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First Field Test of the Novel Integration Mapping Tool for COVID-19 Vaccination Integration into National Immunization Programs and Primary Healthcare - A Case Study from Cote d'Ivoire

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First Field Test of the Novel Integration Mapping Tool for COVID-19 Vaccination Integration into National Immunization Programs and Primary Healthcare - A Case Study from Cote d'Ivoire

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Abstract: Introduction: With the containment of the COVID-19 pandemic in Côte d'Ivoire, efforts were made to seamlessly integrate COVID-19 vaccination into the national immunization program. A collaborative initiative involving UNICEF, WHO, GAVI, and partner organizations resulted in the creation of the COVID-19 Vaccine Integration Mapping Tool. This paper presents a case study documenting the field testing of the Integration Mapping Tool and assessing the integration of COVID-19 vaccination within primary healthcare and routine immunization in Côte d'Ivoire. The study aims to describe the pilot process, gather feedback on tool usefulness and challenges, and establish integration priorities through roadmap development. **Methods:** Under the guidance of the Ministry of Health and Universal Coverage Cabinet, a workshop was conducted with participants from major health programs to field test the tool. Data analysis was performed using Excel, and the results were presented through tables, heat maps, and line graphs. **Results:** The first-of-its-kind field test of the Integration Mapping Tool in Cote d'Ivoire showcased its potential to bring key partners together to discuss the current state of integration, to improve transparency about resource allocation resource allocation, and enhance data management for the successful incorporation of COVID-19 vaccination into existing immunization systems. The integration of COVID-19 vaccines in Côte d'Ivoire showed a moderate level of progress, with improvement needed in resource allocation, payment systems, targeting of highest risk groups and vaccine administration. Support should be increased for target population identification, distribution points, quality of care mechanisms, and health personnel training. Health information systems and access to essential medicines were relatively satisfactory. Integration into existing programs, intersectoral collaboration, national health strategy, communication strategy, community participation, and data utilization require improvement. The post-workshop satisfaction survey gave the tool a score of .7 out of 10. Early lessons from Côte d'Ivoire provide guidance for enhancing integration, focusing on data-driven decision-making, collaboration, stakeholder engagement, and effective leadership. **Conclusion:** The successful field test of the Integration Mapping Tool (IMT) in Côte d'Ivoire marks a groundbreaking milestone, exemplifying the transformative potential of innovative tools in immunization practices. The IMT's application sets a precedent for seamless COVID-19 vaccination integration worldwide, emphasizing data-driven decision-making, collaboration, timing, and leadership. The pilot exercise's success in Côte d'Ivoire was attributed to political commitment, well-

facilitated workshops, assessments, and the fact that the team in CI had previously already developed some initial integration plan.

Keywords: COVID-19 vaccination; integration mapping tool; routine immunization; primary healthcare; field testing; Côte d'Ivoire

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Plain Language Summary

This paper discusses the testing of a tool called the COVID-19 Vaccine Integration Mapping Tool in Côte d'Ivoire from the 12th to the 14th April 2023. In this study, researchers examined the integration of COVID-19 vaccination into the national immunization program and Primary health a tool called the Integration Mapping Tool. This tool was developed through a collaboration between UNICEF, WHO, GAVI, and partner organizations and part of the "Support package for integrating COVID-19 vaccination into immunization programmes and primary health care". The researchers conducted a field test of the IMT to evaluate its effectiveness and gather feedback on its useability and functionality.

The results showed that the tool has the potential to improve coordination, resource allocation, and data management for the successful incorporation of COVID-19 vaccination into existing immunization systems and PHC. The tool highlighted areas that needed improvement, such as resource allocation, payment systems, and vaccine administration.

The study also highlighted the importance of integrating COVID-19 vaccination into existing programs, fostering intersectoral collaboration, developing a national health strategy, implementing a communication strategy, encouraging community participation, and utilizing data effectively. The post-workshop satisfaction survey gave the tool a score of .7 out of 10.

Overall, the successful field test of the IMT in Côte d'Ivoire demonstrates the potential of innovative tools in transforming immunization practices. The findings provide valuable insights for improving integration efforts, emphasizing data-driven decision-making, collaboration, stakeholder engagement, and effective leadership.

This research contributes to the global understanding of integrating COVID-19 vaccination , offering guidance for other countries undertaking similar efforts. The lessons learned from Côte d'Ivoire's experience can inform future advancements in integrated vaccination programs worldwide.

Introduction

The COVID-19 pandemic has presented formidable challenges for African nations, including Côte d'Ivoire, which has witnessed a substantial toll with more than 88,000 reported cases and 834 fatalities as of March 11, 2023 **(1)**. In response, the country has implemented a range of strategies to combat the virus, notably an orchestrated vaccination campaign targeting individuals aged 12 and above, with particular emphasis on specific demographics such as 12-17-year-olds and expectant or nursing mothers **(2)**. Drawing upon its extensive expertise in the deployment of novel vaccines through the Expanded Immunization Program, Côte d'Ivoire has made noteworthy advancements in the administration of four distinct COVID-19 vaccines, encompassing Pfizer-BioNTech, AstraZeneca, Sinopharm, and Johnson & Johnson **(2)**. By March 2023, notable achievements have been made in the national vaccination campaign targeting a target population of around 20 million individuals aged 12 and above. Within the total population of 30,215,522, a remarkable 48% have received at least one dose of the vaccine, while 43% have successfully completed their primary vaccination series. Furthermore, a noteworthy allocation of 222,180 vaccine doses has been dedicated to pregnant and lactating women **(3)**.

Following a significant decline in COVID-19 cases, the National Security Council of Côte d'Ivoire took the decision to terminate the state of emergency on April 12, 2023 **(4)**. To ensure the sustained management of COVID-19, including the administration of booster shots to high-risk populations, the security council recommended the integration of COVID-19 activities into routine healthcare by

the end of June 2023. Additionally, on May 5th, 2023, the Director-General of the World Health Organization (WHO) declared COVID-19 as an ongoing health concern, no longer constituting a public health emergency of international significance **(5)**. This shift necessitates the vital integration of COVID-19 response measures into a comprehensive, long-term approach aimed at strengthening disease management. To facilitate this integration, UNICEF, WHO, GAVI, and partner organizations have collaborated to develop the COVID-19 Vaccine Integration Mapping Tool IMT **(6)**. Aligned with the WHO's health systems strengthening framework and as part of Support package for integrating COVID-19 vaccination into immunization programs and primary health care, this tool encompasses essential components such as the health workforce, information systems, essential medicines, financing, leadership, governance, communication, and intersectoral collaboration. It follows a four-step approach outlined in the WHO-UNICEF's considerations for integrating COVID-19 vaccination **(7)**, empowering countries to evaluate progress, identify areas for enhancement, and formulate action plans.

In the pursuit of seamless integration of COVID-19 vaccines into routine immunization and primary healthcare, the commencement of field testing became imperative, coinciding with Côte d'Ivoire's preparedness to embark on this crucial process. In April 2023, the government of Côte d'Ivoire graciously extended an invitation to UNICEF and WHO for a collaborative mission. The Ministry of Health, taking the lead, convened all relevant departments in a workshop focused on integration. The objective of the mission was to field test the integration mapping tool and provide valuable assistance in facilitating the seamless integration of COVID-19 vaccines into routine immunization and primary healthcare systems. This report documents a comprehensive case study to assess the effectiveness and feasibility of the Integration Mapping Tool in facilitating the seamless integration of COVID-19 vaccination within Cote d'Ivoire's existing immunization programs and primary healthcare.

Objectives:

This paper documents the field testing of the integration mapping tool in Côte d'Ivoire. More specifically , it aims to :

1. **Describe the piloting process and its outcomes.**
2. **Gather feedback on the tool's usefulness, effectiveness, and potential challenges.**
3. **Extract valuable lessons on useability and functionality from the early implementation of COVID-19 vaccine integration.**

Methods

Study Design: The study is descriptive. A survey **(8)** was designed to collect participants' ratings and feedback on the tool. The survey utilized a Likert scale ranging from 0 (lowest score) to 10 (highest score) to evaluate the tool's usefulness.

Setting: The study was conducted in Cote d'Ivoire, a West African country covering a land area of 322,462 km². It is bordered by the Atlantic Ocean to the south, Guinea and Liberia to the west, Mali and Burkina Faso to the north, and Ghana to the east. Cote d'Ivoire is divided into 31 regions, 111 departments, 509 sub-prefectures, and 201 municipalities **(9)**. The estimated population is 28,096,651 inhabitants, with 53.9% residing in urban areas **(10)**. The country has a poverty rate of 46.3% and a Gini index of 0.538, ranking 162 out of 189 countries **(11)**. The literacy rate in 2018 was approximately 65.2% for men and 44.8% for women **(12)**.

Health System: The vaccination process in Cote d'Ivoire involves two main structures: the National Institute of Public Hygiene and Prevention (INHP) and the Expanded Program on Immunization (EPI). The INHP handles vaccinations for the general public, while the EPI focuses on children, pregnant women, and 9-year-old girls **(13)**. The EPI is implemented at all levels of the health system, including primary, secondary, and tertiary levels. Health centers, hospitals, and institutes provide immunization services, with district health systems overseeing EPI implementation.

EPI Performance: The COVID-19 pandemic significantly impacted the Expanded Program on Immunization, leading to a decline in vaccination coverage for routine EPI antigens. The coverage

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for DTP1 fell below the annual target of 95%, with rates of 86% in 2020, 88% in 2021, and 86% in 2022. The number of zero-dose children increased from 4,642 in 2019 to 47,377 in 2020 and 38,331 in 2021 **(14)**. The dropout rate for Penta1-Penta3 vaccines rose from 2% in 2016 to 6% in 2020 and 2021. However, the global dropout rate from Penta1 to RR vaccines decreased from 11% in 2016 to 9% in 2021, with a temporary dip to 7% in 2019.

Target Population: Initially, the National Committee of Independent Experts for Immunization and Vaccines identified priority groups for vaccination, including adults aged 18 years and above, healthcare workers, defense and security forces, teachers, individuals over 50 years old, and those with chronic illnesses. The vaccination target was later expanded to include adolescents aged 12 years and above with comorbidities, those living with vulnerable individuals, and eventually all adolescents and pregnant/lactating women **(2)**.

Data Collection: Data for the study were collected from multiple sources, including the Expanded Program on Immunization of the Ministry of Health of Cote d'Ivoire and the WHO-African Region Covid-19 vaccination database. Country reports and government health ministry websites were also utilized **(15)**, A survey was conducted using the online platform Mentimeter with participants accessing the survey link provided via email.

Data Analysis: All statistical analysis and data visualization were performed using Excel 5.0. The results were presented in tables, heat maps, and line graphs.

Ethical Considerations: This Ministry of Health supported the integration mapping tool pilot process by providing an official invitation. While no ethical clearance is required, participants consented to their experiences being documented and shared. Anonymized data were used solely for research, and presented in aggregate form to protect privacy.

Description of the Integration Mapping Tool: The integration mapping tool is an Excel-based instrument comprising five main sheets that provide instructions, complementary materials, and assessment templates. It facilitates the integration of COVID-19 vaccination into national health systems by addressing dimensions such as leadership, collaboration, financing, service delivery, workforce, and information systems. The tool enables countries to assess their progress and generate visual summaries through heat maps, charts, and graphs, aiding decision-making and strategic planning. More information about the tool can be found on the TechNet-21 website **(16)**. Its implementation in Cote d'Ivoire serves as a significant milestone and a pioneering field-testing site for integration of COVID-19 vaccination into existing immunization programs.

Description of the field-testing process and the implementation of the integration mapping tool in cote d'Ivoire

The field-testing process for the integration mapping tool involved several steps conducted during a comprehensive workshop. The workshop encompassed multiple phases, beginning with preparatory meetings and high-level advocacy, followed by group works, plenary presentations, and discussions. The final phase focused on designing an integration roadmap and providing debriefing to the authorities.

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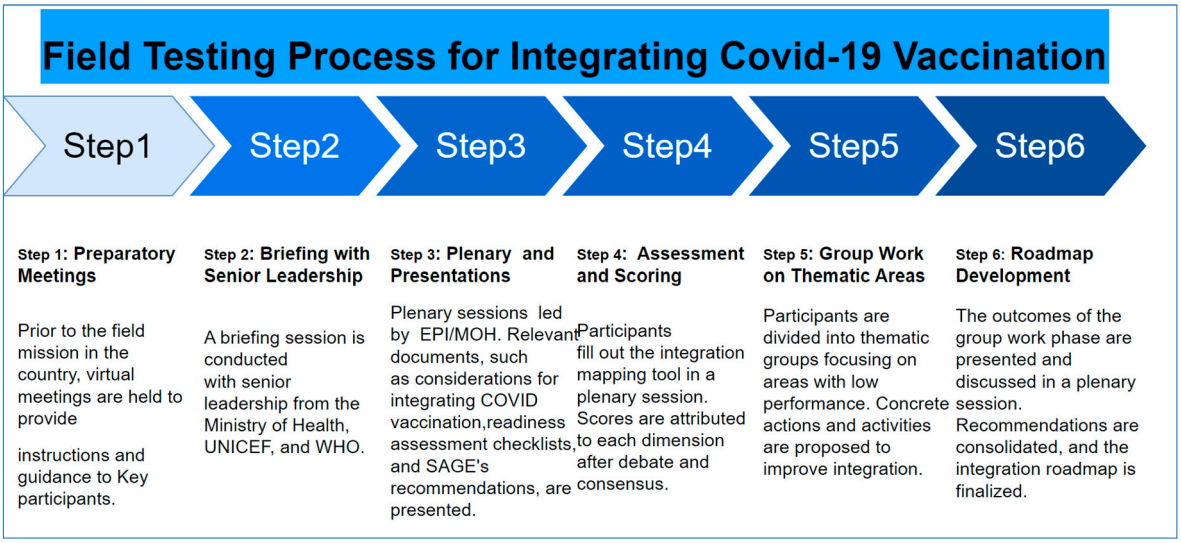

Figure 1. Streamlined Approach to Field Testing COVID-19 Vaccination Integration Mapping Tool in Côte d'Ivoire**.**

The successful integration of COVID-19 vaccination into routine immunization and primary health care requires meticulous planning and coordination. In Cote d'Ivoire, a team of experts embarked on a comprehensive field-testing process to ensure the smooth implementation of an integration mapping tool. The following steps outline the team's approach, starting from preparatory meetings to the validation of the integration roadmap.

Step 1: **Preparatory Meetings**. To set the stage for a successful field test, the team organized virtual meetings weeks before travelling in country. These gatherings served as a platform to provide detailed instructions and guidance to the selected participants. The aim was to ensure a clear understanding of the objectives, methodologies, and expectations of the integration mapping tool.

Step 2: **Briefing with Senior Leadership**. In line with the Ministry of Health's proactive approach to inclusive decision-making, a meeting was convened by the ministry itself, ensuring the participation of all relevant health programs. Representatives from key donor organizations and bilateral partners were also invited to join this important session. The purpose of this briefing was to engage senior leadership from the Ministry of Health, UNICEF, and WHO in a constructive dialogue. The objective was to secure their invaluable commitment, gather insightful perspectives, and align the integration efforts with the broader health policies and strategies in place.

Step 3: **Plenary Session and Presentations**. A significant milestone in the field-testing process involved a plenary session, led by the Director of the Expanded Program on Immunization (EPI) and the official Covid-19 coordinator, who is also the technical advisor to the Minister of Health. During this session, directors of the different health programs and thus 'high level' decision makers were present. Key documents, including considerations for integrating COVID vaccination, readiness assessment checklists **(16)**, and SAGE's recommendations **(17)** were presented. This comprehensive approach ensured that all participants, even those that worked on health programmes that do normally not engage in vaccination, were well-informed and equipped with the necessary knowledge.

Step 4: Assessment and Scoring. In a collaborative plenary session, participants completed the integration mapping tool. Each dimension of the tool was carefully evaluated based on the participants' extensive experience and expertise. Debates and justifications ensued, ultimately leading to a consensus on the scores assigned to each dimension. This rigorous assessment process ensured the accuracy and reliability of the integration mapping tool.

Step 5: Group Work on Thematic Areas. To address areas with lower performance, participants were divided into thematic groups. Each group focused on a specific area, such as community demand and engagement, leadership and governance, service delivery, and health financing.

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Through collective brainstorming, the groups proposed concrete actions and activities aimed at enhancing integration in these thematic areas.

Step 6: Roadmap Development. Following the group work phase, the outcomes were presented and discussed in a plenary session. Recommendations from each thematic area were consolidated, taking into account the valuable insights and proposals generated during the group work. Through a meticulous process of analysis and refinement, the integration roadmap was finalized. This roadmap outlined the necessary steps and actions required to effectively integrate COVID-19 vaccination into routine immunization and primary health care.

To ensure the alignment of the integration roadmaps with the overall integration goal, a synthesis meeting was scheduled after the mission. During this meeting, the roadmap was carefully validated, and any necessary adjustments were made. The team worked towards developing a comprehensive integration plan that encompassed all the dimensions addressed in the integration mapping tool. This plan was subject to further validation in a subsequent workshop, ensuring its robustness and effectiveness

Results

1. Key demographic characteristics

The meeting held at the Cabinet of the Ministry of Health witnessed the participation of 40 attendees, encompassing a diverse range of backgrounds and expertise. This workshop successfully brought together stakeholders from various levels, including representatives from the central and operational tiers, healthcare programs, as well as technical and financial partners. Notably, the workshop also saw the active involvement of six representatives from UNICEF Headquarters and Regional Office, WHO Africa Regional and Inter-Country Support Team of West Africa, and professionals from Boston Consulting Group (BCG). The attendees were further comprised of partners such as CDC, USAID, Agence de Médecine Préventive , Village Reach, and representatives from 14 priority programs of the Ministry of Health. Additionally, six participants from the Senior Leadership team at the Ministry of Health were present. The distribution of participants is illustrated in Figure 2.

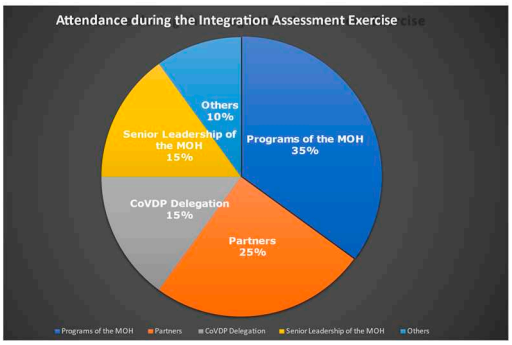

Figure 2. Mapping of participants who participated to the integration assessment exercise**.**

1. Assessment of Immunization Integration Strategies: Analysis of Key Dimensions and Actions

In this analysis, we evaluate the readiness of a national immunization program for integrating COVID-19 vaccination. We assess various dimensions and actions related to leadership and governance, program integration, intersectoral collaboration, healthcare financing, community engagement, service delivery, healthcare personnel, health information systems, access to essential medicines, and monitoring and evaluation. The results of the self-assessment tool for COVID-19 vaccine integration are presented in the form of scores for each dimension or action, ranging from 1 to 5. Based on these scores, we present a concise analysis to highlight the strengths, challenges, and opportunities for improvement in each area.

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Leadership and gouvernance	**2,7**
Intégration du C-19 dans le PEV et d'autres programmes	*3*
Collaboration intersectorielle	*3*
Stratégie nationale de santé	*2*
Financement du système de santé	**2,5**
Financement et allocation des ressources	*3*
Systèmes de décaissement et de paiement	*2*
Demande et engagement communautaire	**2,0**
Stratégie de communication intégrée	*2*
Participation des acteurs communautaires	*2*
Écoute sociale et production et utilisation de données comportem	*2*
Prestation de services	**2,0**
Stratégie de mise en œuvre intégrée	*2*
Points d'entrée et populations cibles	*2*
Mécanismes de qualité des soins	*2*
Personnel de santé	**1,3**
Ressources en personnel soignant	*1*
Ressources en personnel soignant	*1*
Formation	*2*
Systèmes d'information sur la santé	**3,0**
Système d'information sur la gestion de la santé	*2*
Procédures de notification et mécanismes de traçage	*4*
Accès aux médicaments essentiels (y compris les vaccins de	**3,3**
Gestion des achats et de l'approvisionnement	*4*
Chaîne du froid et stockage (y compris pour les environnements	*4*
Gestion des stocks (y compris la réduction des déchets)	*2*
Suivi et évaluation	**1,0**
Développement d'indicateurs	*1*
Plan de suivi et d'évaluation pour l'intégration du vaccin COVID-1	*1*

Figure 3. Heatmap generated at the end of the scoring exercise.

1. Leadership and Governance:

The integration of COVID-19 vaccines into routine immunization services (score: 3) has shown promising progress, particularly in target programs such as maternal health and school/university health. However, there is a need to extend this integration to primary healthcare services. Collaboration across sectors (score: 3) has been initiated through the establishment of an intersectoral task force. While key programs have been included, further efforts are required to involve additional programs such as those addressing HIV and malaria. The task force should be reoriented towards integration, and representation from higher-level officials should be expanded eg through an expansion of the Inter-Agency Coordinating Committee, ICC.

2. Financing of Healthcare Systems:

Efforts in financing and resource allocation (score: 3) are underway, with a comprehensive action plan being developed for the integration of COVID-19 vaccines. However, the current disbursement and payment systems (score: 2) lack efficiency. While the funding for integration is yet to be received, it is crucial to optimize existing systems to ensure effective utilization of resources.

3. Community Engagement:

Communication strategies (score: 2) have been implemented for integrated campaigns, including radio broadcasts and bus advertisements. However, a national strategy for integrated healthcare services is still lacking. Community stakeholders' participation (score: 2) has been observed, particularly with key actors such as religious leaders, but efforts should be expanded to engage a broader range of community representatives. Social listening and behavioral data utilization (score: 2) have been undertaken through research in urban areas, but social identification mechanisms need further development to understand primary healthcare concerns effectively.

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4. Service Delivery:

While an integrated implementation strategy (score: 2) has not been explicitly commented on, targeted population groups have been identified (score: 2). However, roles and responsibilities within these groups remain undefined. Mechanisms for improving quality of care (score: 2) have been implemented in selected integrated healthcare sites, but a national standard for quality care specific to COVID-19 vaccine integration is yet to be established.

5. Healthcare Personnel:

Assessment of healthcare workforce resources (score: 1) for COVID-19 vaccine integration is lacking in detail, although reports from specific services, such as the metabolic program, indicate a shortage of healthcare personnel. Special recruitment strategies are required to address this deficit. Availability of community health workers (score: 4) has been established through a georeferenced national reference list, but funding remains a persistent challenge. Training efforts (score: 2) require further exploration.

6. Health Information Systems:

Two parallel health information systems (score: 2) currently operate independently, and the COVID-19 system lacks daily recording of vaccination characteristics. Notification procedures and tracing mechanisms (score: 4) exist but rely on manual transmission of data upon request, indicating a need for automatic data exchange.

7. Access to Essential Medicines:

Effective management of procurement and supply (score: 4) is observed through regular stock monitoring at the central level. However, delays in order placement have been identified as an issue. Cold chain capacity and storage (score: 4) are established for COVID-19 vaccines, with ongoing assessments of existing storage capacity for integration purposes. Stock management policies (score: 2) exist but are not specifically tailored to COVID-19, such as ultra-cold chain requirements.

8. Monitoring and Evaluation:

Development of performance indicators (score: 1) for monitoring COVID-19 vaccine coverage and accurate denominators remains pending. A comprehensive monitoring and evaluation plan (score: 1) for COVID-19 vaccine integration is currently absent. Limited progress has been made in developing monitoring indicators.

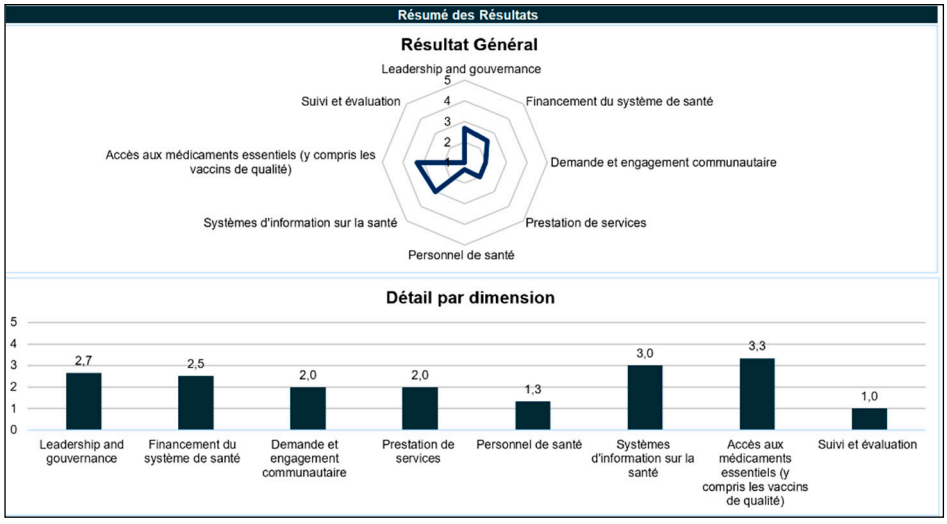

Figure 4. Spider chart autogenerated after filling the country assessment sheet, which gives a snapshot the state of integration of covid-19 vaccination in the country.

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The analysis of the readiness for integrating COVID-19 vaccination into the national immunization program reveals both strengths and areas for improvement. While progress has been made in certain dimensions, such as program integration and intersectoral collaboration, several critical aspects, including healthcare personnel capacity, quality care standards, and monitoring and evaluation frameworks, require immediate attention.

1. Feedback and Insights from Participants the usefulness of the Integration Mapping Tool

A survey was conducted among participants using the online platform Mentimeter **(15)**, to assess the overall appreciation and effectiveness of the integration mapping tool in supporting immunization integration efforts. The survey aimed to gather insights that could further improve the tool and enhance integration strategies. Participants were asked to rate the tool's usefulness on a scale of 0 to 10, with 0 representing the lowest score and 10 the highest. The results of the survey revealed an average rating of 7.7 for the usefulness of the integration mapping tool. The ratings provided by the survey respondents ranged from 5.5 as the lowest score to 10 as the highest. This positive appreciation of the tool demonstrates its value in facilitating immunization integration efforts and supporting stakeholders in their decision-making processes. Participants acknowledged that the completion of the integration mapping exercise using the tool provided them with a comprehensive understanding of the existing integration landscape. By systematically mapping the integration dimensions and actions, the tool enabled stakeholders to identify both strengths and areas for improvement. This information empowered them to take proactive measures in enhancing integration efforts and addressing any gaps or challenges identified. Moreover, the integration mapping tool served as a baseline for measuring progress in immunization integration. It provided a structured framework that facilitated the evaluation of the effectiveness of interventions implemented. Through the mapping process, stakeholders were able to assess the impact of various interventions and identify areas where further actions were needed.

1. Early Lessons Learned from Field Testing the Integration Mapping Tool for COVID-19 Vaccination

Some early lessons gained during the field-testing exercise encompasses improving data collection processes, identifying priority areas, engaging multiple stakeholders, considering timing, providing necessary support, employing effective methods, and communicating with decision-makers. The following points summarize the early lessons learned:

1. Identifying priority groups for effective integration.: The field testing in Cote d'Ivoire shed light on the challenges of identifying high-priority population groups and integrating pediatric populations and corresponding health services into COVID-19 vaccination efforts. The limited availability of data posed a significant obstacle in accurately assessing the progress of vaccination integration into routine and primary healthcare. To overcome these challenges, careful identification of high-priority groups and services is crucial for effective resource targeting and prioritization. The field-testing exercise served as a catalyst for prioritizing improvements in data collection and management processes, enabling better progress tracking and identification of areas for enhancement.

1. Harnessing Collaboration for Successful Integration:

Collaboration emerged as a fundamental aspect of the integration process. Stakeholders from diverse sectors, including government agencies, healthcare providers, community leaders, and international partners like WHO, UNICEF, USAID, CDC and Village Reach, actively participated in the development and implementation of integrated vaccination strategies. The inclusive approach fostered synergy, knowledge sharing, and resource pooling, resulting in a more cohesive and effective response to the vaccination needs of the population. The development of a roadmap for priority areas was made possible through systematic collaboration, leveraging the expertise and perspectives of stakeholders.

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1. Maximizing Impact through Strategic Timing:

The field-testing exercise conducted in April highlighted the challenges arising from conflicting timelines with pre-existing roadmaps of primary healthcare programs. To optimize the integration of COVID-19 vaccination, it is crucial to schedule such exercises towards the end of the year when programs embark on planning for the next cycle. This strategic timing enables seamless incorporation of COVID-19 vaccination integration into existing activities, ensuring maximum effectiveness and alignment with program objectives.

1. Enabling Success through Technical support:

The significance of support and facilitated discussions emerged as a key lesson during the integration process. Field missions with expert assistance proved invaluable in facilitating the successful adoption and utilization of the integration mapping tool. These missions provided necessary support, guidance, and expertise, contributing to the overall effectiveness of the integration efforts. Furthermore, facilitating constructive discussions among participant groups fostered a collaborative environment for idea exchange, consensus-building, and the identification of shared perspectives as well as divergent viewpoints. Recognizing the importance of technical assistance and promoting dialogue within stakeholder groups is crucial for empowering integration initiatives and maximizing their impact.

1. Unleashing Innovation through Group Workshops:

The methods of group workshops proved to be a pivotal method in the integration process, facilitating productive exchanges, fostering diverse perspectives, and stimulating critical thinking. By engaging participants in assessing propositions from their peers, the workshops created an environment of peer learning and constructive criticism, allowing for a comprehensive evaluation of the integration process. The workshops encouraged participants to challenge ideas, leading to innovative solutions and a deeper understanding of the process

Leadership, Understanding, and Ownership are the key Pillars of Successful Integration Efforts:

Effective leadership at various levels of the healthcare system was instrumental in driving the successful integration of COVID-19 vaccination. Political commitment provided a strong foundation for the implementation of the IMT, ensuring the allocation of necessary resources and the prioritization of vaccination efforts. Furthermore, effective communication with decision-makers, such as the Minister's Cabinet, is vital, necessitating clear and concise messaging tailored to the audience, accompanied by evidence-based and actionable recommendations. Strong political support and leadership create an enabling environment for successful integration efforts. Additionally, stakeholders involved in the integration must possess a comprehensive understanding of the complexities and nuances associated with merging different systems or programs. Furthermore, ownership of the integration process is essential, requiring sustained commitment from all stakeholders.

Discussion

The implementation of COVID-19 vaccination in Côte d'Ivoire has been met with significant challenges, disrupting the Expanded Program on Immunization (EPI) (14). However, despite these obstacles, commendable efforts have been made in Côte d'Ivoire to integrate COVID-19 vaccination into routine immunization and primary health care programs. To prepare for the implementation of the integration mapping tool, the country organized an integration planning workshop **(18)** involving multiple participants, which resulted in key recommendations. The results of the mapping tools indicate that to date moderate progress has been made in integrating COVID-19 vaccination into all relevant health programmes, and highlighted important priorities. Particularly the area of leadership and governance require strengthening. The absence of comprehensive national vaccination policies and guidelines emphasizes the need for frameworks that encompass vaccination holistically, going

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beyond the focus solely on COVID-19. In this context, the integration mapping tool served as a catalyst to guide discussions and to make strategic decision-making around integration priorities. The results of the tool also guided the national stakeholders to develop a comprehensive integration roadmap. The country team also also decided to use existing coordination mechanisms, such as the Interagencey Coordination Committee for vaccines (ICC) to monitor the implementation of the integration roadmap.

To ensure that COVID-19 vaccines will reach the highest risk populations through routine immunization and primary health care services , further improvement is necessary in the areas of financing and service delivery. Optimizing resource allocation, payment systems, and vaccine administration is essential. Additionally, support is needed for target population identification, distribution points, quality of care mechanisms, and health personnel training to achieve effective integration. The integration mapping tool provides valuable insights into these aspects, facilitating targeted interventions and efficient resource allocation.. While health information systems and access to essential medicines show relative strength, integration into existing programs, intersectoral collaboration, national health strategy, communication strategy, community participation, and data utilization require improvement.

The findings highlight that the IMT can be a transformative tool, if it is used within a country led process that is supported by high level political commitment and ensured a strong collaboration across the different primary health care programmes.. By addressing the challenges associated with integrating COVID-19 vaccination into national immunization programs and primary healthcare, the IMT opens up new avenues for effective vaccination and improved healthcare delivery systems. Lessons learned from the case study pave the way for accelerated progress towards achieving vaccination targets and strengthening the integration process. It is worth noting that other countries have carried out integration exercises using the mapping tool but through virtual meetings **(19)**.

The positive results of the survey underscore the utility and effectiveness of the integration mapping tool in supporting immunization integration efforts. Its ability to provide a comprehensive understanding of the integration landscape, identify strengths and areas for improvement, and facilitate intervention evaluation demonstrates its value as a strategic decision-making tool for driving effective integration strategies. However, it is important to acknowledge that the integration exercise using the tool is time-consuming and resource-intensive, which may limit implementation capacity. Continuous communication and collaboration among stakeholders are vital for long-term sustainability. Additionally, monitoring and evaluation, as well as regular updates to roadmaps, are essential for adapting to new evidence and feedback.

This study has several strengths that contribute to its credibility and relevance. Firstly, the study took a comprehensive approach by documenting the entire field-testing process, providing a detailed account of the piloting process and outcomes. It included various phases, ensuring a holistic evaluation of the tool's implementation. Additionally, the use of a Likert scale survey allowed for a quantitative assessment of the tool's usefulness, adding rigor to the study. The study also drew upon a wide range of data sources, enhancing its reliability and comprehensiveness. However, the study does have limitations. Its descriptive design restricts the establishment of causal relationships or determination of the tool's effectiveness. The sample size and representativeness of the participants raise concerns about generalizability. Addressing these limitations requires further research. Conducting controlled intervention studies, qualitative research methods, and comparative studies in diverse settings would provide stronger evidence and a more nuanced understanding of the tool's impact. Further research is needed to overcome these limitations and advance the field of COVID-19 vaccine integration, ensuring evidence-based decision-making and improved health system performance.

Conclusion

The successful implementation of the first field test of the Integration Mapping Tool (IMT) for COVID-19 Vaccination in Côte d'Ivoire signifies a groundbreaking milestone and holds immense promise. This research underscores the crucial necessity for having strong country led and managed

processes to use and embrace innovative tools like the IMT to engage different different health programmes into strategic immunization discussion to improve access of the highest risk populations to COVID-19 vaccines. The remarkable application of the IMT in Côte d'Ivoire paves the way for other countries to have similar strategic dialogues to set-up routine service delivery services within their immunization and primary health systems. By offering a standardized and systematic framework, the IMT facilitates these country-led dialogues and also ensure seamless integration into the health systems building blocks . Key takeaways from the field test emphasize the significance of data-driven decision-making, collaboration, strategic timing, supportive environments, interactive workshops, and effective leadership. These invaluable insights and findings not only provide guidance for Côte d'Ivoire but also serve as a solid foundation for future advancements in integrated vaccination programs, offering evidence-based support to nations embarking on similar integration endeavors.

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References

1. World Health Organization (WHO). (2023). WHO Coronavirus (COVID-19) Dashboard. Retrieved from https://covid19.who.int/region/afro/country/ci
2. Ministère de la Santé, de l'Hygiène Publique et de la Couverture Maladie Universelle. (2023). Plan national de vaccination et de déploiement des vaccins contre la COVID-19 en Côte d'Ivoire : EN06-M02 Création : 22/04/2022 Version : 01
3. Ministère de la Santé, de l'Hygiène Publique et de la Couverture Maladie Universelle (2023). Rapport hebdomadaire de Réunion de suivi de la vaccination contre la covid-19 en Côte d'Ivoire du 01 mars 2023
4. Communiqué du Conseil National de Sécurité du 12 avril 2023 Communiqué du Conseil National de Sécurité https://www.rti.info/securite/2023/4/12/communique-du-conseil-national-de-securite-du-12-avril-2023
5. World Health Organization WHO (2023). WHO chief declares end to COVID-19 as a global health emergency." UN News, 2023, May 11. Accessed June 22, 2023. https://news.un.org/en/story/2023/05/1136367.
6. UNICEF, World Health Organization, Gavi the Vaccine Alliance,. (2023). COVID 19 Vaccine Integration Mapping Tool. Retrieved from https://www.technet-21.org/en/hot-topics-items/429-programme-management/15437-considerations-for-integrating-covid-19-vaccination-into-immunization-programmes-and-primary-health-care-for-2022-and-beyond
7. Considerations for integrating COVID-19 vaccination into immunization programmes and primary health care for 2022 and beyond. Geneva: World Health Organization and the United Nations Children's Fund (UNICEF), 2022. Licence: CC BY-NC-SA 3.0 IGO https://apps.who.int/iris/bitstream/handle/10665/366171/9789240064454-eng.pdf
8. Mentimeter. (n.d.). Surveys. Retrieved from https://www.mentimeter.com/features/surveys
9. Ministère de la Santé et de l'Hygiène Publique et de la Couverture Maladie Universelle (2022). Plan National de Développement Sanitaire 2021-2025 [National Health Development Plan 2021-2025]. Retrieved from https://ucp-fm.com/uploads/documentations/6388a0fde5e42-suivis-plan-national-de-developpement.pdf
10. United Nations Population Fund. (2023 .). Population Côte d'Ivoire. Retrieved from https://www.unfpa.org/fr/data/world-population/CI

11. World Bank. (n.d.). Gini index - Cote d'Ivoire. Retrieved 21 June 2023 ,Retrieved from https://data.worldbank.org/indicator/SI.POV.GINI?locations=CI
12. Central Intelligence Agency (CIA). (n.d.). Cote d'Ivoire. In The World Factbook. Retrieved 21 June 2023 , from https://www.cia.gov/the-world-factbook/countries/cote-divoire/ https://www.cia.gov/the-world-factbook/countries/cote-divoire/
13. Data.FI. (2022). Vaccination contre la COVID-19 en Côte d'Ivoire : analyse des systèmes et outils existants d'allocation des vaccins et de visualisation des données. Washington, DC, États-Unis : Data.FI, Palladium
14. Institut National de la Statistique-INS et ICF 2022. Enquête Démographique et de Santé de Côte d'Ivoire, 2021. Rockville, Maryland, USA : INS/Côte d'Ivoire et ICF.
15. Ministère de la Santé et de l'Hygiène Publique et de la Couverture Maladie Universelle (MSHP-CMU) (n.d.). CICG. Point de situation COVID-19. Retrieved from http://www.info-covid19.gouv.ci/welcome/labonneinfos
16. TechNet-21. (Related reference code: COVID-VAX-INTEGRATION). Retrieved from https://www.technet-21.org/en/library/explore/other-publications-and-resources/5224-considerations-for-integrating-covid-19-vaccination-into-immunization-programmes-and-primary-health-care-for-2022-and-beyond
17. World Health Organization. (2023). Strategic Advisory Group of Experts on Immunization (SAGE) - March 2023. Agenda, Policy & Strategy, Immunization, Vaccines and Biologicals, Strategic Advisory Group of Experts on Immunization. (No. WER 98 No. 22, pp. 239-256). Retrieved from https://www.who.int/publications/i/item/who-wer9822-239-256.
18. Ministère de la Santé et de l'Hygiène Publique et de la Couverture Maladie Universelle. (2023). Rapport De l'atelier de réflexion sur la vaccination contre la covid-19 en routine [Workshop on Routine COVID-19 Vaccination]. (Version 01, 18 pages) Grand Bassam, Côte d'Ivoire. (Creation Date: October 24, 2022). Unpublished.
19. UNICEF Africa ROs. (December 2022). Integration Mapping: Detailed Report. Unpublished document