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Minimizing disruptions to immunization services in the context of COVID-19 in Senegal:

Lessons learnt and policy options

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African Health Observatory
PLATFORM ON HEALTH SYSTEMS AND POLICIES

World Health Organization
African Region

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About AHOP

The African Health Observatory - Platform on Health Systems and Policies (AHOP) is a regional partnership that promotes evidence-informed policy-making. AHOP is hosted by the WHO Regional Office for Africa (WHO AFRO) through the integrated African Health Observatory and is a network of centres of excellence from across the continent, leveraging existing national and regional collaborations. National Centres currently include the College of Health Sciences, Addis Ababa University, Ethiopia; KEMRI Wellcome Trust, Kenya; the Health Policy Research Group, University of Nigeria; the School of Public Health, University of Rwanda; and Institut Pasteur de Dakar, Senegal. AHOP draws on support from a technical consortium including the European Observatory on Health Systems and Policies (EURO-OBS), the London School of Economics and Political Science (LSE) and the Bill & Melinda Gates Foundation (BMGF). AHOP joins a cohort of regional health systems Observatories including the European Observatory and the Asia-Pacific Observatory (APO) who have shared their learning to inform the development of the AHOP approach.

About AHOP policy briefs

AHOP policy briefs are one of a suite of outputs produced by the platform. We aim to capture current concepts, experiences, and solutions that are of importance to health policymaking within the African region, often applying a comparative lens to learn from diverse approaches. We recognise that there are multiple approaches to writing policy briefs. Through consultation we have developed a distinct AHOP approach, with all our briefs following a common template. AHOP briefs bring together existing evidence and present it in an accessible format; use systematic methods transparently stated; and all undergo a formal and rigorous peer review process.

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Abbreviations

AFP	acute flaccid paralysis
ANC	antenatal consultation
cMYP	comprehensive multi-year plan
cVDPV2	circulating vaccine-derived poliovirus type 2
DAGE	Directorate of General Administration and Equipment
DP	Department of Prevention
DESVR	Division of Epidemiologic Surveillance and Vaccine Response
DT = VAT	tetanus vaccine
DT	diphtheria, tetanus
DTP-HepB-Hib	diphtheria, tetanus, pertussis, hepatitis B, and Haemophilus influenzae type b
EPI	Expanded Programme on Immunization
EVM	Effective Vaccine Management - framework
GHE	Global Health Examples
GVAP	Global Vaccine Action Plan
IA2030	Immunization Agenda 2030
IHME	Institute for Health Metrics and Evaluation
IPD	Institut Pasteur de Dakar
IPV	inactivated polio vaccine
MNT	maternal and neonatal tetanus
MoH	Ministry of Health
MSAS	Ministry of Health and Social Action
NITAG	National Immunization Technical Advisory Group
NSP	National Supply Pharmacy
OPV	oral poliomyelitis vaccine
PPE	personal protective equipment
PSE	Emerging Senegal Plan
RR	measles-rubella
RED	Reaching Every District
SMT	stock management tool
TFP	technical and financial partners
UNICEF	United Nations Children's Fund
VAA	anti-amarile vaccine
WHO	World Health Organization
YFV	yellow fever vaccine

Key messages

The COVID-19 pandemic highlighted the fragility of Senegal's health system: several essential health services experienced a significant decline during the pandemic, particularly immunization services.

Supply and demand side factors disrupted immunization services: on the supply side, there were staff shortages, restrictions on community-based services, insufficient personal protective equipment, health facility closures, and supply chain interruptions due to the prioritization of COVID-19 response efforts. Meanwhile, lockdowns limiting access to services, financial difficulties, fears of COVID-19 exposure, as well as stigma and misinformation decreased demand for services.

Innovative strategies helped sustain immunization provision: policies at both the national and regional levels, such as the comprehensive multi-year plan for 2019–2023, the Reach Every District strategy, the outreach strategy, and awareness campaigns, were successfully implemented to reinforce commitment and decrease disparities in immunization services.

Pandemic preparedness requires multistakeholder collaboration: establishing partnerships is crucial for implementing best practices in primary health care and for strengthening health systems. Incorporating successful innovations developed during the COVID-19 vaccination campaign, sensitizing health care providers, and emphasizing community ownership could help build system preparedness.

Executive summary

The issue

A number of essential health services were disrupted in Senegal's overstretched health system during the COVID-19 pandemic. Immunization, which saves up to three million lives each year, was one of the most severely affected services, with a sharp decline in supply and/or demand. The interruption of routine immunization services increases susceptibility to vaccine-preventable diseases among vulnerable populations.

The problem

Declining immunization coverage rates for measles, polio, yellow fever, and maternal and neonatal tetanus were evident during the pandemic. This was attributed to a shortage of personnel and a reduction in the availability of immunization services, as a large number of them were repurposed to respond to the pandemic. The population's fear of visiting health care facilities also played a significant role in reducing demand for immunization services. In terms of governance, the pandemic affected the ability to hold regular quarterly monitoring meetings, resulting in only two meetings in 2020 and one in 2021. In addition, funding for the Expanded Programme on Immunization (EPI) was diverted to the COVID-19 Fund. Consequently, progress towards ensuring equity in immunization coverage across all districts was hindered. Traditional vaccine production was also affected as laboratories focused on developing effective COVID-19 vaccines.

Contingency measures

Several strategies were devised prior to the pandemic to forestall disruptions in immunization services and respond to changes. The 2019–2023 comprehensive multi-year plan (cMYP) is the principal governing strategy, which outlines 14 priority areas of concern. EPI performance briefings, community leader-supported immunization programmes, and awareness building were implemented to address disruptions. The Reaching Every District (RED) strategy was implemented by all districts to ensure the continuity of immunization activities during the pandemic, and the outreach strategy targeted the reduction of inequalities in large cities. Financing flows were put in place to ensure continuity of activities. The concrete results of all these strategies are yet to be evaluated; however, regular meetings are held to track the progress of the various activities.

Conclusion

Policies, informed by the lessons learnt from previous waves, could be implemented to minimize the disruption of immunization services due to the ongoing COVID-19 pandemic. Immunization service stakeholders in Senegal should consider:

- Reforming best practices in primary health care and rebuilding resilient health systems by adopting the World Health Organization (WHO) Operational Guidance for maintaining essential health services during the COVID-19 pandemic (WHO, 2020a).
- Taking advantage of innovations introduced during the COVID-19 immunization campaign, such as digital immunization platforms, to support child immunization delivery and real-time monitoring.
- Raising awareness among health-care providers, especially those working at the community level, of the importance of maintaining immunization service delivery during the COVID-19 pandemic.
- Emphasizing community ownership through awareness, equity, and decentralized accountability, ensuring a highly diverse, skilled, and empowered network of community health workers.

Introduction

The COVID-19 pandemic revealed the vulnerability of essential health services globally and caused major disruptions, particularly in immunization services.

In 2020, an estimated two thirds of 105 countries reported disruptions to routine facility-based and/or outreach immunization services (WHO, 2020b). Within the same year, an estimated 23 million children missed out on basic childhood vaccinations, accounting for the highest number since 2009 and representing a significant increase from 2019 (UNICEF, 2021; WHO, 2021a). Some settings experienced an upsurge in deadly diseases, such as measles outbreaks observed in Nigeria and Côte d'Ivoire between late 2020 and early 2021 (WHO, 2022a). The indirect effects of the pandemic on routine immunization services will likely lead to increased illness and death for many years, particularly among vulnerable populations such as women and children.

Figure 1. Global missed immunizations

countries in 2020 reported **disruptions** to **routine immunization** services

were left without **basic childhood vaccinations**, the highest number since **2009**

some settings experienced an **upsurge in diseases**, such as measles outbreaks

increased illness and death is anticipated, particularly among women and children

Senegal had its first confirmed COVID-19 case on 2 March 2020, and subsequently, a state of emergency was declared. Three years later, Senegal has recorded 88 902 COVID-19 cases and nearly 1971 deaths (WHO, n.d). The effects of the pandemic exposed the fragility of the health system and the country continues to experience many health, political, and socioeconomic disruptions. Several essential health services experienced declines in supply and/or demand, particularly those catering to vulnerable groups (WHO, 2020b). Echoing the global situation, in Senegal, routine immunization is thought to be one of the services most affected by COVID-19 (Khatiwada et al., 2021).

In response to the pandemic and further anticipated health system disruptions globally, WHO and international development partners appealed to governments and public health decision-making bodies to ensure the continuity of essential services, including immunization (WHO, 2021b). Gavi, UNICEF, WHO, and other partners launched the Immunization Agenda 2030 (IA 2030), an overarching global vision and strategy for immunization, which aims to save over 50 million lives (UNICEF, 2021). Based on the global strategy, since 2018 the EPI in Senegal has focused on 13 vaccine-preventable diseases. The priority is four diseases targeted for eradication, namely measles, yellow fever, polio, and maternal and neonatal tetanus (MSAS, 2018).

There is a need for evidence-based thinking to identify the level of disruptions in the immunization services for diseases targeted for eradication in Senegal and to understand the impact of the COVID-19 pandemic on the supporting health system components of immunization services, for example, the Directorate of General Administration and Equipment (DAGE) and the National Supply Pharmacy (NSP). The results of this brief will inform the development and implementation of evidence-based policies to ensure the continuity of relevant immunization services during and after the COVID-19 pandemic. The findings will also contribute to new strategies to build health system resilience and support the re-engineering of the health system.

Key questions

- What disruptions were noted in measles, yellow fever, polio, and maternal and neonatal tetanus immunization services during the COVID-19 pandemic at the national and subnational levels in Senegal?
- What were the constraints, bottlenecks, or deficits caused by the COVID-19 pandemic on immunization services in 2020 and 2021 in Senegal?
- What contingency measures were put in place to mitigate disruptions to immunization services in Senegal?

This brief will culminate in evidence-based strategies and policy insights to minimize disruptions to immunization services and contribute to Senegal's progress toward accelerated control of endemic diseases that are targeted for eradication.

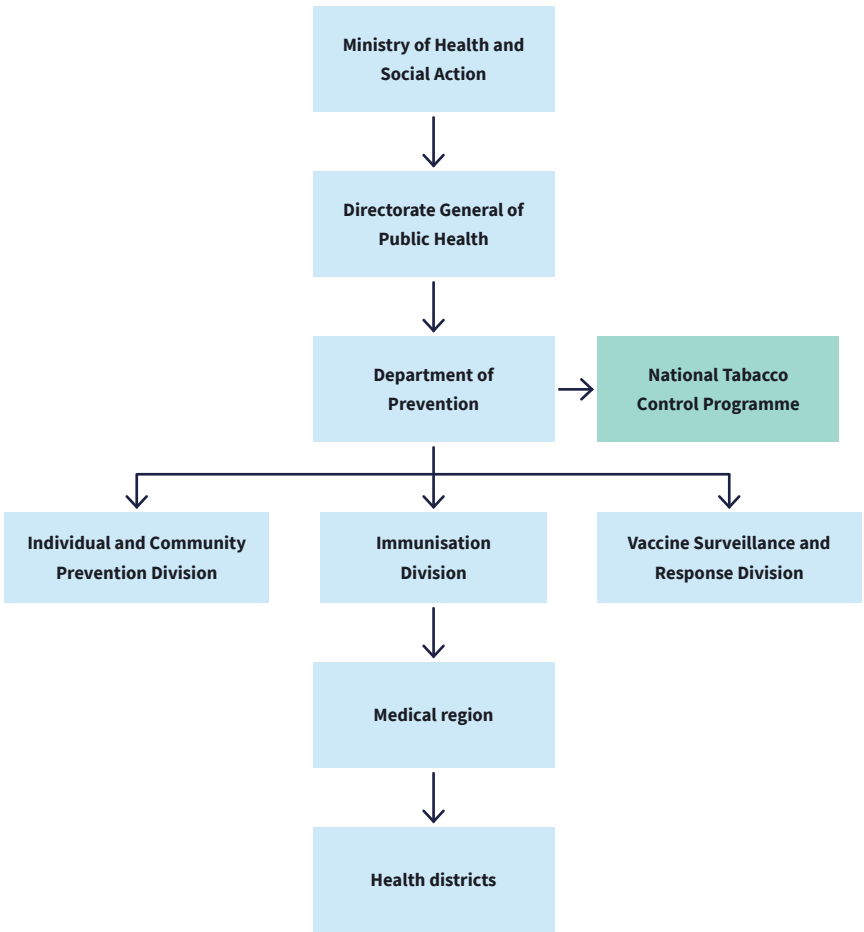
Methodology

This brief draws on local and global evidence to inform efforts to better prepare for disruptions to immunization services and the wider health system in Senegal. A desk review was conducted that involved scanning literature and the available evidence base. Sources included related literature, reports, and databases from WHO and UNICEF, as well as government performance reports, strategic plans, annual activity reviews, and the DHIS2 database. The sources were supplemented by semi-structured interviews with local immunization experts and Ministry of Health (MoH) – Department of Prevention (DP) – officials. The data used in this brief date from 2010 to 2021 for disease incidence and immunization coverage. The keywords used were vaccination, immunization, disruption of services, and impact of COVID-19.

The Expanded Programme on Immunization

Located in western Africa, Senegal covers an area of almost 197 000 km^2 and has a population of over 17 million (World Bank, 2022). The Senegalese health system is organized in a pyramidal structure with three levels: the central (national) level (Ministry of Health and Social Action [MSAS]), the regional (intermediate) level, and the operational (peripheral) level (MSAS, 2018). The DP houses the national EPI (Figure 2).

Figure 2. Organization chart of the Ministry of Health and Social Action (MSAS), Department of Prevention (DP)



Source: MSAS, comprehensive multi-year plan (cMYP 2019–2023).

Senegal's EPI was first launched in 1979. Since 2008, the EPI has offered vaccinations against 13 diseases to children in all localities of the country, four of which are targeted by the Division of Immunization for eradication (polio) and elimination (measles, yellow fever, maternal and neonatal tetanus) through immunization. The strategies designed to address the four diseases are eradication, elimination, and control. These strategies involve:

- **i.** continued supplementary immunization activities against polio,
- **ii.** a measles/rubella campaign,
- **iii.** implementing a preventive campaign against yellow fever, and
- **iv.** implementing the recommendations of a validation survey as well as a control strategy for maternal and neonatal tetanus (MSAS, 2018).

The current infant immunization schedule in Senegal is presented in Figure 3, and the vaccines for the four targeted diseases in Table 1. Routine immunization in Senegal is divided into three operational models according to the distance (km) between the facility and the child's home (Figure 4).

Figure 3. Current EPI schedule in Senegal, Department of Prevention (as of July 2021)

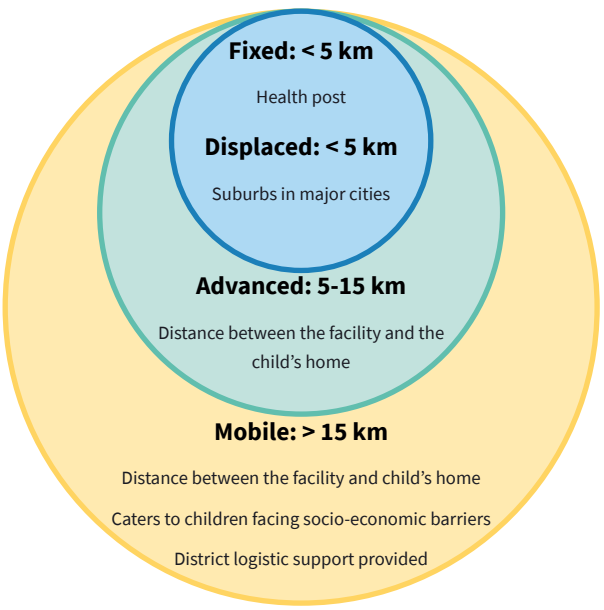
BCG, VPO, HepB	Penta 1, Pneumo 1, VPO 1, Rota 1	Penta 2, Pneumo 2, VPO 2, Rota 2	Penta 3, Pneumo 3, VPO 3, VPI	Vitamin A	RR1 + VAA	Vitamin A	RR2
Birth	**1 1/2 months**	**2 1/2 months**	**3 1/2 months**	**6 months**	**9 months**	**12 months**	**15 months**
Protects from: Tuberculosis, Polio, Hepatitis B	**Protects from:** Diphtheria, Tetanus, Whooping cough, Hepatitis B, HIB infection, Pneumococcal Infection, Polio, Rota virus diarrhoea	**Protects from:** Diphtheria, Tetanus, Whooping cough, Hepatitis B, HIB infection, Pneumococcal Infection, Polio, Rota virus diarrhoea	**Protects from:** Diphtheria, Tetanus, Whooping cough, Hepatitis B, HIB infection, Pneumococcal Infection, Polio		**Protects from:** Measles, rubella, yellow fever		**Protects from:** Measles, rubella

Source: EPI Immunization Schedule, 2021.

Table 1. Vaccines against polio, measles, yellow fever, and maternal and neonatal tetanus in Senegal

Diseases	Vaccines
Polio	Inactivated polio vaccine (IPV)
	Oral polio vaccine (OPV)
Maternal and neonatal tetanus	Diphtheria, tetanus, pertussis, hepatitis B, and Haemophilus influenzae type b (Penta=DTC-HepB-Hib)
	Tetanus vaccine (VAT=DT)
Yellow fever	Anti-amarile vaccine (YFV=VAA)
Measles	Measles-rubella (RR)

Figure 4. Routine immunization in Senegal: operational models according to the distance (km) travelled by the mother to vaccinate her child



Source: MSAS, 2018.

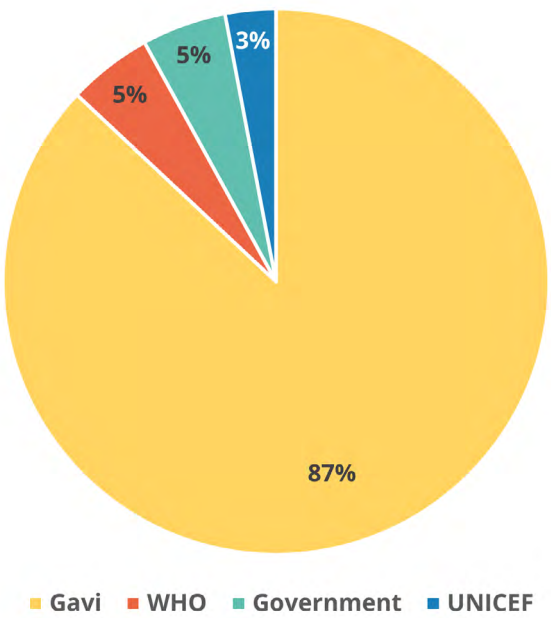
At the national level, the cMYP 2019–2023 is a five-year strategic plan that serves as the reference document for the country's immunization policy (MSAS, 2018). The supervision schedule involves visits every six months from the central level to the regions, every three months from the regions to the districts, and every month from the districts to the health posts. However, it is important to note that a lack of human resources, logistics, and overlapping activities have resulted in irregular supervision, especially from the central level to the regions and districts.

Immunization funding

There is currently no legislation in place to identify the sources of public revenue for financing immunization programmes in Senegal. However, the Directorate of General Administration and Equipment (DAGE) is responsible for the financial management of the Expanded Programme on Immunization (EPI). Since the implementation of the Vaccine Independence Initiative, DAGE has ensured the purchase of traditional vaccines such as BCG, OPV, VAA first dose, and RR through a secure budget line. The Government co-finances new vaccines but remains dependent on technical and financial partners (TFP) to cover operating costs.

In terms of funding streams for EPI activities and routine disease surveillance in Senegal, there are four main contributors: the Government, Gavi, UNICEF, and WHO. Gavi is the largest contributor, providing 87% of funding, followed by the Government (5%), WHO (5%), and UNICEF (3%) (Figure 5). The main expenditure items of the EPI are programme management (42%), vaccine procurement and logistics (35%), and service delivery (11%) (2019 breakdown) (MSAS, 2018).

Figure 5. Distribution of EPI funding flows in 2019



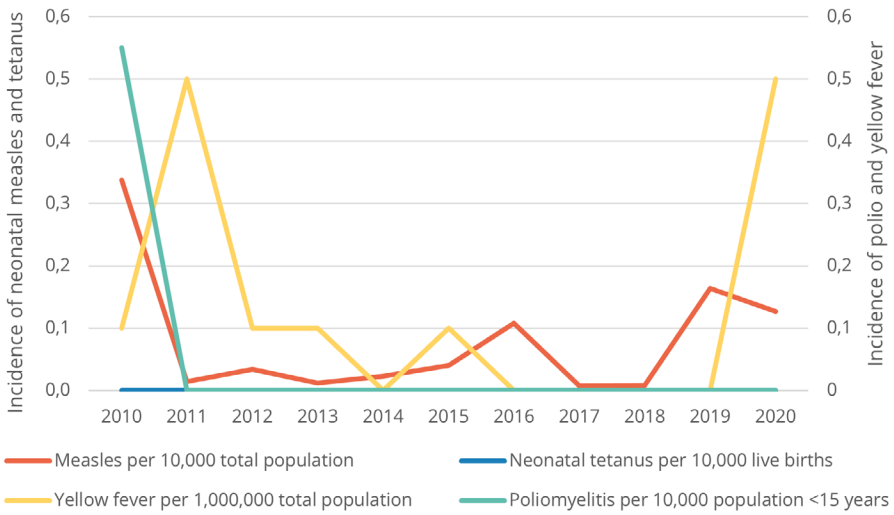
Source: Annual review of activities of the Department of Prevention, 2019.

Disease eradication and elimination

The incidence of yellow fever, measles, polio, and maternal and neonatal tetanus was recorded from 2010 to 2020 (Figure 6). In 2011, the incidence of these diseases decreased significantly, with the exception of yellow fever, which saw a sharp increase. By 2020, there were no reported cases of maternal and neonatal tetanus and polio. However, a 2021 report revealed that an outbreak of circulating vaccine-derived poliovirus type 2 (cVDPV2) occurred in Senegal, with 29 confirmed cases, 17 of which resulted in paralysis, linked to an outbreak in Nigeria (UNICEF, 2022a). More than 80% of cases were reported in two regions; Dakar and Diourbel. Vaccine-derived polioviruses are rare, but these viruses affect unimmunized and under-immunized populations living in areas with inadequate sanitation and low levels of polio immunization (UNICEF, 2022a).

Figure 6 also shows an increase in the incidence of measles from 2018 to 2019 and yellow fever from 2019 to 2020. A 2020 performance report from the Surveillance Division of the MSAS Prevention Directorate further revealed that in 2020, ten cases of yellow fever were recorded in the medical regions of Tamba (4), Matam (2), and one case each in Kedougou, Diourbel, St Louis, and Dakar (MSAS, 2020b). The number of confirmed measles cases also increased from 240 in 2020 to 270 in 2021, with an increased incidence across most regions in Senegal (MSAS, 2020b).

Figure 6. Trends in the incidence of the four diseases, 2010–2020



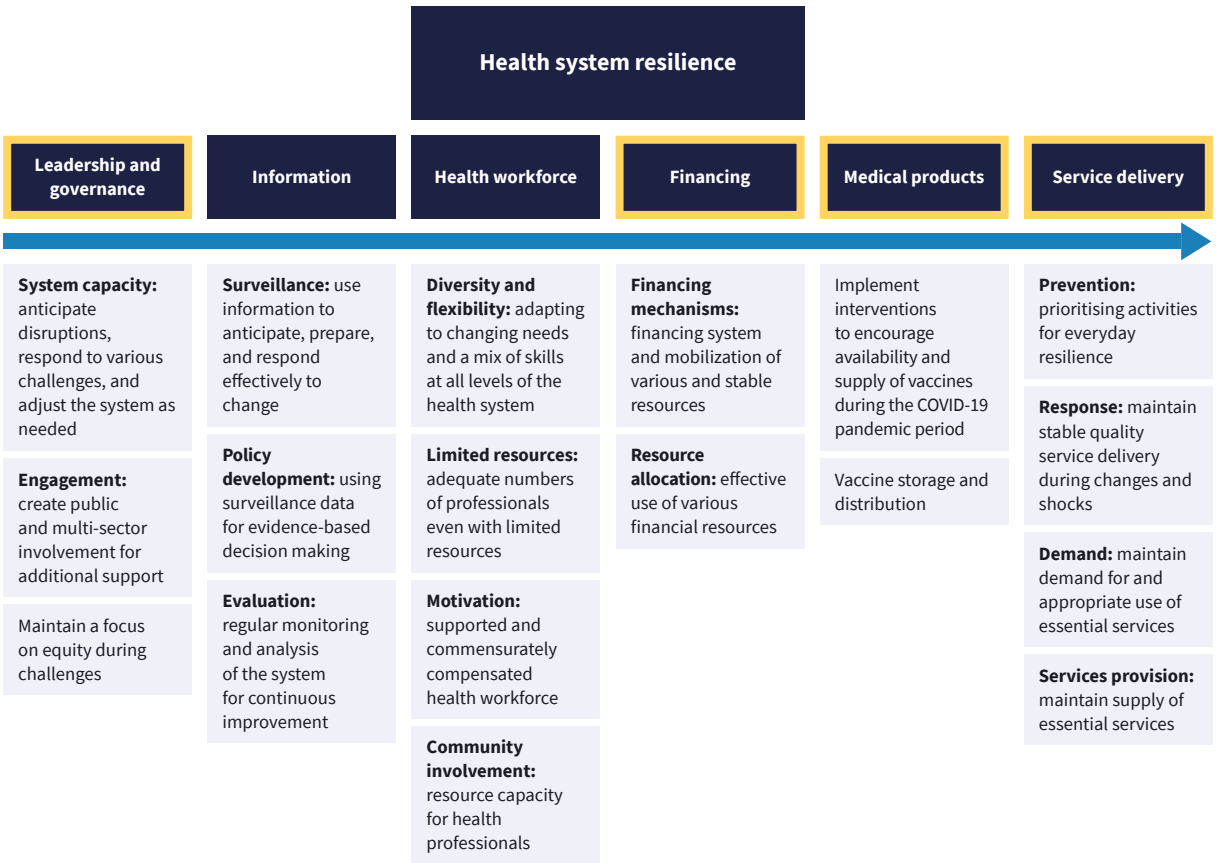
Source: UNICEF, 2022b.

In Senegal, the performance of surveillance and immunization efforts is measured using indicators of the four diseases targeted for eradication and elimination, including acute flaccid paralysis (AFP) for polio, measles, yellow fever, and maternal and neonatal tetanus. In 2020, the majority of vaccines had a coverage rate of 90%, with the exception of the hepatitis B birth dose, the second dose of measles-rubella, and human papillomavirus (HPV) vaccines. The Dakar and Ziguinchor regions failed to meet performance targets, possibly due to the overestimation of immunization targets in Ziguinchor and inadequate data collection from private facilities in Dakar. Six of the 14 regions improved their performance from 2019 to 2020. Despite overall success, there was a slight decrease in vaccine coverage from 2019 to 2020, which may be related to the COVID-19 pandemic (MSAS, 2020b).

Building health system resilience

A whole-system approach is required to understand the ramifications of health system disruptions on vaccination campaigns and to build resilience to shocks. This brief examines the delivery of immunization services using the Fridell et al. model, which incorporates the WHO health system building blocks and the essential components (governance, financing, medical products, and service delivery) of the immunization programme for diseases targeted for eradication and elimination (yellow fever, polio, measles, and maternal and neonatal tetanus) in Senegal (Fridell et al., 2019). The focus of the analysis is on leadership and governance, financing, vaccine supply and distribution, and demand and provision of immunization services. The goal is to provide relevant policy implications for re-engineering and building the resilience of the immunization system.

Figure 7. Characteristics of health system resilience in each of the six WHO health system modules



Source: Adapted from 'Characteristics of Health System Resilience' within each of the WHO 6 Building Blocks in Fridell et al., 2019.

Disruptions to immunization services due to the COVID-19 pandemic

Global

Public health emergencies have major implications for populations and the continuity of essential health services. This is evidenced in changes in the provision of and demand for health services, resulting in decreased coverage of essential services, including immunization services. Significant pandemic-related disruptions to immunization services have been observed globally. Over three rounds of the WHO Pulse Survey – designed to collect data on the extent of disruptions to essential health services – significant immunization service disruption was reported across 2020 and 2021.

Between May and July 2020, the provision of routine immunization services was one of the most frequently disrupted services, in particular, outreach services (70%) and facility-based services (61%) (WHO, 2020c). Similar findings were observed in early 2021, though at a lower magnitude and extent, with around one third of countries reporting disruptions (WHO, 2021c). In late 2021, global disruptions to routine immunization services increased again, as reported by almost half of reporting countries (WHO, 2022b).

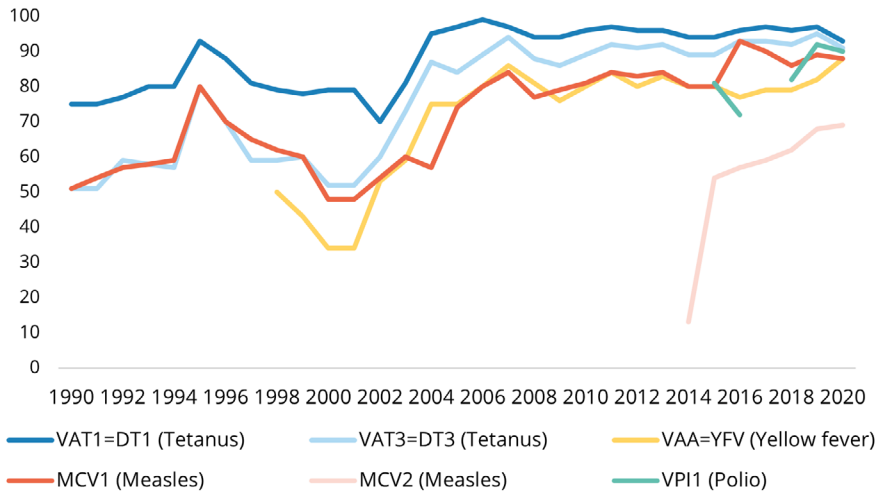
In addition to routine immunization disruptions, mass vaccination campaigns experienced COVID-19-related disruptions. One study revealed 57 postponed mass vaccination campaigns in 66 countries in 2021 for measles, polio, yellow fever, and other diseases, affecting millions more people (WHO, 2021d). This increases the risk of larger outbreaks around the world. One global study estimated that 30 million children missed DTP3 and 272 million children missed MCV1 in 2020, representing an additional 8.5 million and 8.9 million children, respectively, not routinely vaccinated on account of the COVID-19 pandemic (Causey, 2021). The lowest number of vaccine doses administered was observed in April 2020, when 33% fewer DTP3 doses were administered globally, ranging from 9% in the WHO African Region to 57% in the South-East Asia Region. Recovery of vaccinations began by June 2020 and continued into late 2020: more children were immunized in December 2020 than in December 2019.

These global disruptions in immunization services have been observed in the African Region. Findings from the late 2021 Pulse Survey indicate that 57% and 53% of reporting African countries saw disruptions in outreach and facility-based immunization services, respectively (WHO, 2022c). For example, in Côte d'Ivoire, a study on the effects of the COVID-19 pandemic on vaccination activities in Treichville revealed that at the International Vaccination Centre, activities dropped by about 50% in March 2020, then 86% in April 2020, and 82% in May 2020, compared to 2018 and 2019. For community vaccinations, activities decreased by about 26% in March 2020 and 99% in April and May 2020 (Touré and al., 2021). Despite the disruptions, data from Gavi countries suggest African countries saw relatively limited differences in vaccination rates through 2020 and early 2021, particularly in comparison to Asia and Latin America (Anuradha Gupta, 2021).

Senegal

The COVID-19 pandemic impacted immunization efforts in Senegal, particularly for diseases targeted for eradication and elimination. The number of pregnant women and infants aged 1–3 months receiving the maternal and neonatal tetanus vaccine (DT1 and DT3) decreased by 6% and 4% respectively from 2019 to 2020 and 2021 (Masresha et al., 2020). An equity perspective shows that 64% of the 77 districts reached the target coverage of 90% for DT3. The polio vaccine (DT3) also showed a decline, with a drop of 10% in the number of children vaccinated between April to June 2020 compared to between January and March 2020 (Sow et al., 2020). The yellow fever vaccine (VAA) saw a 2% increase from 2019 to 2020 but decreased from 94.8% to 92.4% between 2020 and 2021, with the lowest coverage in the regions of Thies, Fatick, Matam, and Ziguinchor (WHO, 2016). The coverage rates for measles vaccines remained relatively stable, with 57% (44/77) of districts meeting their coverage targets for RR1 (Figure 8) (Ortiz, 2016; WHO, 2016; MSAS, 2020b). The highest coverage was recorded in Kedougou, and the lowest in Ziguinchor. In general, vaccination rates for maternal and neonatal tetanus and polio were higher before COVID-19, while those for measles and yellow fever did not change significantly.

Figure 8. Trends in immunization coverage against the four diseases in Senegal, 2010–2020



Source: UNICEF, 2022b.

Immunization adherence and coverage

In 2018, a review by the DP highlighted very high adherence to immunization schedules and services among the Senegalese population. Dropout rates were estimated by comparing the number of infants who start immunization schedules with the number who complete them. Dropout rates remained low and consistently decreased between 2001 and 2019, with the penta 1/penta 3 national average dropout rate decreasing from 22.4% to 5%, with noted differences across regions. In 2019, the penta3/RR1 dropout rate was at 10% nationwide.

During the COVID-19 pandemic, one way to evaluate potential disruptions in demand between different vaccination checkpoints was through dropout rates. In Senegal, EPI monitoring and the report of the Epidemiological Surveillance meeting (December 2020) noted that from January to October 2020, there were still low dropout rates (<5%) for penta 1 and penta 3 vaccination (-1%), penta 1/RR1 (-2%), and penta 3/RR1 (-3%), with the rates over the first three months comparable to pre-COVID-19 estimates (Figure 11). However, the RR1/RR2 dropout rate was high, at 20% (comparing dropout from month 9 to month 15). Additionally, the Immunization Division of the DP reported that vaccination dropout rates in Senegal significantly decreased from 2017 to 2021 (DP, 2020b).

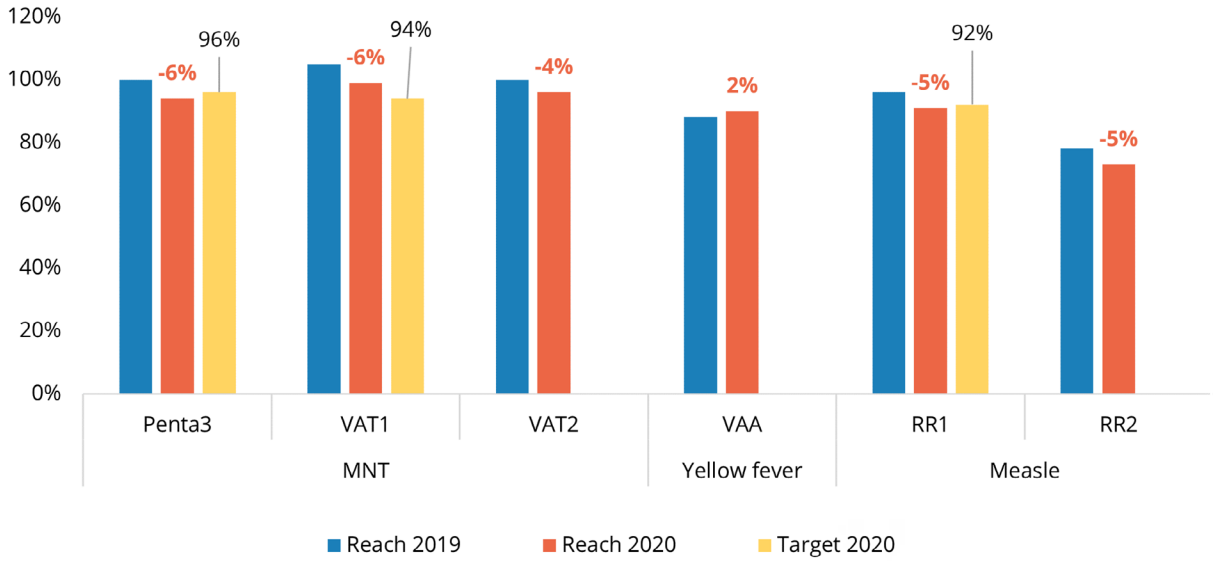
The analysis of dropout rates suggests that the COVID-19 pandemic did not affect dropout rates for most vaccines, except for RR1/RR2. Low dropout rates are an indication of high demand for immunization services. However, studies by the Global Health Examples partnership (GHE) highlighted potential disruptions in demand for immunization services during the COVID-19 pandemic (Dixit et al.,2019). This could be explained by multiple challenges such as staff shortages and restrictions on community-based services. Therefore, it appears that the disruption in demand for immunization services is not entirely related to variations in dropout rates.

Figure 9a. Trends in vaccination coverage for polio, measles, maternal and neonatal tetanus, and yellow fever in Senegal, 2017–2021

Figure 9b. Regional trends in vaccination coverage for polio, measles, maternal and neonatal tetanus, and yellow fever in Senegal, 2017–2021

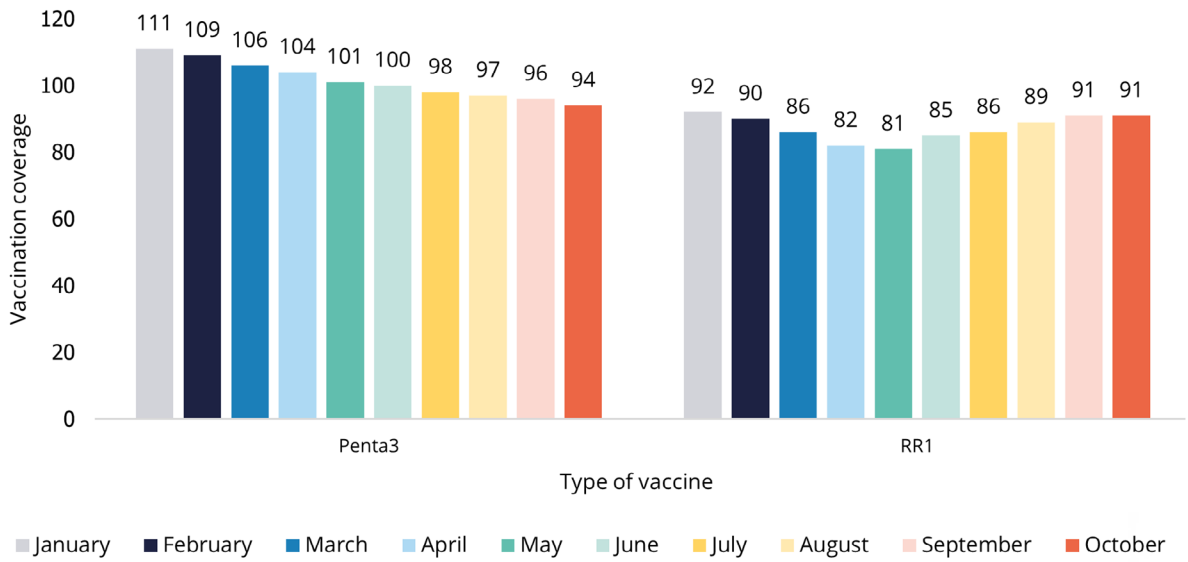
Source: MSAS, 2021.

Figure 10. Changes in vaccination coverage, 2019–2020



Source: Department of Prevention, Epidemiological Bulletin, author's construction (DP, 2020a).

Figure 11. Trends in Penta 3 and RR1 vaccination coverage, January–October 2020



Source: DP, 2020b.v

Note: COVID-19 cases peaked in August 2020 and a second wave was reported from September to November 2020.

Causes of disruptions to immunization services

Several factors are reported as causes of disruptions to immunization services. These reasons may relate either to the supply or demand side of immunization services.

Supply

According to Dixit et al. (2021), the GHE Partnership investigated the impact of the COVID-19 pandemic on routine childhood immunization in Senegal and identified several disruptions to service delivery, as shown in Figure 12:

- **Staff shortages:** health facility staff were tasked with managing and responding to COVID-19 (49%), which reduced their availability for other services, including immunization (WHO, 2020a).
- **Restrictions on community-based services:** mass rallies were banned in mid-March 2020, which delayed outreach and mobilization activities to boost community immunization, such as those conducted by community health workers (commonly called “Badienou Gokh”).

There were also other factors that disrupted service delivery in Senegal during the COVID-19 pandemic (WHO, 2020a):

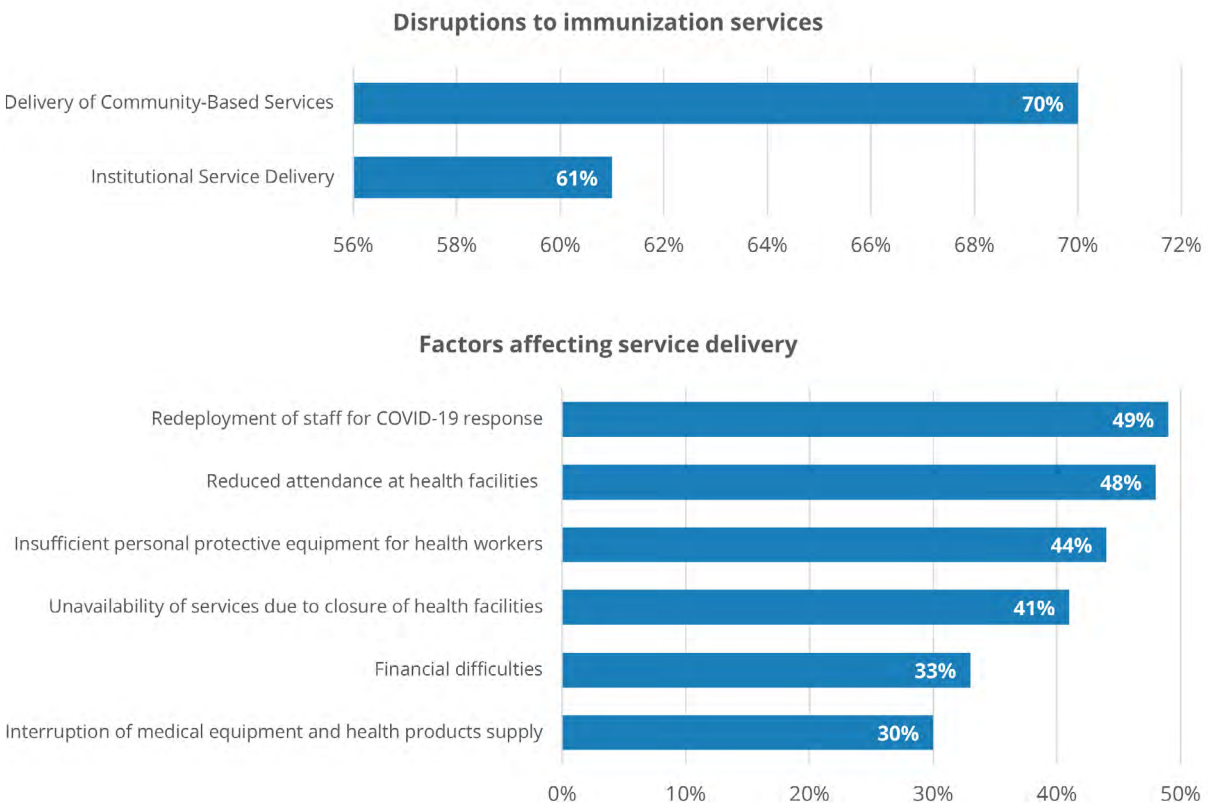
- **Insufficient personal protective equipment (PPE):** a total of 44% of health care workers had inadequate PPE, exposing them to infection.
- **Closures of health facilities:** between 33% and 41% were closed, leading to unavailability of services.
- **Supply chain interruptions:** a 30% interruption in the supply of medical equipment and health products led to delays in routine immunization.

Demand

Based on studies evaluating immunization service demand during the COVID-19 pandemic, there was evidence of reluctance to participate in routine vaccination. For instance, the GHE partnership highlighted the following challenges:

- **COVID-19 restrictions:** patient attendance in health facilities substantially declined for vaccine services as a result of lockdowns (48%) and financial difficulties (33%) (WHO, 2020a).
- **Concerns about COVID-19 exposure:** patients refused care when home visits were offered by community health workers in full PPE.
- **Stigma, fear, and misinformation:** fifty-seven per cent of countries reported these reactions to the COVID-19 response and the safety of immunization services, which became more significant in 2021. Rumours spread about an ‘possible evil’ COVID-19 vaccine trial in Senegal.

Figure 12. Disruptions to immunization services and factors affecting service delivery



Source: Dixit et al., 2021.

These observations were confirmed by a survey conducted by the Africa CDC in 15 African countries in 2021, which showed a reduction in demand for routine vaccination due to the COVID-19 pandemic. The findings reported that 29% of Senegalese participants felt that vaccination in general is not risk-free. In addition, 26% of Senegalese surveyed were less likely to get vaccinated in 2020 than before the COVID-19 pandemic. Senegal had one of the highest rates of vaccine hesitancy among the 15 African countries included in the survey (Africa CDC, 2021). These data show that there was indeed a reduction in demand for routine immunization services, thus stressing the need to implement strategies and contingency measures to boost demand and adherence.

Given the increase in COVID-19 cases, many countries have adopted multiple personal protective measures resulting in a significant decrease in outpatient visits and consequently immunization rates for children have decreased (Infanti et al., 2020). The above analyses have shown that vaccination coverage rates for the four diseases (yellow fever, measles, polio, and maternal and neonatal tetanus) declined between 2019 and 2020. This could be a result of the decrease in outpatient visits during the COVID-19 pandemic, highlighting the attendant disruptions in immunization services over the same period.

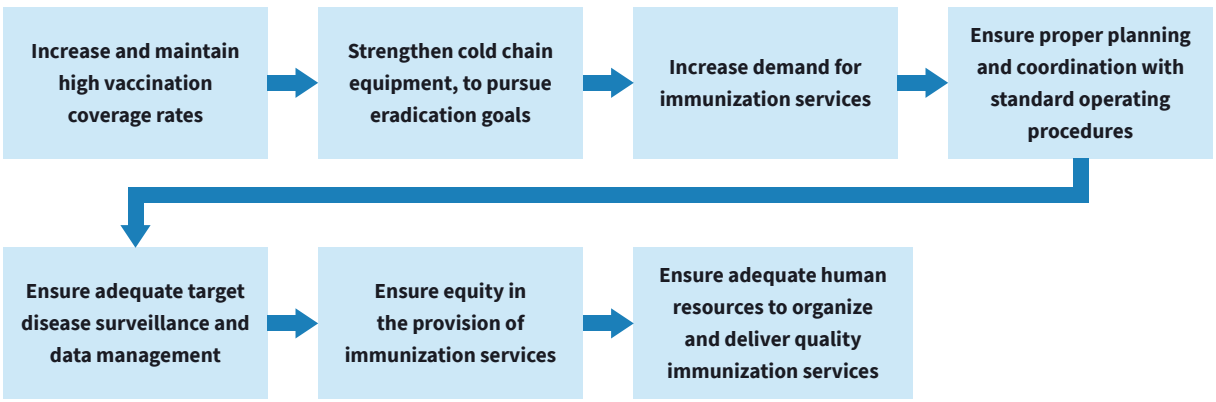
Vaccination coverage depends on a range of factors within the immunization system, such as leadership and governance, service provision and human resources, input costs and financing, supply and demand, quality and logistics of medical products, and communication (MSAS, 2018). These components present strengths, weaknesses, and opportunities in the elaboration of strategies for better vaccination coverage in Senegal in the context of the COVID-19 pandemic. Applying this conceptual framework, this section addresses these aspects of the immunization system and how they were incorporated within the responses and contingency measures to ensure continuity of vaccination services in Senegal during the COVID-19 pandemic.

Governance

The comprehensive multi-year plan

High routine immunization coverage in Senegal has been driven by a prioritization of immunization programming across the policy-making environment – inclusive of all levels of the health system (national, regional, district, and community levels) and external partners. To strengthen commitment and strategic direction, the cMYP 2019–2023 guides the immunization programme. This multi-year plan presents the 14 different priority areas of concern for which strategies and operations are developed and critical indicators assessed. These priority areas encompass the following, with a cross-cutting emphasis on equity:

Figure 13. Different priority areas of the comprehensive multi-year plan 2019–2023



Source: MSAS, 2018.

Coordination meetings and supportive supervision take place frequently and at all levels of the health system to support implementation of the cMYP and improve accountability and transparency (Sakas et al., 2022). At the health facility level, the non-performers (the facilities that have not reached their targets for a long time) are brought together to find solutions to enable them reach their targets. At the peripheral level, briefings with health workers and community representatives on EPI performance and needs are also held quarterly with the aim of strengthening, improving the quality, and popularizing disease surveillance systems to generate information for informed decision-making. Due to the pandemic, these community-level meetings could only take place twice in 2020 and once in 2021.

Effective leadership has been fundamental in enabling a resilient routine immunization. Noting a drop in immunization coverage, additional supportive supervision meetings were held between the national/regional level and district management teams. On 23 June 2020, the MoH sent a concept note with an official letter addressed to regional Chief Medical Officers, Chief District Physicians, and Regional Governors to encourage them to ensure the continuity of immunization services for the protection of health workers and the community in all health facilities (MSAS, 2020a).

Population and stakeholder engagement

Health workers travelled to communities to vaccinate children, which helped to improve immunization coverage. Within each district, MoH staff visited the operational level as part of the outreach strategy. Each district provided an action plan to benefit from crisis exit funding (Gavi), which enabled rescheduling and drawing up of plans to relaunch vaccination activities. Lastly, as part of strategies to ensure vaccination continuity, retired health workers were called up to avoid shutting down other vaccination-related services. Those who were recruited were assigned to COVID-19 care services, so that workers who had been re-assigned to COVID-19 care could return to their original duties.

The current vision of the EPI is to contribute to the development of human capital, which is the second axis of the Emerging Senegal Plan (PSE). PSE is a ten-year strategy (2014–2023), backed by a vision of an emerging Senegal by 2035 through three strategic axes: (i) structural transformation of the economy and growth; (ii) human capital, social protection, and sustainable development; and (iii) governance, institutions, peace, and security. This vision of the EPI is in phase with the WHO Global Vaccine Action Plan (GVAP). It emphasizes the transition to immunization that is driven by informed public demand, allowing for the recognition of the right to immunization and the responsibility of the State and communities (cMYP 2019–2023).

Throughout the pandemic, alignment of priorities between governmental entities and external partners was prioritized. Furthermore, to maintain the commitment of the population and stakeholders, a number of communication and outreach engagement strategies were put in place, such as awareness-raising activities with the support of community and religious leaders. Academics, such as the paediatrician, Dr Ousmane Ndiaye, through his various media appearances, also helped raise awareness about vaccination. Lastly, multisectoral interventions were undertaken, which facilitated engagement with various stakeholders such as the Ministries of Health, Education, and Security; youth organizations; and religious leaders in promoting vaccine acceptance and sharing information across the 14 regions of Senegal (UNICEF, 2022a).

Maintaining the focus on equity

In the cMYP 2019–2023, the focus is on equity, particularly geographic equity. Geographic equity is measured by the proportion of districts with immunization coverage above 80%. Equity in relation to gender, educational level and income are also considered. The proportion of fully vaccinated children is lower in the south (68%) and higher in the central region (82%). The immunization equity analysis approach is used to identify priority districts as well as innovative strategies to reach the remaining children in these districts.

In 2017, a prioritization strategy focusing on improving vaccination coverage and reducing the number of unvaccinated children was implemented for a select number of districts. Fifteen priority districts were selected in 2018 to conduct an EPI analysis using the immunization equity approach and to develop their annual action plans based on this analysis. Six more districts were added in 2019, bringing the total to 21. In 2020, the plans were approved and partially funded, but the COVID-19 pandemic impacted their implementation. Innovations such as increased digitization and capacity building for EPI management to enhance equity among the districts were hindered by COVID-19 restrictions (MSAS, 2020b). Lastly, the MoH through the Division of Immunization and its cMYP, aligned its strategies with those of GVAP, which stress the importance of ensuring equity within vaccination campaigns.

The RED plan is one of the organizational processes put in place to ensure the continuity of immunization activities during the pandemic. It is an action plan developed annually by the districts to strengthen immunization and is currently implemented by all districts, although the plans have not been supported by DP funding. Multiple strategies were undertaken to better convey awareness messages to all social strata of the population. To reduce inequities in the provision of immunization services, the outreach strategy has been developed in large cities, particularly in peri-urban areas. This strategy consists of reaching children living less than 5 km from an immunization unit, who face socioeconomic barriers in accessing services (MSAS, 2013).

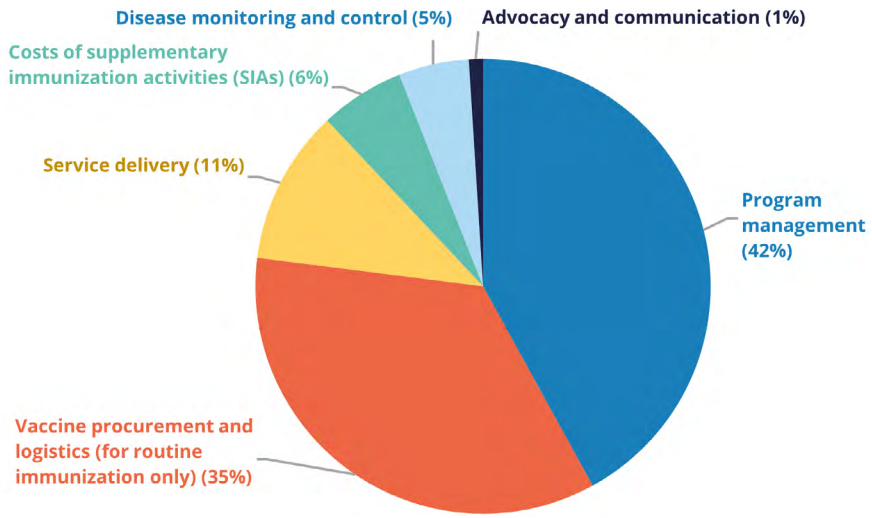
Financing

According to MSAS (2018), the reallocation of resources to the COVID-19 Fund disrupted the financing flows of the EPI. To address the problem, new funding sources were established for routine immunization and surveillance activities during the pandemic, including funding from TFPs such as WHO, UNICEF, Gavi, and the World Bank. Gavi pledged US$ 200 million to support health systems strengthening in low-income countries (WHO, 2020a).

To alleviate the economic impact of the pandemic, President Macky Sall established the 'Fonds Force - COVID-19' with an endowment of CFAF 1 trillion, financed by the State, the private sector, development partners, and other donors. A portion of the fund, including CFAF 50 billion, was allocated to emergency food aid, while another part was earmarked for routine immunization. Local authorities did not contribute to financing vaccination campaigns, and according to MoH staff interviews, there were no disruptions during the pandemic related to their role in funding such campaigns.

Government resource allocation was responsive to the challenges arising from the pandemic. For example, in order to prioritize community education and awareness, the share of funding committed to public awareness campaigns (TV and radio) was increased (MSAS, 2018). Figure 14 presents the allocation of EPI resources to various activities, according to 2019 estimates.

Figure 14. Allocation of EPI resources to various activities



Source: MSAS, 2018.

Vaccines

Availability

The supply of routine vaccines in Senegal was relatively unaffected by the COVID-19 pandemic. From the vaccine supply market perspective, a staff member of the Immunization Division stated that "a shortage of 0.5 ml auto-disable syringes was noted during the pandemic, while no antigen shortages are noted during the years 2020 and 2021". This statement was corroborated by evidence of a global shortage (PATH, 2021). Data suggests that French-speaking West Africa, inclusive of Senegal, saw a relative increase in the procurement of vaccines from January to March 2020 and from April to August 2020, compared to the same periods in 2019 (Zeitouny et al., 2021).

Global efforts, particularly from Gavi and UNICEF, ensured that routine vaccine production and supply were maintained (Zeitouny et al., 2021). Even so, there was a decline in immunization coverage rates and a reduction in the production of traditional vaccines, as laboratories focused on finding an effective vaccine against COVID-19. WHO warned that this shift in focus would have consequences for several million people around the world who would no longer have access to traditional vaccines. WHO delivered 2.01 billion doses of traditional vaccines worldwide in 2020, compared to 2.29 billion in 2019, reflecting a 14% decrease in the supply of vaccines used in routine immunization (WHO, 2020d).

Supply chains

COVID-19 starkly revealed the reliance of the African continent on the importation of vaccines. Supply chains can be unpredictable and unreliable in times of shock. To build resilience for the future, Senegal – through the Institut Pasteur de Dakar (IPD) – will scale up local capacity for manufacturing routine vaccines (IMF Blog, 2022). Construction of a new vaccine manufacturing facility is underway, representing the continent's first high-volume start-to-finish vaccine production site. When operating at capacity, the new site will be able to produce up to 300 million vaccine doses per year for the continent and will serve as a research site for the production of new-generation vaccines (Ngila, 2022).

Some of the existing supply chain infrastructure has served to mitigate COVID-19 related disruptions. Vaccine products, such as antigens, are managed by monitoring their expiry dates and storing them according to WHO recommendations. All regions have a cold room that is functional and has sufficient capacity to store and preserve vaccines until 2023 (cold rooms are equipped with an audible and/or visual alarm system in the event of a temperature difference).

Prior to the COVID-19 pandemic, Senegal, in partnership with Gavi and Parsyl Inc., introduced an innovative system for remote monitoring of vaccine storage and cold chain transport in district warehouses and immunization units (DP, 2020c). Seeking to strengthen supply chains and address last-mile distribution challenges, the quality assurance platform provides a real-time overview of the in-country vaccine supply chain via mobile and web interfaces. Throughout the pandemic, this vaccine monitoring system was used to manage the EPI and COVAX cold chain across the national and district levels. Vaccine stock management mechanisms were adjusted during the pandemic to consider COVID-19 antigens by acquiring ultra-low temperature equipment for the storage of the Pfizer vaccine, thus increasing storage capacity.

Effective vaccine supply chain management is a critical element of the EPI. The Effective Vaccine Management (EVM) framework is used to assess and identify gaps in the immunization supply chain, and to ensure that vaccines are managed efficiently and reach their intended target populations. Despite the COVID-19 pandemic, vaccine distribution has continued with measures such as social distancing being implemented to ensure safety.

Innovation

It is important to engage and inform communities on the role of vaccines while ensuring vaccination services are available, maintained, and accessible. Therefore, while community-based outreach services were suspended, facility-based routine immunization services were adapted to ensure the safe continuation of services for health-care personnel and patients. Modifications included the implementation of infection control protocols, establishing social distancing, limiting the number of individuals allowed within a building, and procuring and wearing masks/PPE (MSAS, 2021). Health-care personnel engaged in training webinars coordinated with national-level programmers to prepare for continued immunization service delivery. Activities related to innovations increased, including Coach2EPI; LogistiMo; monthly transmission of the stock management tool (SMT) by the medical regions; low usage of the Beyond Wireless platform; capacity building for doctors and EPI focal points on EPI management; and communication activities (MSAS, 2020c).

To further promote immunization service continuity during the pandemic, health workers offered alternative hours for vaccine administration (for example, after work and during weekends) in collaboration with community-based organizations. Community health workers conducted house-to-house vaccination for HPV amid the continued closure of schools. Finally, systems were set in place to track missed doses, including facility staff texting or calling parents whose children missed immunization visits based on contact records kept at district offices.

Catch up campaigns and intensification strategies were initiated to mitigate the impact of disruptions. For example, in December 2021, a national polio immunization campaign was undertaken with the novel oral polio vaccine type 2 (nOPV2). Approximately 95% (2.6 million children) of the 2.8 million target population was vaccinated during the campaign (UNICEF, 2022a).

Positive outcomes of such interventions highlight the need for multisectoral involvement as well as innovative strategies in maintaining vaccine supply and demand. Such strategies bring together diverse sectors, and most importantly, factor in community actors and youth organizations. Therefore, policy-makers can incorporate these insights and approaches in developing and enacting appropriate reforms and policies.

Engagement

Mass communication strategies, including radio and television broadcasts, as well as televised theatre performances, were delivered to raise awareness, not only about COVID-19 restrictions and prevention measures, but also about the importance of routine immunization continuity. These communications sought to increase awareness among viewers/communities of the availability of immunization services and to address misinformation. In addition to these media campaigns, community involvement in creating demand was instrumental during the organization of vaccination campaigns. The Badienou Gokh were mobilized to go door-to-door, sharing information on COVID-19 safety measures, the benefits of immunization, and the availability of services.

Through multisectoral interventions, vaccine acceptance was promoted in hesitant communities, while information sessions were conducted in schools across all regions of Senegal. In order to address rumours around vaccinations and misinformation, UNICEF supported the MoH in the implementation of a digital-based strategy: 50 adolescent and youth volunteers were engaged in the dissemination of key messages on polio, tracking rumours on the web, and disseminating the appropriate communication and response materials (UNICEF, 2022a).

Conclusion

Vaccination coverage rates for months 1–3 (DTP, OPV) were higher than months 9–15 (RR1, RR2, VAA) before the onset of the COVID-19 pandemic.

Vaccination coverage rates for months 1–3 decreased in 2020 and 2021 compared to 2019. Vaccination coverage rates for months 9–15 were relatively stable during the pandemic compared to 2019. Adherence to the vaccination schedule was comparable to what it was before COVID-19. However, the main barrier during both periods was the dropout rate. For most vaccines, the highest coverage rates were recorded in Kedougou, and the lowest in Ziguinchor. The following challenges were observed in maintaining continuity of immunization services for diseases targeted for eradication and elimination during the pandemic:

- **Staff shortages:** health facility staff were tasked with managing and responding to COVID-19, which reduced their availability for other services, including immunization services.
- **Fear of contagion:** at the beginning of the pandemic, the population's fear of visiting health facilities strongly affected demand.
- **Health resource shortages:** there was inadequate supply of essential 0.5 ml syringes, which are used to administer vaccines.

The pandemic led to the following disruptions in the governance, financing, and maintenance of vaccination services:

- **Movement and gathering restrictions:** Monitoring meetings that were supposed to take place every quarter were only held twice in 2020 and once in 2021.
- **Compromised funding:** the flow of financing for EPI activities was disrupted by the reallocation of resources to the COVID-19 Fund.
- **Shift in focus of laboratory expertise:** there was a reduction in the production of traditional vaccines as laboratories focused on finding an effective vaccine against COVID-19 (WHO, 2020d).

Despite the multiple obstacles caused by the pandemic, the existence of a number of catalytic effects minimized the level of disruption to services:

- **Promotion of service continuity:** the MoH of Senegal encouraged health personnel at the operational level to ensure continuity of immunization services while respecting movement restrictions and social distancing measures.
- **Telemedicine services:** facility staff texted or called parents whose children missed immunization visits based on contact records kept at district offices.
- **Follow-up services:** multiple catch-up vaccinations were organized in late 2021.
- **Community engagement:** vaccine demand was stimulated through community leaders, such as the Badienou Gokh, who went door-to-door to inform the population.
- **Communication strategies:** radio and television broadcasts as well as televised theatre performances were produced to raise awareness about COVID-19 and the importance of routine vaccination continuity.
- **Supply chain logistics:** vaccine stock management mechanisms were adjusted during the pandemic to consider the impact of COVID-19.

Policy implications

The COVID-19 pandemic may continue to evolve through several, potentially overlapping waves until sufficient immunity is developed either via widespread vaccination or exposure to the virus.

There is a need to foster health system resilience and to adopt a strategic approach to minimize disruptions to essential health services, particularly immunization services, for the accelerated control of endemic diseases in Senegal. Various perspectives on policy implications emerged from the literature review, semi-structured interviews, and data analysis. The following avenues have been identified to minimize disruption to services for vaccine-preventable diseases such as polio, measles, yellow fever, and tetanus.

Maintaining vaccine supply

Promoting equity and ensuring that vaccines are available and accessible to every community: the immunization equity analysis approach, as well as continuous monitoring, can help ensure access to vaccination services for vulnerable groups.

Alternative procedures can sustain facility-based routine immunization: offering alternative hours for vaccine administration.

Develop supervisory mechanism tools: promote the continued monitoring and evaluation of vaccine stock, storage, maintenance, and provision across the country. This can be used as a supportive tool for EVM and ensure optimal vaccine quality.

Maintaining vaccine demand

Community engagement: maintain and promote strong relationships with communities through ongoing television and radio broadcasts.

Raise awareness among health care providers and the public: behaviours, attitudes, and misinformation can affect public perception of, or willingness to access vaccine services, especially at the community level. Encourage local authorities to participate in the funding and organization of immunization services.

Decentralize responsibility: relying on a highly diversified, qualified, and empowered network of community health workers to emphasize community ownership through awareness raising.

Prioritize catch-up immunization: texting or calling parents whose children missed immunization visits based on contact records kept at district offices. Special attention should be given to areas with low immunization coverage.

Governance and financing

Establish and promote multisectoral interventions and innovative strategies: stakeholder engagement can involve diverse sectors and community actors/leaders. The latter can enhance trust and community reach to ensure the continued provision of vaccination services.

Build on lessons learnt: several strategies were put in place during the COVID-19 immunization campaign, including the stakeholder mobilization plan and the dual immunization strategy to reach target populations.

Strengthen information systems: establish a tracking administrative system, such as a platform that provides timely data to monitor immunization coverage rates to help health workers identify and target children who need to be vaccinated and help manage any disruptions in the immunization process. Such a system will also inform the response to immunization disruptions.

Leverage innovations introduced during the pandemic: this includes digital immunization platforms to support the delivery of child immunization and real-time monitoring.

Establish best practices in primary health care and restructure health systems to build resilience: adopt the WHO Guidance on maintaining essential health services during the COVID-19 pandemic.

Secure financing: ensure that funding for COVID-19 mitigation does not affect the financial schemes of routine immunization programmes. Mobilize additional resources to support catch-up activities and contingency measures.

Establish sustainable systems for routine immunization: based on the experience of the COVID-19 vaccination campaign, a registration platform for routine immunization could reduce the burden on health workers and improve the efficiency of the vaccination process. This could also help ensure timely reminders and follow-up on missed vaccinations, which may lead to improved coverage rates, a strengthened immunization system, and reduced outbreaks of vaccine-preventable diseases.

Advance the cMYP 2019–2023: incorporate the objective of prioritizing innovations in research and development at national and regional levels to maximize the benefits of immunization in alignment with the global and regional strategic plans for immunization.

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