction of rotavirus vaccine, Senegal's rotavirus-caused diarrhea sentinel surveillance system monitored its impact.

4. Using evidence-based decision-making to determine the need and appropriateness of EBIs, and create policies and implementation strategies based on global and local scientific evidence; balancing the need for local evidence with the strength of existing global evidence; and prioritizing rapid adoption and scale-up of EBIs where appropriate

Senegal had a practice of exploring globally emerging EBIs (e.g. IMCI strategy) and then requiring local research to determine appropriateness before deciding to implement. The country also strongly favored pilot testing to determine feasibility, effectiveness, or acceptability of potential EBIs before scale-up. However, Senegal recognized the importance of rapid introduction and scale-up of EBIs that did not require much context-specific adaptation. There was a history of acceptability of similar EBIs, such as rotavirus vaccine and PCV, which were rapidly introduced and scaled because of high acceptability of vaccines. Further, in cases where local data already existed, Senegal did not conduct additional research, instead using these data. For example, adaptation of the disease-management component of WHO IMCI protocols was based on existing Senegal-specific data. Specific lessons included:

- Senegal adopted new EBIs based on local research to determine appropriateness and feasibility and to inform program design. For example:
    - A randomized, placebo-controlled, double-blind trial in Niakhar, Fatick region, in 2005 led by the parasitology laboratory at Cheikh Anta Diop University found that giving chemo-prophylactic malaria treatment (one dose of SP and one dose of artesunate) to children under 5 reduced the incidence of malaria by 86%; this research was used to inform the design of the children's IPT program.
    - The IMCI nutrition sub-working group employed the "Trials of Improved Practices" approach across four districts in different regions of Senegal to identify their feeding practices and beliefs and assess their purchasing power as the basis for designing the nutrition component of FB-IMCI for a trial period.
    - Senegal's introduction of rotavirus vaccine was delayed because the country prioritized the introduction of PCV13 based on disease burden data and country vaccine capacity. In addition, PCV13 was introduced at scale without any pilot testing on acceptability and strength of global evidence.
- Senegal pilot tested selected EBIs before scale-up in districts chosen to determine feasibility, effectiveness, and acceptability. For example:
    - For FB-IMCI, districts were chosen because of their relatively high U5M rates, the availability of partners already working within the districts to support the process, and for being harder-to-reach areas.
- Senegal adapted EBI eligibility criteria and EBI guidelines based on emerging local data. For example:
    - Use of local data to adjust criteria for areas eligible for the children's IPT program.

- Use of surveillance data from the National Malaria Control Program to adapt malaria treatment from chloroquine to a combination of SP and AQ.
- Senegal identified the high cost of treating malaria without confirmatory tests and introduced RDTs for confirming malaria cases before treating, one year earlier than the 2008 WHO recommendations.
- Senegal moved away from deltamethrin (for indoor spraying) based on local resistance data.

5. Planning for equity from the beginning and adapting systems for equity

Senegal constantly implemented systems to address equity, with variable success. Specific examples of successes and failures included:

- Ensuring financial accessibility through systems designed to safeguard equity
  - Senegal employed strategies such as free distribution and subsidization of commodities to priority populations to ensure equity of coverage such as IPT and ITNs for children and pregnant women and HIV treatment.
  - Success was limited in certain areas. For example, since the 1970s, Senegal has employed risk pooling schemes including mandatory employer-based insurance, public subsidies for specific services and population groups, and voluntary CBHI to ensure financial access to health care for its citizens. However, as of 2010-2011, most women (94%) and men (92%) had no medical coverage.[17]
- Integrating an equity agenda into program implementation decisions

Senegal focused on tetanus vaccination in high-risk areas and distributing the FDCP for the poorest regions.

- Adapting existing systems to ensure equity
  - Ensuring geographical accessibility through adapting existing systems: The National Malaria Control Program introduced the PECADOM program, which included another cadre of CHWs. DSDOMs were added to the CB-IMCI program to test and treat malaria cases within homes in harder-to-reach areas like Kedougou and Tambacounda. Reflecting Senegal's integration strategy, they were also later trained to manage pneumonia.
  - Redesigning information systems to reflect focus on equity: One major adaptation for the introduction of rotavirus vaccine was the disaggregation of vaccination data by sex to be able to track gender equity.

6. Consultations and participation: Engaging and consulting stakeholders and leveraging their expertise, including MOH, other sectors, donors, academics, implementing partners, and communities

This approach ensured both better acceptability and potential for scale-up through broad engagement at the start, and leveraging of available technical knowledge. This was typically done through technical working groups as well as identifying technical experts to lead the pilot testing, which was characteristic of the start of implementation of selected EBIs. Scope of engagement included pilot testing and program design, technical support during implementation, and adaptation of existing EBIs.

- *Leveraging and coordinating donor and implementing partner activities*: Senegal had significant donor support, which drove a number of effective initiatives. However, a number of others were not scaled nationally or sustained because of the lack of coordination (e.g. ORT programs) and challenges were experienced when the funding available from donors was time limited (e.g. BASICS for FB-IMCI). Some lessons included:
    - Leveraging donors during the exploration phase: In 1996, at the request of the Government of Senegal, WHO organized several meetings at the national level to present the IMCI approach.
    - Leveraging donors during the preparation phase: For implementing FB-IMCI, Senegal invited WHO experts for a preliminary visit to assess its readiness for implementing the strategy. A working group was established to guide the preparation process with support from USAID, WHO, and UNICEF. Similarly, preparations for the children's IPT program involved the development of policies, guidelines, protocols, and data collection tools with support from the Global Fund, USAID, and UNICEF.
    - Leveraging donors and implementing partners throughout implementation: Intervention harmonization workshops were useful platforms for donors and implementing partners to align with government stakeholders in the implementation of FB-IMCI. Also, GAVI co-funded the initial and ongoing implementation of rotavirus vaccine and PCV programs while WHO, UNICEF, and USAID provided technical support.
- *Leveraging national/local stakeholders, including academics*: Senegal leveraged its academics and program implementers through discussions during exploration and preparation and throughout implementation. Specific examples included:
    - Cheikh Anta Diop University led the pilot test of the introduction of ACT into the FB-IMCI program. Similarly, the CB-IMCI pilot was designed by a professor of pediatrics at the Cheikh Anta Diop University.
    - An IRS steering committee was set up to include representatives from Cheikh Anta Diop University.
- *Ensuring focus on communities in program design and implementation*: Senegal integrated a focus on communities into the design of its U5M reduction programs, such as inclusion of mothers (and caregivers more broadly) in decisions regarding their children's care as part of the IMCI approach. Other examples included:
    - Community engagement, education, and sensitization for the introduction of rotavirus vaccine and PCV
    - Social marketing activities employing both in-person and mass media campaigns to engage communities in order to increase the sales of ITNs at pharmacies and other vendors
    - Community engagement through awareness-raising campaigns involving a variety of door-to-door and community-wide outreach activities to improve ITN use
    - Setting up refusal case management committees for the children's IPT program
    - Community control of ongoing selection of CHWs

7. Multi-sectoral collaboration to address health and health-related determinants

Through engagement of multiple sectors, Senegal addressed health determinants of U5M (for example, WASH programming).

8. Investing in health systems

Between 2000 and 2015, Senegal invested in its health system with total health expenditure per capita increasing from US$22 in 2000 to US$40 in 2010, though it dropped to US$36 in 2015. Senegal's domestic health expenditure, as a percentage of overall health expenditure, fluctuated between 2000 and 2015, peaking at 45.13% in 2006 (from 36.75% in 2000) and dropping to 26.46% in 2013, although this increased to 31.75% in 2015.[191] Despite these investments, donor funding continued to support a significant portion of U5M reduction programs. More detailed data on donor funding for health were not found.

9. Planning for sustainability

Senegal used a range of strategies (largely focusing on integration) to ensure sustainability of EBIs. For example, integration of IMCI into the National Health Development Plan (1998-2007). Other examples included the strategic plan, Programme Elargi de Vaccination (2014-2018), explicitly articulating Senegal's increasing contribution to the co-financing of rotavirus vaccine from US$0.20 per dose in 2014 to US$0.26 per dose by 2016; and the budget that the MOH allocated for vaccines increasing from 950 million CFA to 3.117 billion CFA from 2013 to 2017, to ensure the funding of all vaccines. IPT for pregnant women was integrated into the National Malaria Control Program policy and Senegal's reproductive health policy and guidelines were developed based on WHO standards. Additionally, training modules on new EBIs were integrated into existing training guides. As an example, training modules for rotavirus and new vaccines were integrated into routine immunization trainings in Senegal for both newly recruited health workers and annual refresher trainings for existing health workers.

10. Private sector engagement

Senegal engaged its private sector to expand access through PPPs (e.g. with a mining company for expansion of diarrhea treatment). In addition, oversight of the private sector service delivery was done through the division of private health facilities within the directorate of health facilities at the MOH while the Alliance of Private Health Providers, a forum established in 2014, provided an avenue for exchange between the public and private sectors to strengthen the role of the private sector in the development, implementation, and monitoring of the health sector. However, private sector engagement had not always been successful. For example, a private organization, the Agence d'Exécution de Travaux d'Intérêt Public's implementation of the CNP experienced challenges to its efficiency and effectiveness due to the organization's limited reach and the relative absence of a national-level body to lead the implementation of the program.

8 Conclusions

Senegal achieved remarkable drops in U5M and neonatal mortality despite ongoing challenges with equity and coverage of some EBIs. Effective leadership and control, donor engagement and coordination, integration of new initiatives into existing systems, data systems strengthening and data use, community engagement, planning for sustainability, and investment in health systems were identified as some of the facilitators of this drop. However, challenges such as overreliance on donor funding, inadequate reflection of policy at the service delivery level, and significant out-of-pocket spending on health care despite efforts to improve medical insurance coverage, remain.

References

1. International AN de la S et de la D (ANSD) [Senegal] and I. *Continuous Demographic and Health Survey in Senegal (Continuous DHS) 2012-2013*. Calverton, Maryland, USA; 2013.
2. Agence Nationale de la Statistique et de la Démographie (ANSD) [Sénégal] et ICF. *Sénégal : Enquête Démographique et de Santé Continue (EDS-Continue 2016)*. Rockville, Maryland, USA; 2016. https://dhsprogram.com/pubs/pdf/FR331/FR331.pdf.
3. Global Burden of Disease Collaborative Network. Global Burden of Disease Study 2016 (GBD 2016) Population Estimates 1950-2016. 2017.
4. The World Bank. World Development Indicators. https://databank.worldbank.org/data/reports.aspx?source=world-development-indicators. Published 2018. Accessed May 27, 2019.
5. UNDP. Human Development Reports: Human Development Indices and Indicators. United Nations Development Programme. http://hdr.undp.org/en/2018-update. Published 2018. Accessed May 31, 2019.
6. Carroll E. The Complexity of Peace: A Case Study of the Peaceful Islamic-Christian Coexistence in Senegal. 2015. http://scholar.colorado.edu/honr_theses. Accessed May 31, 2019.
7. USAID, The DHS Program. STAT compiler for Senegal. https://www.statcompiler.com/en/. Published 2017. Accessed May 28, 2019.
8. USAID and MCHIP. Integrated Community Case Management of Childhood Illness: Documentation of Best Practices and Bottlenecks to Program Implementation in Senegal.; 2012. www.mchip.net. Accessed May 29, 2019.
9. PMI. *President's Malaria Initiative: Senegal Malaria Operational Plan FY 20117*.; 2017. https://www.pmi.gov/docs/default-source/default-document-library/malaria-operational-plans/fy17/fy-2017-senegal-malaria-operational-plan.pdf?sfvrsn=9. Accessed May 29, 2019.
10. Sylla A, Guèye E-H-B, N'diaye O, et al. La formation des agents de santé communautaire instruits : une stratégie pour améliorer l'accès des enfants au traitement des infections respiratoires aiguës au Sénégal. *Arch Pédiatrie*. 2007;14(3):244-248. doi:10.1016/J.ARCPED.2006.11.022
11. Ba F, Seck A, Bâ M, et al. Identifying an appropriate PCV for use in Senegal, recent insights concerning Streptococcus pneumoniae NP carriage and IPD in Dakar. *BMC Infect Dis*. 2014;14(1):627. doi:10.1186/s12879-014-0627-8
12. GAVI. Senegal Proposals, reports, and plans. Global Alliance for Vaccine and Immunization. https://www.gavi.org/country/senegal/documents/. Accessed May 29, 2019.
13. Agence Nationale de la Statistique et de la Démographie (ANSD), Dakar S. *Sénégal: Enquête Démographique et de Santé Continue (EDS-Continue)*. Rockville, Maryland, USA ; 2017. https://dhsprogram.com/pubs/pdf/FR331/FR331.pdf. Accessed May 27, 2019.
14. ExchangeRate.com - Currency Converter USD/XOF. http://www.exchangerate.com/currency-converter/USD/XOF/1.00/?XR-200Plus_Converter=convert&calc_short_from_iso=239&calc_short_to_iso=204. Accessed May 31, 2019.
15. WHO releases new guidance on insecticide-treated mosquito nets. *World Health Organization - Media Centre*. August 2007.
16. Traore VG. *Social Change in Ghana, Senegal and Burkina Faso: A Hit ? A Miss ? Or a Work in Progress ?*; 2017. http://www.niyel.net/agl/assets/social-change---eng-.pdf. Accessed May 31, 2019.
17. Agence Nationale de la Statistique et de la Démographie (ANSD) [Senegal] and ICF International. *Senegal Demographic and Health Survey – Multiple Indicator Cluster Survey (EDS-MICS), 2010-2011*. Rockville, Maryland, USA; 2012. https://dhsprogram.com/pubs/pdf/FR258/FR258_English.pdf.

18. IHME. Global Burden of Disease Study 2016 (GBD 2016) Population Estimates 1950-2016. Institute of Health Metrics and Evaluation. http://ghdx.healthdata.org/record/ihme-data/gbd-2016-population-estimates-1950-2016. Accessed May 31, 2019.
19. Carroll E. The Complexity of Peace: A Case Study of the Peaceful Islamic-Christian Coexistence in Senegal. 2015. https://scholar.colorado.edu/honr_theseshttps://scholar.colorado.edu/honr_theses/896. Accessed May 28, 2019.
20. Sylla A, Guèye E-H-B, N'diaye O, et al. La formation des agents de santé communautaire instruits : une stratégie pour améliorer l'accès des enfants au traitement des infections respiratoires aiguës au Sénégal. *Arch Pédiatrie*. 2007;14(3):244-248. doi:10.1016/J.ARCPED.2006.11.022
21. GAVI. Haemophilus influenzae type B vaccine support. Global Alliance for Vaccine and Immunization. https://www.gavi.org/support/nvs/hib/. Accessed May 30, 2019.
22. Country Information - Senegal. http://www.exchangerate.com/country-information/republic-of-senegal.html. Accessed May 29, 2019.
23. Agence Nationale de la Statistique et de la Démographie (ANSD). *Continuous Demographic and Health Survey in Senegal (Continuous DHS) 2012-2013*. Calverton, Maryland, USA; 2012. https://dhsprogram.com/pubs/pdf/FR288/FR288eng.pdf. Accessed May 27, 2019.
24. Senegal Administrative Map. https://interactive.aljazeera.com/aje/2016/breaking-cycle-fgm-senegal/images/map_final.png. Accessed May 28, 2019.
25. Infoplease. https://www.infoplease.com/world/countries/senegal/morefacts&figures. Accessed May 28, 2019.
26. IHME. Global Burden of Disease Study 2016 (GBD 2016): Population Estimates 1950-2016. Institute of Health Metrics and Evaluation. http://ghdx.healthdata.org/record/ihme-data/gbd-2016-population-estimates-1950-2016. Published 2016. Accessed May 27, 2019.
27. Diagana B, Reardon T. Household consumption responses to the franc CFA devaluation: evidence from urban Senegal. *Food Policy*. 1999;24(5):495-515. doi:10.1016/S0306-9192(99)00055-X
28. Senegal GDP per capita (constant 2010 US$). World Bank national accounts data, and OECD National Accounts data files. https://data.worldbank.org/indicator/NY.GDP.PCAP.KD?locations=SN. Accessed May 28, 2019.
29. Guinea GDP per capita (constant 2010 US$). World Bank national accounts data, and OECD National Accounts data files. https://data.worldbank.org/indicator/NY.GDP.PCAP.KD?locations=GN. Accessed May 28, 2019.
30. Mali GDP per capita (constant 2010 US$). World Bank national accounts data, and OECD National Accounts data files. https://data.worldbank.org/indicator/NY.GDP.PCAP.KD?locations=ML. Accessed May 28, 2019.
31. UNDP. Senegal Human Development Indices and Indicators: 2018 Statistical Update.; 2018. http://hdr.undp.org/en/data. Accessed May 28, 2019.
32. Senegal Human Development Data. The World Bank Group. https://data.worldbank.org/country/senegal. Accessed May 28, 2019.
33. Senegal - GDP Historical Data Graphs per Year. Index Mundi. https://www.indexmundi.com/g/g.aspx?c=sg&v=65. Accessed May 28, 2019.
34. Hanson R, Ndiaye M. *Senegal Agricultural Situation Country Report 2007*.; 2007. https://apps.fas.usda.gov/gainfiles/200701/146279961.pdf. Accessed May 28, 2019.
35. Senegal Economy. Britanica. https://www.britannica.com/place/Senegal/Economy. Accessed May 28, 2019.
36. Emerging Senegal. Presidency of Senegal. http://www.presidence.sn/en/pse/emerging-senegal. Accessed May 28, 2019.

37. Carroll E. The Complexity of Peace: A Case Study of the Peaceful Islamic-Christian Coexistence in Senegal. 2015.
38. IHME. Global Burden of Disease Study 2017 (GBD 2017) Data Resources. Institute of Health Metrics and Evaluation. http://ghdx.healthdata.org/gbd-2017. Published 2017. Accessed May 28, 2019.
39. Victora CG, Boerma T. Inequalities in child mortality: real data or modelled estimates? *Lancet Glob Heal*. 2018;6(5):e477-e478. doi:10.1016/S2214-109X(18)30109-8
40. Victora CG, Bahl R, Barros AJD, et al. Breastfeeding in the 21st century: epidemiology, mechanisms, and lifelong effect. *Lancet*. 2016;387(10017):475-490. doi:10.1016/S0140-6736(15)01024-7
41. Victora CG, Adair L, Fall C, et al. Maternal and child undernutrition: consequences for adult health and human capital. *Lancet*. 2008;371(9609):340-357. doi:10.1016/S0140-6736(07)61692-4
42. IHME. Global Burden of Disease Results Tool. Institute of Health Metrics and Evaluation. http://ghdx.healthdata.org/gbd-results-tool. Published 2017. Accessed May 28, 2019.
43. AHO and WHO Africa. Senegal:The Health System. African Health Observatory and World Health Organization Regional Office for Africa. http://www.aho.afro.who.int/profiles_information/index.php/Senegal:The_Health_System. Published 2018. Accessed May 28, 2019.
44. WHO. *Senegal Country Cooperation Strategy*. 2016. http://apps.who.int/gho/data/node.cco. Accessed May 28, 2019.
45. Heyen-Perschon J. *Report on Current Situation in the Health Sector of Senegal and Possible Roles for Non-Motorised Transport Interventions*. Institute for Transport and Development Policy; 2005. https://www.itdp.org/wp-content/uploads/2014/07/ITDP-Transport-and-Health-Care-Senegal.pdf. Accessed May 28, 2019.
46. Organigramme du Ministère de la Santé et de l'Action Sociale. Republic of Senegal. http://www.sante.gouv.sn/le_ministere/organigramme. Published 2017. Accessed May 28, 2019.
47. USAID and MCSP. Health Management Information Systems (HMIS) Review: Survey on Data Availability in Electronic Systems for Maternal and Newborn Health Indicators in 24 USAID Priority Countries.; 2016. www.mcsprogram.org. Accessed May 29, 2019.
48. Joseph G, Mohnsam da Silva IC, Wehrmeister FC, Barros AJ, Victora CG. Inequalities in the coverage of place of delivery and skilled birth attendance: analyses of cross-sectional surveys in 80 low and middle-income countries. *Reprod Health*. 2016;13(1):77. doi:10.1186/s12978-016-0192-2
49. Direction Générale de la Santé. *Politique Nationale de Santé Communautaire*. Dakar, Sénégal; 2014. http://www.sante.gouv.sn/sites/default/files/politiksantcom.pdf. Accessed May 29, 2019.
50. Brunner B, Barnes J, Carmona A, et al. *Senegal Private Health Sector Assessment: Selected Health Products and Services*.; 2016. www.abtassociates.com. Accessed May 29, 2019.
51. Tine J, Hatt L, Faye S, Nakhimovsky S. *Universal Health Coverage Measurement in a Lower-Middle-Income Context: A Senegalese Case Study*. 2014. www.abtassociates.com. Accessed May 29, 2019.
52. DHS Program and USAID. The DHS Program - Service Provision Assessments (SPA). Demographic Health Surveys. https://www.dhsprogram.com/What-We-Do/Survey-Types/SPA.cfm. Accessed May 29, 2019.
53. Leslie HH, Spiegelman D, Zhou X, Kruk ME. Service readiness of health facilities in Bangladesh, Haiti, Kenya, Malawi, Namibia, Nepal, Rwanda, Senegal, Uganda and the United Republic of Tanzania. *Bull World Health Organ*. 2017;95(11):738-748. doi:10.2471/BLT.17.191916
54. Winter R, Yourkavitch J, Mallick L, Wang W. Levels and trends in newborn care service availability and readiness in Bangladesh, Haiti, Malawi, Senegal, and Tanzania. August 2016. https://dhsprogram.com/publications/publication-CR41-Comparative-Reports.cfm. Accessed May 29, 2019.

55. Zurn P, Codjia L, Sall FL. La fidélisation des personnels de santé dans les zones difficiles au Sénégal. *Organ Mond la Santé*. 2010;(1):26. https://www.who.int/hrh/resources/case_senegal/fr/. Accessed May 29, 2019.
56. Devlin K, Egan KF, Pandit-Rajani T. *Community Health Systems Catalog Country Profile: Senegal*. Arlington; 2016. Advancing Health Partners and Communities. https://www.advancingpartners.org/sites/default/files/catalog/profiles/senegal_chs_catalog_profile_0_0.pdf. Accessed May 29, 2019.
57. Devlin K, Egan KF, Pandit-Rajani T. *Community Health Systems Catalog Country Profile: Senegal*. Arlington; 2016. Advancing Health Partners and Communities. https://www.advancingpartners.org/sites/default/files/catalog/profiles/senegal_chs_catalog_profile_0_0.pdf. Accessed May 29, 2019.
58. Senegal Health expenditure per capita. https://knoema.com/atlas/Senegal/topics/Health/Health-Expenditure/Health-expenditure-per-capita. Accessed May 29, 2019.
59. National Health Accounts - Senegal. https://knoema.com/WHONHA2018Feb/national-health-accounts. Published 2018. Accessed May 29, 2019.
60. IHME. Financing Global Health. Institute of Health Metrics and Evaluation. https://vizhub.healthdata.org/fgh/. Published 2016. Accessed May 29, 2019.
61. MNCS. *Countdown Equity Analyses by Country: Senegal*. 2015. www.countdown2015mnch.org. Accessed May 29, 2019.
62. Lewis CC, Fischer S, Weiner BJ, Stanick C, Kim M, Martinez RG. Outcomes for implementation science: an enhanced systematic review of instruments using evidence-based rating criteria. *Implement Sci*. 2015;10(1):155. doi:10.1186/s13012-015-0342-x
63. Beidas RS, Becker-Haimes EM, Adams DR, et al. Feasibility and acceptability of two incentive-based implementation strategies for mental health therapists implementing cognitive-behavioral therapy: a pilot study to inform a randomized controlled trial. *Implement Sci*. 2017;12(1):148. doi:10.1186/s13012-017-0684-7
64. MNCH and UNICEF. *Integrated Management of Childhood Illness (IMCI) in the 21st Century: Integration into Health Systems*. New York; 2016. https://www.unicef.org/health/files/UNICEF_-_IMCI_Integration_into_Health_Systems_Working_Paper_2_FINAL_11Oc....pdf. Accessed May 29, 2019.
65. Kolstad PR, Burnham G, Kalter HD, Kenya-Mugisha N, Black RE. The integrated management of childhood illness in western Uganda. *Bull World Health Organ*. 1997;75(1):77-85. http://www.ncbi.nlm.nih.gov/pubmed/9529720. Accessed May 29, 2019.
66. WHO. Integrated Management of Childhood Illness (IMCI). WHO.
67. Camara B, Faye P, Diagne-Gueye N, et al. Evaluation of integrated management of childhood illness three years after implementation in a health care district in Senegal. *Médecine Trop Rev du Corps santé Colon*. 2008;68(2):162-166. http://www.ncbi.nlm.nih.gov/pubmed/18630049. Accessed May 29, 2019.
68. Briggs J, Gabra M, Ickx P. Senegal Assessment: Drug Management for Childhood Illness. Management Sciences for Health. https://www.researchgate.net/publication/237346394_SENEGAL_ASSESSMENT_DRUG_MANAGEMENT_FOR_CHILDHOOD_ILLNESS. Published 2002. Accessed May 29, 2019.
69. Fall B, Pascual A, Sarr FD, et al. Plasmodium falciparum susceptibility to anti-malarial drugs in Dakar, Senegal, in 2010: an ex vivo and drug resistance molecular markers study. *Malar J*. 2013;12(1):107. doi:10.1186/1475-2875-12-107
70. PMI and USAID. *President's Malaria Initiative: Senegal Malaria Operational Plan FY 2015*.; 2015. https://www.pmi.gov/docs/default-source/default-document-library/malaria-operational-plans/fy-15/senegal_mop_fy15.pdf?sfvrsn=4. Accessed May 29, 2019.

71. WHO. *Guidelines for the Treatment of Malaria*. 3rd Editio. Geneva: World Health Organization; 2015. https://books.google.rw/books?hl=en&lr=&id=IVo0DgAAQBAJ&oi=fnd&pg=PP1&ots=9Tng1lS3gJ&sig=txBChxzBsecbYxQl2trvUUS8-M4&redir_esc=y#v=onepage&q&f=false. Accessed May 29, 2019.
72. Faye A, Ndiaye P, Diagne-Camara M, et al. Economic evaluation of rapid diagnostic tests in malaria treatment. *Sante Publique*. 2010;22(6):617-623. http://www.ncbi.nlm.nih.gov/pubmed/21491742. Accessed May 29, 2019.
73. Gera T, Shah D, Garner P, Richardson M, Sachdev HS. Integrated management of childhood illness (IMCI) strategy for children under five. *Cochrane database Syst Rev*. 2016;(6):1-61. doi:10.1002/14651858.CD010123.pub2
74. Desk Review and Qualitative Assessment of Case Management Social and Behavior Change Communication Strategies in Four Countries: Ethiopia, Rwanda, Senegal and Zambia Cover Photo: A Field Worker Collects a Blood Sample for Malaria Testing from a Child in Northern Zambia.; 2012. http://healthcommcapacity.org/wp-content/uploads/2015/06/Malaria-Case-Mgmt-Desk-Review-Ethiopia-Rwanda-Senegal-Zambia.pdf. Accessed May 29, 2019.
75. Credit P, Jarrah Z, Jarrah Z, Wright K, Suraratdecha C, Collins D. *Costing of Integrated Community Case Management in Senegal*. 2013. https://www.msh.org/sites/msh.org/files/msh_costing_of_integrated_community_case_management_analysis_report_sene.pdf. Accessed May 29, 2019.
76. USAID and MCHIP. Review of Integrated Community Case Management Training and Supervision Materials in Ten African Countries.; 2013. www.mchip.net. Accessed May 29, 2019.
77. WHO, WFP, UNSSC and U. *Community-Based Management of Severe Acute Malnutrition*.; 2004. http://www.unscn.org/files/Statements/Community_Based__Management_of_Severe_Acute_Malnutrition.pdf. Accessed May 29, 2019.
78. WHO. *Maternal, Newborn, Child and Adolescent Health*. World Health Organization; 2014. https://www.who.int/maternal_child_adolescent/documents/IMCI_chartbooklet/en/. Accessed May 29, 2019.
79. Collins D, Jarrah Z, Gilmartin C, Saya U. The costs of integrated community case management (iCCM) programs: A multi-country analysis. *J Glob Health*. 2014;4(2):11. doi:10.7189/jogh.04.020407
80. Wilson S, Morris S, Gilbert S. *Senegal ORS Case Study*.; 2012. https://www.shopsplusproject.org/sites/default/files/resources/Senegal_ORS Case Study.pdf. Accessed May 29, 2019.
81. Teck and Micronutrient Initiative. The Micronutrient Initiative, Government of Canada and Teck Launch Child Health Initiative with Governments of Ethiopia and Burkina Faso.; 2013. http://www.cesl.com/document/DocumentViewer.aspx?portal=tc&path=_ces_portal_meta/downloads/Media/2013/13-5-TR.pdf.
82. The DHS Program - Senegal: Continuous DHS, 2016. Demographic and Health Surveys. https://dhsprogram.com/what-we-do/survey/survey-display-524.cfm. Published 2016. Accessed May 29, 2019.
83. Wilson SE, Morris SS, Gilbert SS, et al. Scaling up access to oral rehydration solution for diarrhea: Learning from historical experience in low-and high-performing countries. *J Glob Health*. 2013;3(1):10404. doi:10.7189/jogh.03.010404
84. GAVI. Rotavirus vaccine support. GAVI, the Vaccine Alliance. https://www.gavi.org/support/nvs/rotavirus/. Accessed May 29, 2019.

85. WHO. Principles and Considerations for Adding a Vaccine to a National Immunization Programme: From Decision to Implementation and Monitoring. Geneva, Switzerland; 2014. doi:10.1016/j.vaccine.2012.10.116
86. Diop A, Thiongane A, Mwenda JM, et al. Impact of rotavirus vaccine on acute gastroenteritis in children under 5 years in Senegal: Experience of sentinel site of the Albert Royer Children's Hospital in Dakar. *Vaccine*. 2018;36(47):7192-7197. doi:10.1016/j.vaccine.2017.10.061
87. PATH. Vaccine Access and Delivery: Rotavirus Disease and Vaccines in Senegal. 2014. http://www.unicef.org/. Accessed May 29, 2019.
88. WHO. Principles and Considerations for Adding a Vaccine to a National Immunization Programme: From Decision to Implementation and Monitoring. Geneva; 2014. doi:10.1016/j.vaccine.2012.10.116
89. GAVI. *Advance Market Commitment for Pneumococcal Vaccines: Annual Report*. 2017. https://www.gavi.org/funding/pneumococcal-amc/%0Ahttps://www.gavi.org/support/nvs/pneumococcal/.
90. GAVI. GAVI Alliance welcomes introduction of two life-saving vaccines in Senegal: Senegalese children to benefit from pneumococcal and measles-rubella vaccines. Global Alliance for Vaccine and Immunization. https://www.gavi.org/library/news/statements/2013/gavi-alliance-welcomes-introduction-of-two-life-saving-vaccines-in-senegal/. Accessed May 29, 2019.
91. Ba O, Fleming JA, Dieye Y, et al. Hospital surveillance of childhood bacterial meningitis in Senegal and the introduction of Haemophilus influenzae type b conjugate vaccine. *Am J Trop Med Hyg*. 2010;83(6):1330-1335. doi:10.4269/ajtmh.2010.10-0346
92. Daniels RF, Deme AB, Gomis JF, et al. Evidence of non-Plasmodium falciparum malaria infection in Kédougou, Sénégal. *Malar J*. 2017;16(1):9. doi:10.1186/s12936-016-1661-3
93. PNLP, PATH and S. *Senegal: Charting the Path to Malaria Elimination*. 2018. https://path.azureedge.net/media/documents/MACEPA_Senegal_Case_Study.pdf. Accessed May 29, 2019.
94. Thwing J, Eckert E, Dione DA, et al. Declines in Malaria Burden and All-Cause Child Mortality following Increases in Control Interventions in Senegal, 2005–2010. *Am J Trop Med Hyg*. 2017;97(3_Suppl):89-98. doi:10.4269/ajtmh.16-0953
95. Thwing JI, Perry RT, Townes DA, Diouf MB, Ndiaye S, Thior M. Success of Senegal's first nationwide distribution of long-lasting insecticide-treated nets to children under five - contribution toward universal coverage. *Malar J*. 2011;10(1):86. doi:10.1186/1475-2875-10-86
96. Cissé B, Sokhna C, Boulanger D, et al. Seasonal intermittent preventive treatment with artesunate and sulfadoxine-pyrimethamine for prevention of malaria in Senegalese children: a randomised, placebo-controlled, double-blind trial. *Lancet*. 2006;367(25):659-667. www.thelancet.com. Accessed May 29, 2019.
97. Roman E, Wallon M, Brieger W, Dickerson A, Rawlins B, Agarwal K. Moving malaria in pregnancy programs from neglect to priority: experience from Malawi, Senegal, and Zambia. *Glob Heal Sci Pract*. 2014;2(1):55. doi:10.9745/GHSP-D-13-00136
98. Bâ E-H, Pitt C, Dial Y, et al. Implementation, coverage and equity of large-scale door-to-door delivery of Seasonal Malaria Chemoprevention (SMC) to children under 10 in Senegal. *Sci Rep*. 2018;8(1):7088. doi:10.1038/s41598-018-25426-4
99. USAID, CDC, MCSP GF. *Senegal Malaria in Pregnancy Country Profile*. 2018. www.mcsprogram.org. Accessed May 29, 2019.
100. WHO. Seasonal malaria chemoprevention (SMC). World Health Organization. https://www.who.int/malaria/areas/preventive_therapies/children/en/. Published 2017. Accessed May 29, 2019.
101. Ministere de la Sante de la Prevention et de l'Hygiene Publique. 2009. http://www.jo.gouv.sn/spip.php?article7657. Accessed May 29, 2019.

102. PMI. *President's Malaria Initiative: Senegal Malaria Operational Plan FY 2018*. 2018. https://www.pmi.gov/docs/default-source/default-document-library/malaria-operational-plans/fy-2018/fy-2018-senegal-malaria-operational-plan.pdf?sfvrsn=5. Accessed May 30, 2019.
103. WHO. *Indoor Residual Spraying: Use of Indoor Residual Spraying for Scaling up Global Malaria Control and Elimination*. 2006. https://apps.who.int/iris/bitstream/handle/10665/69386/WHO_HTM_MAL_2006.1112_eng.pdf;jsessionid=53CD2D4140F5FAF5E95C0FA143A9E325?sequence=1. Accessed May 30, 2019.
104. USAID, CDC. *President's Malaria Malaria Operational Plan (PMI) for Senegal FY 2007*. 2007. https://www.pmi.gov/docs/default-source/default-document-library/malaria-operational-plans/fy07/senegal_mop-fy07.pdf?sfvrsn=6. Accessed May 30, 2019.
105. Sow B, Ndiaye S, Gaye A. *Enquête Sénégalaise Sur Les Indicateurs de Santé (ESIS) 1999*. Dakar, Sénégal; 2000. https://dhsprogram.com/pubs/pdf/FR113/FR113.pdf. Accessed May 30, 2019.
106. Nepal Demographic and Health Survey 2001. Kathmandu, Nepal; 2002.
107. WHO. Prequalified Vaccines. World Health Organization. https://extranet.who.int/gavi/PQ_Web/. Published 2019. Accessed May 30, 2019.
108. Vanderslott S, Roser M. Vaccination: The history of vaccine innovation. 2018. doi:10.1136/bmj.325.7361.430
109. Sabin Vaccine Institute. Senegal Immunization Program. https://www.sabin.org/programs/sustainable-immunization-financing/senegal. Published 2016. Accessed May 30, 2019.
110. PATH and WHO. *Optimize Senegal Report*. 2013. www.path.org. Accessed May 30, 2019.
111. GAVI. Meningitis A vaccine support. Global Alliance for Vaccine and Immunization. https://www.gavi.org/support/nvs/meningitis-a/. Published 2014. Accessed May 30, 2019.
112. GAVI. Meningitis vaccine introduced in Africa's meningitis belt. Global Alliance for Vaccine and Immunization. https://www.gavi.org/library/news/statements/2010/meningitis-vaccine-introduced-in-africa-s-meningitis-belt/. Published 2010. Accessed May 30, 2019.
113. Fleming JA, Dieye Y, Ba O, et al. Effectiveness of Haemophilus Influenzae Type B COnjugate Vaccine for Prevention of Meningitis in Senegal. *Pediatr Infect Dis J*. 2011;30(5):430-432. doi:10.1097/INF.0b013e318203aaa0
114. WHO. Global Health Observatory Data Repository: Immunization. World Health Organization. http://apps.who.int/gho/data/node.main.A824?lang=en. Accessed May 30, 2019.
115. Dia N, Fall A, Ka R, et al. Epidemiology and Genetic Characterization of Measles Strains in Senegal, 2004-2013. Khudyakov YE, ed. *PLoS One*. 2015;10(5):e0121704. doi:10.1371/journal.pone.0121704
116. Hoekstra EJ, Van Den Ent MM, Dao H, Khalaf H, Salovaara A. Measles Supplementary Immunization Activities and GAVI Funds as Catalysts for Improving Injection Safety in Africa. *J Infect Dis*. 2011;204(1):190-197. doi:10.1093/infdis/jir073
117. UNICEF. *Senegal Annual Report 2013*. 2014. https://www.unicef.org/about/annualreport/files/Senegal_COAR_2013.pdf. Accessed May 30, 2019.
118. Healio. Senegal introduces pneumococcal, measles-rubella vaccines. Vaccine-Preventable Diseases. https://www.healio.com/infectious-disease/vaccine-preventable-diseases/news/online/%7B66eb4805-1b66-4c17-8902-576ee36a91cd%7D/senegal-introduces-pneumococcal-measles-rubella-vaccines. Accessed May 30, 2019.
119. World Health Rankings. Measles in Senegal. https://www.worldlifeexpectancy.com/senegal-measles. Published 2017. Accessed May 30, 2019.
120. Ndoye I. AIDS in Senegal]. *Vie Sante*. 1990;(5):30-32. http://www.ncbi.nlm.nih.gov/pubmed/12342926. Accessed May 30, 2019.

121. HIV/ AIDS country profile: Senegal Risk Analysis. *AIDS Anal Afr*. 1996;6(6):4-7. http://www.ncbi.nlm.nih.gov/pubmed/12320531. Accessed May 30, 2019.
122. Diouf D, Santé E. *HIV/AIDS Policy in Senegal: A Civil Society Perspective*. New York; 2007. www.soros.org. Accessed May 30, 2019.
123. HIV i-BASE. Early infant diagnosis. http://i-base.info/htb/14000. Accessed May 30, 2019.
124. UNAIDS. Country Factsheets: HIV and AIDS Estimates in Senegal. https://www.unaids.org/en/regionscountries/countries/senegal. Published 2017. Accessed May 30, 2019.
125. Taverne B, Desclaux A, Egrot M, et al. *Présentation de l'Initiative Sénégalaise d'accès Aux Antirétroviraux*.; 2002. http://horizon.documentation.ird.fr/exl-doc/pleins_textes/doc34-08/010030323.pdf. Accessed May 30, 2019.
126. Desclaux A, Laniece I, Ndoye I, Taverne B. The Senegalese Antiretroviral Drug Access Initiative: An Economic Social Behavioural and Biomedical Analysis. 2004. http://www.who.int. Accessed May 30, 2019.
127. WHO. HIV/AIDS: Senegal Triples Number of People on HIV Treatment. World Health Organization. https://www.who.int/hiv/mediacentre/news58/en/. Published 2006. Accessed May 30, 2019.
128. Diouf O, Gueye-Gaye A, Sarr M, et al. Evaluation of Senegal's prevention of mother to child transmission of HIV (PMTCT) program data for HIV surveillance. *BMC Infect Dis*. 2018;18(1):588. doi:10.1186/s12879-018-3504-z
129. The Global Fund. Senegal Data Explorer. https://data.theglobalfund.org/home. Accessed May 30, 2019.
130. Baptiste DJ, Djibril D, Assane S, Ngagne M, Baly O, Ousmane N. Serological and nutritional outcome of infants born to HIV positive mothers undergoing option B + therapy in Guédiawaye. *Pan Afr Med J*. 2016;25:224. doi:10.11604/pamj.2016.25.224.10441
131. UNAIDS and AIDSinfo. Trend of New HIV Infections. http://aidsinfo.unaids.org/. Published 2018. Accessed May 30, 2019.
132. CNLS. *Rapport de Situation Sur La Riposte Nationale a l'Epidemie de VIH/SIDA, Senegal: 2013--2014*.; 2015. https://www.unaids.org/sites/default/files/country/documents/SEN_narrative_report_2015.pdf. Accessed May 30, 2019.
133. UNAIDS. *AIDS Data 2016*.; 2016. https://www.unaids.org/sites/default/files/media_asset/2016-AIDS-data_en.pdf. Accessed May 30, 2019.
134. Cisse C. Integration of prevention of mother-to-child HIV transmission into maternal health services in Senegal. *Med Sante Trop*. 2017;27(2):200-208. doi:10.1684/mst.2017.0684
135. Mbaye N. Providing comprehensive care for children living with HIV: Lessons learned from a low prevalence country. 2010. https://childrenandhiv.org/wp-content/uploads/Ngagne_Mbaye1.pdf. Accessed May 30, 2019.
136. Kampman H, Zongrone A, Rawat R, Becquey E. How Senegal created an enabling environment for nutrition: A story of change. *Glob Food Sec*. 2017;13:57-65. doi:10.1016/J.GFS.2017.02.005
137. Gartner A, Maire B, Kameli Y, Traissac P, Delpeuch F. Process evaluation of the Senegal-Community Nutrition Project: an adequacy assessment of a large scale urban project. *A Eur J Trop Med Int Heal*. 2006;11(6):955-966. doi:10.1111/j.1365-3156.2006.01644.x
138. WHO, UNICEF, WFP and U. *Community-Based Management of Severe Acute Malnutrition*. 2007. http://www.unscn.org/files/Statements/Community_Based__Management_of_Severe_Acute_Malnutrition.pdf. Accessed May 30, 2019.
139. Sall M, Mbaye N, Diouf S, et al. *Le Centre De Récupération Et D'éducation Nutritionnelles : Une Structure A Vulgariser*. Dakar, Sénégal; 1996. http://www.santetropicale.com/Resume/44301.pdf. Accessed May 30, 2019.

140. ScalingUp Nutrition. 61 countries are leading a global movement to end malnutrition in all its forms. https://scalingupnutrition.org/about-sun/the-history-of-the-sun-movement/. Published 2015. Accessed May 30, 2019.
141. The World Bank. A New Holistic Approach to Nutrition Drops Childhood Stunting in Senegal. https://www.worldbank.org/en/news/immersive-story/2017/05/09/a-new-holistic-approach-to-nutrition-drops-childhood-stunting-in-senegal. Published 2017. Accessed May 30, 2019.
142. Cord L. Lutte contre la malnutrition: Le Prn jugé très satisfaisant. https://www.lequotidien.sn/lutte-contre-la-malnutrition-le-prn-juge-tres-satisfaisant/. Published 2017. Accessed May 30, 2019.
143. Vaillancourt D. A Decade of World Bank Support to Senegal's Nutrition Program. Open Knowledge Repository. https://openknowledge.worldbank.org/handle/10986/30483. Published 2016. Accessed May 30, 2019.
144. ScalingUp Nutrition. Building Capacities in SUN Countries to Promote Nutrition through "Learning Routes": An Innovative Project in Senegal. www.clm.sn. Accessed May 30, 2019.
145. Imdad A, Herzer K, Mayo-Wilson E, Yakoob MY, Bhutta ZA. Vitamin A supplementation for preventing morbidity and mortality in children from 6 months to 5 years of age. In: Bhutta ZA, ed. *Cochrane Database of Systematic Reviews*. Chichester, UK: John Wiley & Sons, Ltd; 2010. doi:10.1002/14651858.CD008524.pub2
146. Ross DA. Recommendations for Vitamin A Supplementation. *J Nutr*. 2002;132(9):2902S-2906S. doi:10.1093/jn/132.9.2902S
147. Ndiaye S, Ayad M. *Enquête Démographique et de Santé Sénégal 2005*. Dakar, Sénégal; 2006. http://www.measuredhs.com. Accessed May 30, 2019.
148. Papa SN, Diouf D, Ayad M. *Enquête Démographique et de Santé Au Sénégal*. Dakar, Sénégal; 1994. https://dhsprogram.com/pubs/pdf/FR55/FR55.pdf. Accessed May 30, 2019.
149. Sightsavers. May highlights: updates from around the world. https://www.sightsavers.org/from-the-field/2018/05/may-highlights/. Published 2018. Accessed May 30, 2019.
150. National Public Radio. In Senegal, The Grandmas Are In Charge. https://www.npr.org/2011/08/11/139543928/in-senegal-the-grandmas-are-in-charge. Published August 11, 2011. Accessed May 30, 2019.
151. Vandelaer J, Raza A, Zulu F, Yakubu A, Khan R. Maternal and neonatal tetanus elimination: from protecting women and newborns to protecting all. *Int J Womens Health*. 2015;7:171. doi:10.2147/IJWH.S50539
152. Senegal Ministry of Public Health and Prevention. *EPI Comprehensive Multiyear Plan 2012-2016*. 2017. http://www.gavi.org/Country/Senegal/Documents/CMYPs/Comprehensive-multi-year-plan-for-2012-2016/.
153. Vandelaer J, Raza A, Zulu F, Yakubu A, Khan R. Maternal and neonatal tetanus elimination: from protecting women and newborns to protecting all. *Int J Womens Health*. 2015;7:171. doi:10.2147/IJWH.S50539
154. Siekmans K, Roche M, Kung'u JK, Desrochers RE, De-Regil LM. Barriers and enablers for iron folic acid (IFA) supplementation in pregnant women. *Matern Child Nutr*. 2018;14:e12532. doi:10.1111/mcn.12532
155. Ndiaye M, Siekmans K, Haddad S, Receveur O. Impact of a Positive Deviance Approach to Improve the Effectiveness of an Iron-Supplementation Program to Control Nutritional Anemia among Rural Senegalese Pregnant Women. *Food Nutr Bull*. 2009;30(2):128-136. doi:10.1177/156482650903000204
156. Seck BC, Jackson RT. Determinants of compliance with iron supplementation among pregnant women in Senegal. *Public Health Nutr*. 2008;11(6):596-605. doi:10.1017/S1368980007000924
157. Seck BC, Jackson RT. Providing iron/folic acid tablets free of charge improves compliance in pregnant women in Senegal. *Trans R Soc Trop Med Hyg*. 2009;103(5):485-492. doi:10.1016/j.trstmh.2008.11.022

158. Sarr AM, Toure K, Ondoa P, et al. Evaluation of Antenatal Care Screening According to the National Recommendations in Senegal. *Cent African J Public Heal*. 2017;3(5):73-79. doi:10.11648/j.cajph.20170305.14
159. Witter S, Drame FB, Cross S. Maternal fee exemption in Senegal: is the policy a success? *Afr J Midwifery Womens Health*. 2009;3(1):5-10. doi:10.12968/ajmw.2009.3.1.39409
160. Witter S, Dieng T, Mbengue D, Moreira I, De Brouwere V. The national free delivery and caesarean policy in Senegal: evaluating process and outcomes. *Health Policy Plan*. 2010;25(5):384-392. doi:10.1093/heapol/czq013
161. Witter S, Dieng T, Mbengue D, Moreira I, De Brouwere V. The national free delivery and caesarean policy in Senegal: evaluating process and outcomes. *Health Policy Plan*. 2010;25(5):384-392. doi:10.1093/heapol/czq013
162. WHO, UNICEF, UNFPA and WBG. *Senegal Maternal Mortality in 1990-2015*.; 2016. http://data.unicef.org/. Accessed May 30, 2019.
163. Every Woman Every Child, USAID and H. Demand Generation for Reproductive, Maternal, Newborn and Child Health Commodities: Demand Generation for 23 Life-Saving Commodities- A Synthesis of the Evidence.; 2014. http://sbccimplementationkits.org/demandrmnch/wp-content/uploads/sites/2/2015/04/Demand-Generation-A-Synthesis-of-the-Evidence-FINAL.pdf. Accessed May 30, 2019.
164. Sylla A, Diouf S, Thiam A, et al. Évaluation de l'état et du devenir du matériel de base destiné à la prise en charge du nouveau-né à la naissance dans les structures sanitaires périphériques au Sénégal, après un recul de trois ans. *Arch Pédiatrie*. 2012;19(4):355-360. doi:10.1016/J.ARCPED.2012.01.009
165. HBB-GDA. *Helping Babies Breathe (HBB) Global Development Alliance*.; 2013. https://www.healthynewbornnetwork.org/hnn-content/uploads/HBB-Annual-report-21-Nov-2013-Final_0.pdf. Accessed May 30, 2019.
166. Ndiaye O, Diallo D, Ba MG, et al. Maternal risk factors and low birth weight in Senegalese teenagers: the example of a hospital centre in Dakar. *Sante*. 2001;11(4):241-244. http://www.ncbi.nlm.nih.gov/pubmed/11861200. Accessed May 30, 2019.
167. Ndiaye O, Diallo D, Diouf S, et al. Neonatal mortality associated with transfer of low birth weight newborns. Assessment of a neonatal care unit of Dakar. *Dakar Med*. 2003;48(1):7-11. http://www.ncbi.nlm.nih.gov/pubmed/15776642. Accessed May 30, 2019.
168. WHO. Senegal: A leap forward on infant survival. World Health Organization. https://www.who.int/features/2013/senegal-infant-survival/en/. Published 2014. Accessed May 31, 2019.
169. Faye PM, Thiongane A, Diagne-Guèye NR, et al. Les soins kangourou pour nouveau-nés de faible poids de naissance au centre hospitalier national d'enfants Albert-Royer de Dakar. *Arch Pédiatrie*. 2016;23(3):268-274. doi:10.1016/j.arcped.2015.12.010
170. Chlorhexidine Working Group. Senegal Country Summary. https://www.healthynewbornnetwork.org/hnn-content/uploads/Senegal-2.pdf. Accessed May 31, 2019.
171. MEASURE Evaluation. Senegal: HIS Indicators. Health Information Systems Strengthening Resource Center. https://www.measureevaluation.org/his-strengthening-resource-center/country-profiles/senegal. Accessed May 31, 2019.
172. Government of Senegal, IMF and W. Enhanced Structural Adjustment Facility Economic and Financial Policy Framework Paper (1999-2001). Government of Senegal, International Monetary Fund, and World Bank. https://www.imf.org/external/np/pfp/1999/senegal/#VIB. Published 1999. Accessed May 31, 2019.
173. USAID and BASICS II. *Tools for Operationalizing Essential Nutrition Actions*. www.basics.org. Accessed May 31, 2019.

174. The Study on the Improvement of Environment for Early Childhood in the Republic of Senegal: Health Care and Nutrition of Children. http://open_jicareport.jica.go.jp/pdf/11769205_02.pdf. Accessed May 31, 2019.
175. MLI. *Reducing Financial Barriers to Reproductive Health Care: Senegal's Free Delivery Program*. 2010. http://www.ministerial-leadership.org/sites/default/files/events/event_files/Senegal Country Spotlight.pdf. Accessed May 31, 2019.
176. IMF. *Senegal: Poverty Reduction Strategy Paper*. Washington, DC; 2013. https://extranet.who.int/nutrition/gina/sites/default/files/SEN 2012 National Strategy for Economic and Social Development %28NSESD%29 2013-2017.pdf. Accessed May 31, 2019.
177. WHO. Policy - National Strategy for Economic and Social Development (NSESD) 2013-2017. World Health Organization and Republic of Senegal. https://extranet.who.int/nutrition/gina/en/node/23006. Published 2012. Accessed May 31, 2019.
178. Results for Development. Laying the Groundwork for Universal Health Coverage in Senegal through Sustainable Financing. https://www.r4d.org/projects/laying-groundwork-universal-health-coverage-senegal-sustainable-financing/. Accessed May 31, 2019.
179. USAID. *African Strategies for Health: Senegal Health Financing Profile*. 2013. www.africanstrategies4health.org. Accessed May 31, 2019.
180. UHC2030. World leaders for universal health coverage: achieving the SDGs through health for all - UHC2030. https://www.uhc2030.org/news-events/uhc2030-events/world-leaders-for-universal-health-coverage-achieving-the-sdgs-through-health-for-all-417832/. Published 2017. Accessed May 31, 2019.
181. WHO. Millennium Development Goals (MDGs). World Health Organization. https://www.who.int/topics/millennium_development_goals/about/en/. Published 2015. Accessed May 31, 2019.
182. ANSD. Sustainable Development Goals of Senegal. Agence Nationale de la Statistique et de la Démographie. http://senegal.opendataforafrica.org/SNSDG2016/sustainable-development-goals-of-senegal. Accessed May 31, 2019.
183. Nafissatou Traore, Badolo L, Chaupendo D, Thiam AS. Social Change in Ghana, Senegal and Burkina Faso: A Hit? A Miss? Or a Work in Progress? A 2017 NIYAL Report. 2017.
184. Marsch L, Lord S, Dallery J. *Behavioral Healthcare and Technology: Using to Transform PracticeScience-Based Innovations To* . Oxford University Press; 2014. https://books.google.co.in/books?id=iYIjBQAAQBAJ&pg=PT389&lpg=PT389&dq=Ministry+of+health+%2B+Senegal+%2B+data+aggregate+%2B+use&source=bl&ots=6pbjOm8KZ#v=onepage&q=Ministry of health %2B Senegal %2B data aggregate %2B use&f=false. Accessed May 31, 2019.
185. Pronyk PM, Nemser B, Maliqi B, et al. The UN Commission on Life Saving Commodities 3 years on: global progress update and results of a multicountry assessment. *Lancet Glob Heal*. 2016;4(4):e276-e286. doi:10.1016/S2214-109X(16)00046-2
186. Senegal RMNCH. From Knowledge to Action for Reproductive, Maternal, Newborn, Child, and Adolescent Health. Life-Saving Commodities Pratitioners' Network. http://lifesavingcommodities.org/countries/senegal/. Accessed May 31, 2019.
187. Alemu AM. To what extent does access to improved sanitation explain the observed differences in infant mortality in Africa? *African J Prim Heal care Fam Med*. 2017;9(1):e1-e9. doi:10.4102/phcfm.v9i1.1370
188. UNICEF. People using at least basic drinking water services (% of population). WHO/UNICEF Joint Monitoring Programme (JMP) for Water Supply, Sanitation and Hygiene. https://data.worldbank.org/indicator/SH.H2O.BASW.ZS?locations=SN. Accessed May 31, 2019.

189. WHO and UNICEF. People using at least basic sanitation services (% of population) | Data. WHO/UNICEF Joint Monitoring Programme (JMP) for Water Supply, Sanitation and Hygiene. https://data.worldbank.org/indicator/SH.STA.BASS.ZS?locations=SN. Accessed May 31, 2019.
190. glaas. Senegal Sanitation, Drinking-Water and Hygiene Status Overview.; 2015. www.who.int. Accessed May 31, 2019.
191. World Development Indicators | DataBank. The World Bank .
192. El Arifeen S, Masanja H, Ehsanur Rahman A. Child mortality: the challenge for India and the world. *Lancet*. 2017;390. doi:10.1016/S0140-6736(17)32469-8
193. Aarons GA, Hurlburt M, Horwitz SM. Advancing a Conceptual Model of Evidence-Based Practice Implementation in Public Service Sectors. *Adm Policy Ment Heal Ment Heal Serv Res*. 2011;38(1):4-23. doi:10.1007/s10488-010-0327-7
194. Gaglio B, Shoup JA, Glasgow RE. The RE-AIM Framework: A Systematic Review of Use Over Time. *Am J Public Health*. 2013;103(6):e38-46. doi:10.2105/AJPH.2013.301299
195. Damschroder LJ, Aron DC, Keith RE, Kirsh SR, Alexander JA, Lowery JC. Fostering implementation of health services research findings into practice: a consolidated framework for advancing implementation science. *Implement Sci*. 2009;4(1):50. doi:10.1186/1748-5908-4-50
196. Proctor E, Silmere H, Raghavan R, et al. Outcomes for implementation research: conceptual distinctions, measurement challenges, and research agenda. *Adm Policy Ment Heal Ment Heal Serv Res*. 2011;38(2):65-76. doi:10.1007/s10488-010-0319-7

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 is 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 causes of death – 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 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 (e.g. Countdown 2015, WHO) and from existing implementation science frameworks (see 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 to 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 (e.g. vaccinations, safe birth practices, insecticide-treated nets), and those treating illness or other complications (e.g. antibiotics, antimalarial medication, neonatal resuscitation). We included interventions that were at the individual process level (e.g. administering the right antibiotic and the right time) as well as those targeting inputs (e.g. development of neonatal intensive care units) and systems needed to deliver the EBIs meeting the definitions of quality including effectiveness, safety, timeliness, and equity (e.g. 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 causes of death seen in some countries, with low birth weight (LBW) and prematurity increasing in importance in causes of mortality.[192]

Table 44: Infant and Child Under-5 Mortality Evidence-Based Interventions

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 C-section for untreated HIV+ mothers**; replacement feeding**
		ARV treatment for mother for life as prevention (started in 2012)
		Exclusive breast feeding
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

Table 45: Neonatal Mortality Evidence-Based Interventions

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	
	C-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)	

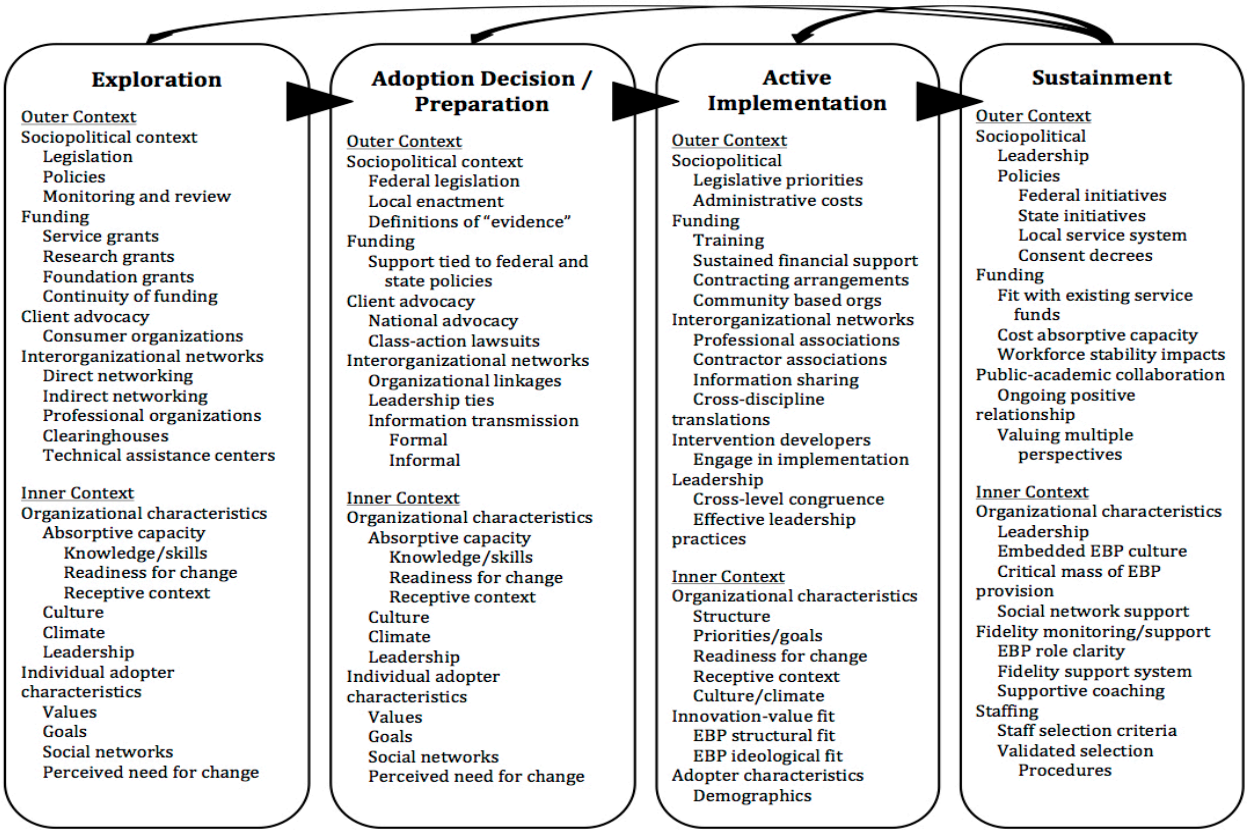
* Further assessment needed in literature review

Both the desk review and the primary research are informed by an implementation science framework that incorporates a number of existing frameworks and is 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 41: EPIS model of implementation (Source: Aarons, et al)



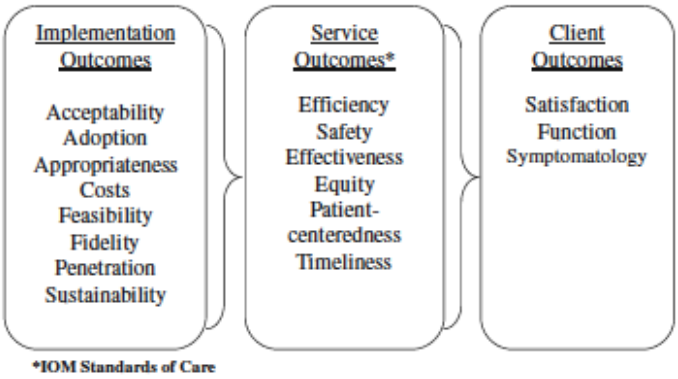
1. **Exploration, Preparation, Implementation, and Sustainment (EPIS)**[193]: This framework walks through four key steps of the implementation process needed to achieve long-term change-starting. Within each phase there are important contextual factors which may influence success (Figure 41).

2. **Re-AIM**[194]**:** 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)**[195]**:** 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)**[196] **:** 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 42).

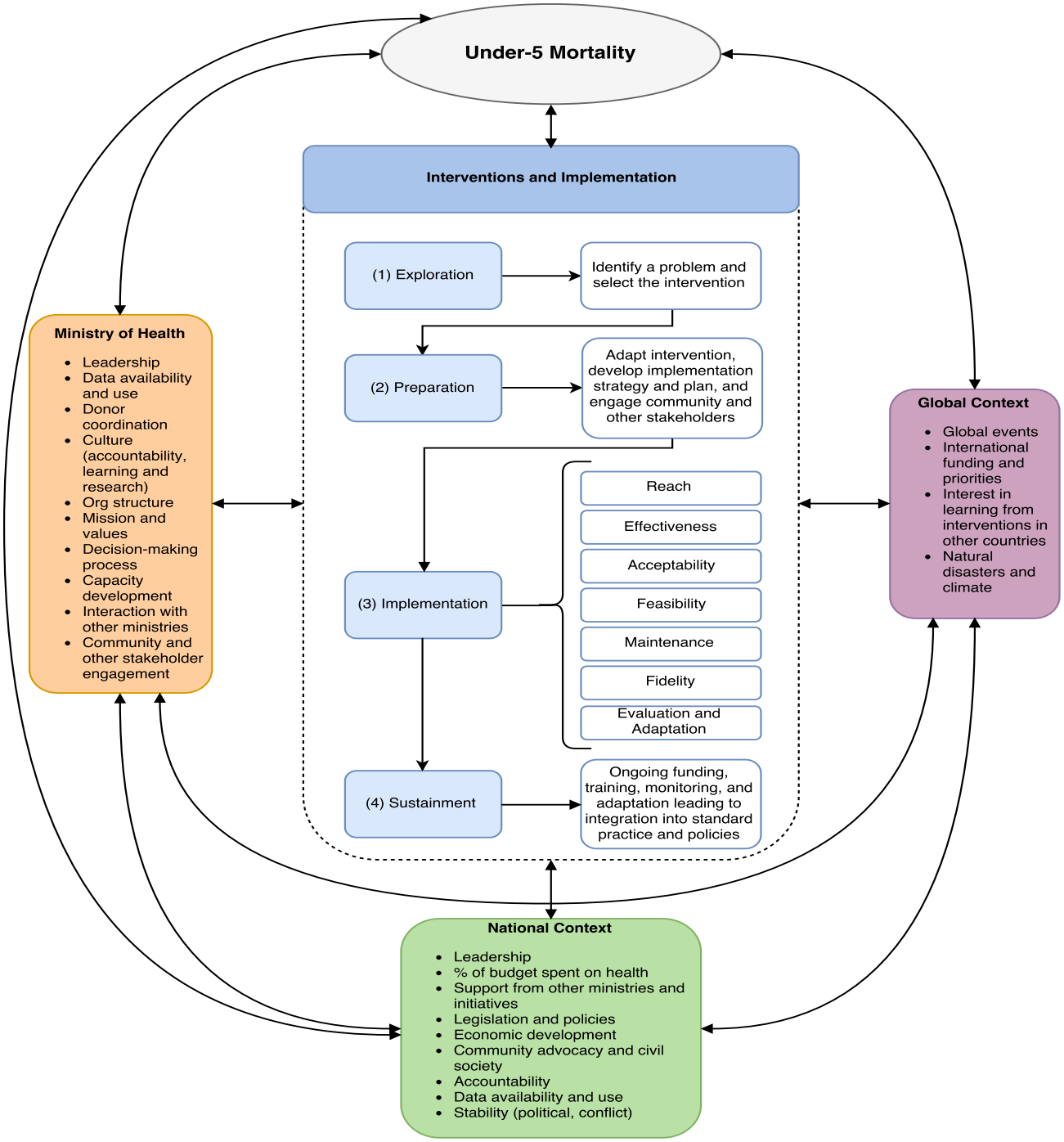
Figure 42: Types of outcomes in implementation research (Source: Proctor, et al)



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 43).

Figure 43: Framework for understanding interventions to reduce under-5 mortality (copyright UGHE)



Desk Review: (Led by Evaluserve 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, causes of death, 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 causes of death 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: (Led by UGHE team and Institute of Population, Development, and Reproductive Health, Cheikh Anta Diop University Dakar)

In collaboration with our in-country partner in Senegal, the Institute of Population, Development, and Reproductive Health, Cheikh Anta Diop University Dakar, we identified KIs 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 close collaboration with the in-country partners, prioritizing those KIs able to provide information on the EPIS stages during the period of study. Key informants 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. While we prioritized individuals active in the study period, we were able to also capture some experiences from before 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 causes of death 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 the project Principal Investigators (Agnes Binagwaho and Lisa Hirschhorn) or in-country team leads, with support from Research Associates and Research Coordinators on both teams taking notes and operating recorders. Following the close of the interviews, notes were combined and the tape recordings (if allowed) were used to clarify areas as needed.

Interview guides were translated into French and interviews were conducted in French or English depending on the linguistic comfort of the KI.

Human Subjects Review

This research was approved by the National Ethics Committee for Health Research, Ministry of Health and Social Work, Senegal. The ethics review committees of UGHE and Northwestern University also approved the study. No quotes or specific viewpoints which are identifiable to the source were included without explicit permission. All recordings and interviews had names removed and were kept in password protected computers and stored on a limited access Google Drive. All recordings were destroyed once the interview coding had been completed.

Key informants were informed about the goals and structure of the project, and consent for participation and recording was obtained separately from the interview (recording was solely for the purpose of reviewing notes).

Analysis and Synthesis

The UGHE team used a mixed methods explanatory approach, applying the framework to understand the progress (or lack thereof) for each cause of death and coverage of chosen EBIs, as well as facilitators and barriers at the local, national, and global levels. This approach was designed to understand what, how, and why the Government of Senegal was able to achieve success in decreasing U5M and what the challenges were. The analyses were also informed by work completed by other initiatives, including Countdown 2015, equity plots from the International Center for Equity in Health (Victora and team), and geospatial mapping from the Institute for Health Metrics and Evaluation (S Hays and team), amongst others.

Key informant interviews were coded by one of the researchers, using Nvivo software 12, and reviewed by at least one of the Principal Investigators for accuracy. The framework was used to extract the EPIS steps, implementation strategies, implementation outcomes, and contextual factors. A priori codes for contextual factors and strategies were adapted and expanded as emerging themes were identified.

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.