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Challenges and enablers to establishing COVID-19 vaccine effectiveness studies in the World Health Organization Africa region: A mixed-methods evaluation of the African region monitoring vaccine effectiveness (AFRO-MoVE) network

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Abstract

Background: The African Region Monitoring Vaccine Effectiveness network (AFRO-MoVE) was established by the World Health Organization Regional Office for Africa in March 2021 to support implementation of COVID-19 vaccine effectiveness studies in the region.

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Authorship

All authors certify that they meet authorship criteria. Adam Crawley wrote the first draft and incorporated feedback from coauthors, who had also contributed to conduct of the study. The authors acknowledge the support of the AFRO-MoVE secretariat in planning the design of the evaluation and in facilitating data collection processes. In particular the authors thank Jason Mwenda, Archibald Worwui, Celine Gurry, Sandra Cohuet, and Anthony Nardone for their support and contributions.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data analysis

The analysis was planned by Adam Crawley, Katherine Murphy, Ian Plumb, and Eva Leidman, with input from other coauthors. Data collection was conducted by Grace Adjoa Ocansey, Isaac Baffoe-Nyarko, Katherine Murphy, and Adam Crawley. Data preparation and data analysis were conducted by Grace Adjoa Ocansey, Katherine Murphy, and Adam Crawley.

CRediT authorship contribution statement

Adam W. Crawley: Writing – review & editing, Writing – original draft, Visualization, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Katherine Murphy:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Ian D. Plumb:** Writing – review & editing, Writing – original draft, Validation, Methodology, Formal analysis, Conceptualization. **Grace Adjoa Ocansey:** Writing – review & editing, Investigation, Formal analysis, Data curation. **Isaac Baffoe-Nyarko:** Writing – review & editing, Investigation, Formal analysis, Data curation. **Norman Nyazema:** Writing – review & editing, Validation, Methodology, Conceptualization. **Sibongile Walaza:** Writing – review & editing, Validation, Methodology, Conceptualization. **Eva Leidman:** Writing – review & editing, Writing – original draft, Supervision, Methodology, Investigation, Formal analysis, Conceptualization.

Objectives: Primary goals of the evaluation were to assess how AFRO-MoVE addressed its objectives supporting regional vaccine effectiveness (VE) studies, to describe challenges and opportunities, and make recommendations to strengthen future efforts related to regional VE research.

Methods: From September 2023 through June 2024, a mixed-methods approach was employed to synthesize information from: (1) documentation provided by AFRO-MoVE; (2) a standardized study review tool; (3) an electronic stakeholder survey; and (4) a series of key informant interviews. Data were collected and exported via REDCap and summarized using Microsoft Excel. Thematic analysis was used to analyse the qualitative data. Perceived challenges were summarized together with perceived support by the network in addressing each challenge.

Results: AFRO-MoVE provided support to ten VE studies, including support for protocol development, study implementation, data management, and analysis, while also facilitating knowledge exchange and experience sharing among study implementers. While respondents reported strengthened capacity for VE studies at the national and regional levels in these areas, enrollment of SARS-CoV-2 positive cases was challenging, due to a decline in reported cases in network countries in mid-2022, when many studies were launched. These challenges contributed to a lack of published VE estimates from network study sites in time to inform vaccine policy.

Conclusion: AFRO-MoVE technical assistance and financial support was viewed positively by network members and contributed to increased capacity for conducting VE studies in the region. Publication of study results would further bolster the impact of the network. These findings underscore opportunities to enhance capacity for rapid VE generation and support preparedness for future pandemics.

Keywords

Vaccine effectiveness; Vaccine policy; Sentinel surveillance; Technical assistance; Regional network; COVID-19; SARS-CoV-2

1. Background

The COVID-19 pandemic led to substantial morbidity and mortality in the African region, with more than 500 million infections and more than 400,000 deaths estimated during 2020–2021. [1] Although highly effective COVID-19 vaccines became authorized and available in early 2021, capacities for low-income countries to equitably procure vaccines was cause for concern, including those in the African region. [2] COVID-19 Vaccines Global Access (COVAX) was established by the World Health Organization (WHO), GAVI, and the Coalition for Epidemic Preparedness Innovation (CEPI) was established to ensure rapid and equitable access to COVID-19 vaccines for all countries regardless of income level. [3] COVAX delivered the first doses of COVID-19 vaccines in West and Central Africa by the beginning of March 2021. [4]

Since the introduction of different COVID-19 vaccines, studies of vaccine effectiveness (VE) have aimed to characterize their real-world performance against a range of clinical endpoints, over time, and against successive SARS-CoV-2 variants. Performance of COVID-19 vaccines could plausibly differ by regional setting and among populations

that may differ in background comorbidities, immunological profiles, ethnicity, and age structures. Performance may also differ due to changes and adaptations in the virus, by vaccine formulations and vaccine products, or by stability of the vaccine in real-world conditions. [5,6] Multiple regional VE networks were either established or modified to estimate COVID-19 VE, including the European Severe Acute Respiratory Infection Vaccine Effectiveness (Euro-SAVE) Network, the Influenza – Monitoring Vaccine Effectiveness in Europe (I-MOVE) network, and the Network for the Evaluation of Vaccine Effectiveness in Latin America and the Caribbean (REVELAC). [7–9] To support capacity for VE estimates in the African region, the African Region Monitoring Vaccine Effectiveness network (AFRO-MoVE) was established by the WHO Regional Office for Africa (WHO AFRO) in March 2021. [10] The AFRO-MoVE secretariat is composed of staff from WHO AFRO and EpiConcept, a French company contracted to provide domain expertise and services in the field of public health.

In addition to assessing vaccine performance against clinical endpoints, another aim of producing estimates of COVID-19 VE in the AFRO region was to contribute to the shaping and strengthening of COVID-19 vaccine policy. More broadly, building regional capacity to conduct vaccine effectiveness studies also aimed to strengthen the scientific community in Africa with capacity to evaluate new vaccines. The objectives of AFRO-MoVE to support current and future estimates of vaccine effectiveness in the WHO AFRO region are summarized in Box 1. [10]

To assess successes and challenges of AFRO-MoVE in meeting its objectives, an evaluation was initiated in September 2023. Primary goals of the evaluation were to assess how AFRO-MoVE addressed the network's objectives in supporting regional COVID-19 vaccine effectiveness studies, to describe associated challenges and opportunities in meeting these objectives, and to make recommendations to strengthen future efforts. The specific objectives of the evaluation were to (1) evaluate how the secretariat and network were established and functioned; (2) review country and site-specific activities conducted to generate VE estimates as context for network contributions; (3) summarize the outputs of network activities; and (4) make recommendations for the network on how to improve and build on network activities and the capacity for conducting VE or other related studies in the WHO AFRO region in the near and long-term.

2. Methods

The evaluation of the AFRO-MoVE network was coordinated by WHO AFRO and the AFRO-MoVE secretariat and was conducted by an external team led by U.S. Centers for Disease Control and Prevention (US CDC) alongside scientists from the African Region. Evaluation of AFRO-MoVE combined formative and process evaluation approaches, as described by Berkowitz et al. in 2008, to assess network performance against its stated objectives. [11] The evaluation scope was limited to the contributions of AFRO-MoVE on coordination, financing, facilitation, and capacity building for implementing VE studies across different countries in the region, and did not include assessment of the individual studies nor methods used to generate pooled VE estimates.

The AFRO-MoVE network includes over forty different organizations across eighteen African countries, as well as collaborating international partner organizations (Supplementary Table 1). For evaluation purposes, countries were categorized based on the level of support they received from AFRO-MoVE for conducting VE studies: (Group A) countries receiving both financial and technical assistance to implement VE studies, (Group B) countries implementing VE studies receiving technical assistance but not receiving direct financial support from AFRO-MoVE, and (Group C) all other partners engaging with the network. All countries in Groups A and B are summarized in Table 1.

To fully assess the objectives described in the scope of the evaluation, the evaluation team used multiple sources of information that included both primary and secondary data. A mixed-methods approach was used to synthesize information from the following sources:

1. **Network documentation**, including presentations, meeting notes, abstracts, and some VE study protocols were either publicly available or supplied to the evaluation team by the AFRO-MoVE secretariat and network partners. These materials were reviewed by the evaluation team to develop an initial understanding of AFRO-MoVE activities. This formative stage of the evaluation process was conducted from November 2023 through the end of January 2024.
2. **A standardized questionnaire administered to study teams** (Supplementary File 3) was used to capture information on study design, approval, and implementation timelines, and contextual country information (e.g. testing practices, vaccine uptake) for the seven countries hosting VE studies that had received funding from AFRO-MoVE (Group A). Principal investigators or study coordinators engaged in one-hour virtual interviews with two members of the evaluation team, who administered the questionnaire. Interviews were conducted from April 10 through April 25, 2024 and responses entered into a REDCap survey tool hosted by WHO AFRO and transcribed using Microsoft Teams' transcription function.
3. **An electronic survey of network stakeholders** (Supplementary File 4) was administered to network stakeholders (Groups A, B, and C) and was open to any individual participating in the AFRO-MoVE network (such that multiple people from the same country or study could participate) to ensure that perspectives from a broad array of network stakeholders were captured, including study teams, government officials, and WHO staff. Survey questions were used to assess the respondent's role and level of engagement with the network, level of satisfaction with the performance of the network, perceived benefits from network participation, perceived challenges to the network achieving its objectives, potential changes that could be made in the future to strengthen the network, and level of interest in continuing to engage with the network. The survey was deployed using REDCap software, with data hosted by WHO AFRO. Invitations to complete the survey were sent out via email by the AFRO-MoVE secretariat to a comprehensive list of email addresses maintained by the network. The survey link was distributed to 230 contacts on March 22, 2024 and multiple

reminders were shared before the survey was closed on May 1, 2024. Survey responses were exported from REDCap and summarized using Microsoft Excel.

4. **Key informant interviews with network stakeholders** were conducted to solicit in-depth information on network successes and challenges from a variety of stakeholders (Groups A, B, and C). Questions were asked in a standardized format that included both fixed choice and open-ended questions (Supplementary File 5). Interview responses were recorded in a REDCap survey tool hosted by WHO AFRO and transcription was performed using Microsoft Teams. To represent the different roles in the network, the evaluation team sought responses from stakeholders that included network funders, the scientific steering committee, the network secretariat, WHO staff representing VE networks from other regions, and network members at the country level that included study site staff, WHO country office staff, and ministry of health officials. The evaluation team aimed to interview up to 15 key informants that had a high degree of engagement with the network in their respective roles. Questions were administered in a spoken interview format with two evaluation team members via a series of one-hour, virtual interviews between May 10 to June 10, 2024.

Thematic analysis techniques were used to analyse the qualitative data collected during the key informant interviews. This analysis followed a deductive approach, using a set of predefined codes that were informed by the results of the AFRO-MoVE stakeholder survey, conversations with the AFRO-MoVE secretariat, and subject matter expertise. Perceived challenges were summarized together with perceived support by the network in addressing each challenge. Data were collected and exported via REDCap and summarized using Microsoft Excel. Given non-random sampling and small sample sizes from the survey response, key themes, rather than proportions, are presented.

A timeline of study activities was developed and contextualized using the number of monthly COVID-19 cases reported to the World Health Organization for the seven countries funded by AFRO-MoVE — Ghana, Malawi, Mali, Namibia, Senegal, Tanzania, and Uganda. The average across all seven countries was calculated for each month from March 2020 through June 2024 and graphed using Microsoft Excel. Data were obtained from the WHO COVID-19 Dashboard. [12]

The evaluation protocol was reviewed and received ethical approval by WHO AFRO and the AFRO-MoVE Scientific Steering Committee. This activity was reviewed by CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy.¹ Participants provided oral consent for interviews to be recorded and transcribed.

3. Results

3.1. Survey responses

Of the eighteen invitations for key informant interviews that were sent, two respondents declined to participate due to lack of availability. Joint interviews were conducted for each

¹§See e.g., 45C.F.R. part 46, 21C.F.R. part 56; 42 U.S.C. §241(d); 5 U.S.C. §552a; 44 U.S.C. §3501 et seq.

of two members of the scientific steering committee, two staff from WHO AFRO, and two staff from EpiConcept. Other interviewees represented a variety of roles in the network, including one staff from WHO headquarters, two individuals from other WHO regional offices that support VE networks, a staff member from AFRO-MoVE's primary funder, two staff from WHO offices in implementing countries, one Ministry of Health official from an implementing country, and three staff that played leading roles in study implementation in their respective countries. In total, thirteen interviews were conducted with a total of sixteen respondents.

A standardized study questionnaire was completed with study staff representing all seven countries hosting VE studies funded by AFRO-MoVE. Five interviews featured single respondents representing their organizations, while the remaining two interviews featured two respondents each. All respondents represented non-governmental health or research organizations acting as the primary study implementers.

The electronic stakeholder survey was distributed to 230 contacts, resulting in 22 responses across nine African countries, a response rate of 9.6 %. Among the survey respondents, five funded countries were represented (Ghana, Mali, Namibia, Tanzania, Uganda), along with respondents from Ethiopia, The Gambia, Kenya, and South Africa. Of the 22 respondents, 18 identified as 'study implementers', two as 'scientific steering committee members', and two as 'other network members'.

3.2. Network establishment and timeline

AFRO-MoVE was launched in March 2021, the same month that COVAX initiated rollout of COVID-19 vaccines to the region. The network supported multiple study designs, including both cohort and case-control test-negative designs, that included different outcomes of interest ranging from hospitalization to symptomatic infection. Data collection for the four VE studies in the network that used a cohort design was conducted from December 2021 through July 2022, whereas the six studies using a test-negative design (TND) or other case-control design initiated data collection from June 2022 through March 2023. Consultations with study teams on a regional pooled data analysis were initiated in November 2023. At the time of this evaluation, all Group A and B study sites had concluded data collection and begun analysis. A timeline of network milestones is summarized in Fig. 1, further contextualized by the mean monthly COVID-19 case counts reported to WHO, averaged across the seven countries directly funded by AFRO-MoVE. Ninety percent of VE studies supported by the network did not initiate until June 2022 or later, by which point both the number of reported COVID-19 cases and the number of new vaccine doses being administered had slowed considerably. [3] Initiation of many network-supported VE studies aligned with declines in reported cases and new vaccinations in the region; this led to several perceived challenges which are further articulated below.

The network included up to forty organizations from eighteen countries and convened virtual meetings and workshops twenty-one times over the course of three and half years (March 2021 through September 2024), including fourteen network meetings and seven technical workshops or webinars. In addition, during the same time period, four in-person site visits were conducted by secretariat members to countries hosting VE studies (Ghana, Namibia,

Senegal, Uganda), and one in-person meeting of the network held in South Africa in March 2023. Survey respondents and interviewees agreed that network meetings and webinars were ‘substantially impactful’. Nearly all key respondents highlighted the benefits of ‘experience sharing’ between countries. The network meetings provided a forum for periodic updates on VE studies in the region, particularly those financially or technically supported by AFRO-MoVE, building awareness of COVID-19 VE studies in the region. The virtual workshops supported skill building and facilitated support for collection, management, and analysis of study data.

3.3. Standard protocols and pooled data

In 2020, WHO developed a series of generic protocols (i.e., Unity Protocols) for studies of relevance during the COVID-19 pandemic response, including two protocols for studies evaluating vaccine effectiveness. [13] AFRO-MoVE hosted a webinar orienting countries to the protocol for VE estimation leveraging a cohort design, the WHO Unity Health Worker COVID-19 Vaccine Effectiveness Protocol, in May 2021. This was followed by a webinar orientation to methods for VE estimation leveraging a test-negative design, the WHO Unity Severe Acute Respiratory Illness (SARI) COVID-19 Vaccine Effectiveness Protocol, in June 2021.

A large majority of respondents considered the sharing of generic protocols and support to adapt them as ‘significantly impactful’. During key informant interviews, stakeholders noted that the use of standard protocols supported more rapid implementation of VE studies at the national level by reducing the time required to develop protocols and associated data collection tools. The use of standard protocols also helped study investigators navigate ethical review processes more easily in some countries.

An additional benefit of shared protocols was the enabling of pooled data analysis across some countries in the region that were using test-negative designs. The AFRO-MoVE secretariat established a centralized data platform using a REDCap database that was made available to countries willing to share data with WHO AFRO; all ten studies opted to use the data collection and data management tools made available, which reduced overall costs and time required to implement study activities. AFRO-MoVE leveraged this platform to conduct a pooled data analysis targeting a subset of studies employing a test-negative design with hospitalization and/or severe disease as the outcome of interest. The pooled analysis ultimately included three countries - Ghana, Kenya, and Mali. Although Senegal, Tanzania, and Uganda had also hosted test-negative design studies, the volume of data from Senegal and Tanzania were determined to be insufficient for inclusion. Uganda had used symptomatic illness, rather than severe disease or hospitalization, as the outcome of interest and therefore was also excluded. The resulting pooled analysis has a data collection period from January 2022 through July 2024 spanning 36 participating hospitals across the three countries. The study population for the pooled analysis was defined as those 18 years and over with no contraindication for COVID-19 vaccination hospitalised for at least 24 h with a severe acute respiratory infection in one of the study health structures. At the time of this writing, analysis was ongoing with preliminary results shared among network stakeholders on September 20, 2024.

3.4. Country and regional capacity for VE studies

There was consensus among respondents that AFRO-MoVE provided either ‘substantial additional benefit’ or ‘some additional benefit’ through its provision of technical assistance. In addition to the support for adapting study protocols, capacity building activities included a REDCap data management workshop, data analysis workshops for analyzing cohort and case-control data, and a scientific communication workshop to support interpretation and communication of study results. These activities were complemented by routine network calls in which study sites were provided opportunities to present interim results, discuss implementation challenges and methodological questions, and obtain feedback from relevant experts. In addition, the creation by the network secretariat of shared data collection and data management tools in REDCap was characterized as ‘substantially impactful’.

Among the respondents who identified as study investigators, all indicated that their studies would not have been established absent financial support from AFRO-MoVE. Several of these respondents noted that while some technical capacity for conducting these studies already existed, the funding from AFRO-MoVE was crucial to initiating the studies. There was consensus among stakeholders that the combined technical and financial support from AFRO-MoVE was ‘significantly useful for strengthening capacity for VE studies in the AFRO region’, and that the network was ‘significantly useful’ in strengthening capacity within their country.

3.5. Regional VE strategy and advocacy

Nearly all survey respondents agreed that AFRO-MoVE strengthened the ability of countries in the region to conduct VE for other pathogens in the future, and this sentiment was shared by respondents during interviews, with some mentioning future opportunities that might be presented by the introduction of respiratory syncytial virus (RSV) vaccine. [14] While some respondents expressed viewpoints on future opportunities, a formal strategy for VE studies in the region has not yet been established.

Overall, AFRO-MoVE’s strategy of supporting many independent studies of multiple designs and endpoints in the region is in contrast to the strategy in other regions, such as Europe’s Euro-SAVE network and South America’s REVELAC network, which function more as a single study with sites across multiple countries aiming at generating national as well as regional VE estimates.

3.6. Challenges to network objectives and study implementation

A variety of factors were perceived to contribute to delays in study initiation. Stakeholders specifically cited administrative challenges, including both time required to select countries for funding and time required to establish contracts with the organizations leading implementation as a challenge. Once studies were formally initiated, enrollment of SARS-CoV-2 positive cases was reported to be challenging given that there was a notable decline in reported cases in many countries in the region beginning in early-to-mid 2022. The timing of study initiation and decline in reported cases contributed to the fact that the VE studies supported by AFRO-MoVE had not published any VE estimates by the end of the COVAX initiative supporting distribution of vaccines in the region, in December 2023. As a result,

network-supported studies did not directly impact regional vaccine policy while the COVAX initiative was active. At the time of this evaluation, the network secretariat was organizing the publication of several potential manuscripts from study sites associated with the network, including some with estimates of COVID-19 vaccine effectiveness.

Vaccine availability was limited in many countries in the AFRO region, particularly during the earlier stages of the COVID-19 pandemic. Even once COVID-19 vaccines had become more widely available, many network stakeholders emphasized that they faced challenges in analyses arising from low uptake, reflecting challenges previously documented. [15] Of the nine countries included in Table 1, the percent of the population receiving at least one COVID-19 vaccine dose by December 2023 ranged from 15.1 % to 56.2 %, with a median of 28.1 % across all nine countries. [3] By 2022, respondents noted that vaccination may have been less of a priority among the general population. With sample size targets determined based on an assumed proportion of vaccinated cases among the study population, lower than expected vaccination coverage within plausible ranges would drive the required sample sizes even higher. [16] As a result, duration of data collection had to be extended to enroll sufficient cases, limiting release of data on a policy relevant timeline.

In addition to the limitations of the individual studies, AFRO-MoVE's efforts at pooled VE analysis were limited first by variability in study designs and outcomes interest across the network, reducing the number of studies that could be considered for pooled analysis. While the studies were all adapted from WHO Unity Study protocols, specific details were not initially coordinated to enable pooled analysis. For those studies that were included, heterogeneity between countries was one limiting factor, as studies contributing pooled data experienced variable timing of waves of COVID-19, circulation of different variants, and different levels of natural and vaccine derived protection, limiting the ability to draw conclusions around vaccine effectiveness, as study participants experienced different epidemiologic scenarios. Further, given the difficulty of recruitment, study implementers reported that the achieved sample sizes were typically lower than planned, which limited the ability to stratify results even in pooled analysis, potentially limiting insights into differences by age, vaccine formulation received, and other factors.

Finally, as network activities and resources were focused on building the capacity of study teams, there was limited ability to address underlying health system challenges related to completeness and accuracy of information on vaccination status in vaccine registries, and capacity building in this area was generally beyond the scope of the scope of AFRO-MoVE. Respondents also noted delays and challenges to gaining access to data from vaccine registries that were maintained by Ministries of Health or other government institutions, potentially due to a lack of existing relationships or collaborations between academic study sites and government institutions prior to study initiation.

Although AFRO-MoVE was well-positioned to help address some of the aforementioned challenges, others were beyond its remit. Table 2 summarizes the level of perceived challenges, together with extent of perceived benefits of the network in addressing those challenges, using quantitative survey data and comments from key informant interviews. Respondents considered that low vaccine coverage and availability of vaccination

information represented the greatest challenges, and that the network was moderately effective in improving access to data on vaccination status, but less so on the issue of vaccine coverage. In addressing challenges, respondents considered the network to be most effective in strengthening efforts to secure funding and to ensure data management and analytic support.

4. Discussion

As a technical network, AFRO-MoVE provided a forum to share expertise, common protocols, scientific strategies, and updates of vaccine effectiveness within the WHO AFRO region, leading to strengthened individual studies. These achievements are particularly notable given the context of an ongoing health emergency caused by the COVID-19 pandemic. As a result of shared expertise, shared protocols, data management and analysis support, and technical expertise, AFRO-MoVE also provided an opportunity to pool estimates between studies within the AFRO region. Although objectives to enable AFRO-MoVE funded studies to publish national or regional estimates were largely unrealized at the time of writing, other African institutions did produce VE studies with high-impact findings. [17–19] AFRO-MoVE's goals were also broader and longer-term. An increase in regional capacity for vaccine effectiveness was also intended to strengthen an African-led strategy, support regional advocacy, and provide preparedness against future threats.

To increase capacity for VE studies in the region, AFRO-MoVE employed a variety of strategies, including provision of technical expertise, resources, and shared protocols. AFRO-MoVE coordinated information-sharing updates across at least ten different COVID-19 vaccine effectiveness studies taking place in the AFRO region that were funded or technically supported by the network, and provided a venue for updates from additional VE studies that may not have been directly supported by the network. Network meetings and technical assistance webinars were well-received by network stakeholders, and opportunities for 'experience sharing' across countries and study sites were frequently highlighted. There was broad agreement that the technical assistance provided by the network was valuable to countries implementing VE studies. More directly, respondents considered the network to be substantially effective in providing financial support, and moderately effective in enabling access to appropriately trained staff.

However, there were also myriad challenges to generating reliable and timely national and regional estimates of COVID-19 vaccine effectiveness, some within the control of AFRO-MoVE or host country governments to address, while other factors were largely outside of stakeholder control. Establishing new studies takes time, but there was agreement that among respondents that further streamlining the approval process for study protocols and improved processes for transfer of funds to study sites may decrease the time required to initiate studies in the future. Other significant challenges such as local uptake of vaccines and test availability may have been outside AFRO-MoVE's control, but future efforts in the region might look to increase the coordination between VE studies and vaccination campaigns, as low rates of vaccine uptake and limited number of severe cases are significant ongoing challenges to conducting VE studies for COVID-19. It has been documented that low and middle-income countries with existing seasonal influenza vaccination programs

were better prepared for the COVID-19 pandemic compared to other countries where the influenza vaccination platform was weak or non-existent. [20] Low uptake and prioritization of influenza vaccine in many African countries may have adversely impacted preparedness for SARS-CoV-2 in the region. [21] In addition, respondents reported a substantial challenge in ensuring complete vaccination status information, data which are crucial for generating reliable vaccine effectiveness estimates. [22] Improved linkage between vaccine registry programs and relevant study sites or SARI surveillance systems may reduce this challenge in the future, both for SARS-CoV-2 and other respiratory pathogens like influenza and RSV.

The decline in both reported cases and vaccination uptake in many countries just as studies were established proved challenging both in terms of study operation and relevance of studies being conducted. Once studies were initiated, the decline in reported COVID-19 cases exacerbated difficulties with enrolling cases, which may limit statistical power and increase the risk of selection bias. Since COVID-19 vaccine effectiveness wanes over several months, time-since-vaccination is a key parameter in analysis. There is a relatively short window to include an intervention group with recent receipt of vaccines, and therefore estimate peak effectiveness, a particular challenge for COVID-19 VE studies in a region where low uptake of COVID-19 vaccines was considered to be a substantial challenge. [23] Lastly, a variety of other challenges were also acknowledged, such as difficulty controlling for prior infections and the wide array of potential biases that can distort VE estimates. [6]

Although the objective of generating timely vaccine effectiveness estimates was not met by the time of writing, this should not obscure the network's underlying contribution to strengthening capacity, or its success in addressing other longer-term objectives. Establishing new studies is challenging, and especially so during a global pandemic. Others have noted that leveraging or adapting pre-positioned platforms was often effective in providing timely data to inform the COVID-19 response, such that maintenance of systems that can more rapidly be modified and strengthened may have longer-term benefits against future threats. [24]

5. Evaluation limitations

Evaluation of regional capacity, advocacy, and a specific strategy was limited by information provided, and assessment of capacity gains relied on reported information and was not evaluated directly. The response rate to the electronic stakeholder survey was low, and data collected through key informant interviews and an electronic survey may not be representative of the network as a whole. Given the distribution of responses to key informant interviews, our evaluation team was not able to ascertain systematic differences in the challenges faced between those study teams conducting test-negative design and cohort studies, despite previously documented challenges generally observed within each type of observational study. [6] The evaluation did not seek to assess individual studies, but rather the overall performance of the network in supporting the implementation of VE studies in the region. As such, only a small number of study protocols were available and no patient-level data were reviewed, limiting insights into the quality of the studies conducted.

This evaluation did not capture information related to AFRO-MoVE's activities to advocate for additional funding for study sites, national authorities, or other organizations.

6. Conclusions

This evaluation identified potential opportunities in the near and long-term for AFRO-MoVE. Most immediately, the network's impact might be strengthened by completing planned analyses and sharing findings through a planned publication. Although direct impact on vaccine policy may have been minimal, this is an important opportunity for the network to highlight capacity gains in the region. Completion of the pooled analysis may also help to demonstrate the viability of this approach in the future. AFRO-MoVE and other regional stakeholders could also develop a clearer strategy for VE studies in the region to support ongoing work and bolster pandemic preparedness for the next novel pathogen. Such a strategy would ideally include a decision regarding VE study aims (e.g. annual estimates), study designs (cohort, test-negative, or other case-control), increased standardization across study protocols to better facilitate pooled analysis, and power considerations (e.g. national estimates vs regional estimates). Furthermore, countries with the requisite capacity for implementing VE studies might aim to include VE studies as part of their national research agendas and advocate to maintain or increase investments in genomic sequencing capacity, enabling timely characterization of circulating variants and subvariants.

There is a need to determine if the network's desired role is that of a community of practice where technical experts can share updates, knowledge, and resources related to vaccine effectiveness studies or, additionally, a platform for regional VE estimates similar to the models seen in Europe and South America that feature standardized, pooled data from targeted locations with ongoing COVID-19 vaccination efforts. The latter option is highly likely to be the more impactful, yet resource-intensive, opportunity. If neither option is feasible, consideration should be given to phasing out the network given that its specific purpose for supporting COVID-19 VE studies may be less relevant in the region beyond 2025.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Box 1.**Objectives of the AFRO-MoVE network.**

- Create and maintain a regional network of vaccine effectiveness (VE) technical experts
- Conducting a landscape of ongoing and planned studies in the region
- Rapidly share findings to inform policy decisions
- Encourage the use of standard study designs for multicenter studies
- Establish a data platform for pooled VE estimates
- Building regional capacities for VE for other pathogens
- Advocate for and mobilize resources for VE studies in the region
- Enable and inform a regional strategy for monitoring VE

Source: AFRO MOVE Network. WHO Regional Office for Africa, 2024. <https://www.afro.who.int/health-topics/coronavirus-covid-19/afro-move-n>

AFRO-MoVE network milestones and mean monthly COVID-19 cases reported to WHO across seven African countries

Source: WHO COVID-19 Dashboard
<https://data.who.int/dashboards/covid19/cases>

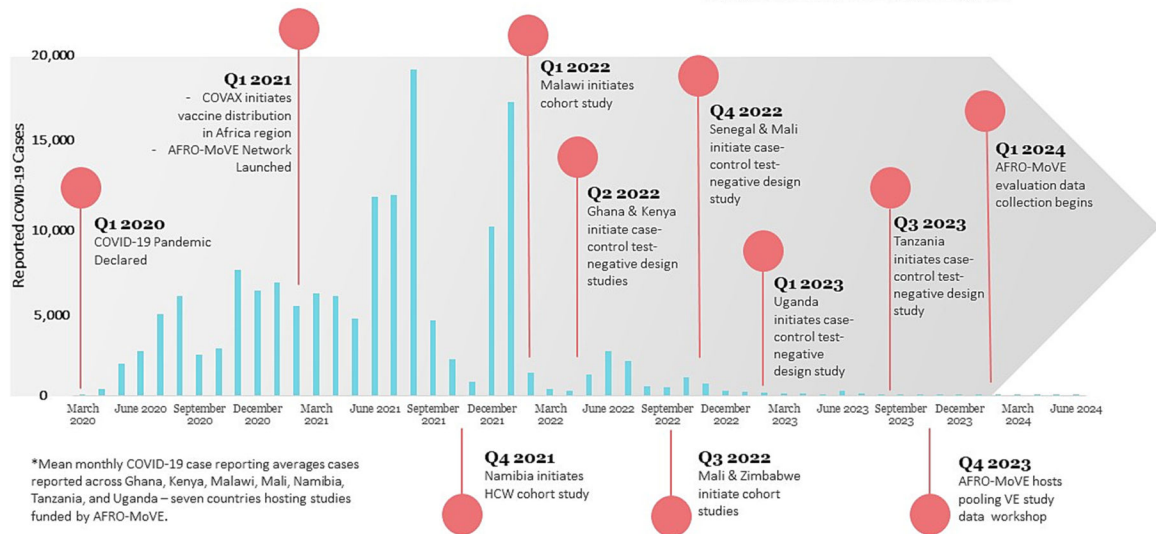


Fig. 1.
 Vaccine Effectiveness Milestones in the African Region.

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Table 1

Vaccine Effectiveness Studies Technically Supported by AFRO-MoVE.

Country	Design	Study Population	Effective Start	Outcomes	Funded by AFRO-MoVE
Ghana	Case-control	General population	June 2022	Hospitalization	Yes
Senegal	Case-control	General population	Sept 2022	Hospitalization	Yes
Tanzania	Case-control	General population	July 2023	Hospitalization	Yes
Kenya	Case-control	General population	July 2022	Severe disease	No
Mali	Case-control	General population	June 2022	Severe disease	Yes
Uganda	Case-control	General population	March 2023	Symptomatic Infection	Yes
Malawi	Cohort	Adults living with HIV, diabetes, or hypertension	December 2021	Symptomatic disease, severe disease	Yes
Zimbabwe	Cohort	Adults living with HIV, diabetes, or hypertension	June 2022	Symptomatic disease, severe disease	No
Mali	Cohort	Health workers	July 2022	Symptomatic disease, severe disease	Yes
Namibia	Cohort	Health workers	June 2022	Symptomatic disease, severe disease	Yes

Table 2

Vaccine Effectiveness Study Implementation Challenges and Reported Benefits from the AFRO-MoVE Network.

Potential challenge to implementing VE studies	Implication of potential challenge	Reported level of challenge experienced by AFRO-MoVE members	Reported level of benefit from AFRO-MoVE in addressing challenge
Availability of information on vaccine status	Limits ability to accurately classify if a case or control is vaccinated	Substantial	Moderate
Individual verification of vaccine status	Limits ability to accurately classify if a case or control is vaccinated	Substantial	Moderate
Accrual of enough data for analysis of VE	Inability to generate VE estimates to inform policy	Substantial	Moderate
Local access to or uptake of COVID-19 vaccines	Limits ability to enroll sufficient vaccinated cases and controls; Increasing time-since-vaccination among cases	Substantial	Low
Securing funding	Limits ability to support study activities	Moderate	Substantial
Data management and analysis support	Limits ability to properly analyse and interpret results	Moderate	Substantial
Agreement on protocol design	Slows study implementation timeline	Moderate	Moderate
Timely approval of protocols	Slows study implementation timeline	Moderate	Moderate
Timely implementation of study	Slows study implementation timeline	Moderate	Moderate
Inclusion/enrollment of participants	Limits ability to achieve sufficient statistical power	Moderate	Moderate
Writing for publication	Limits ability to communicate findings	Moderate	Moderate
Availability of tests	Limits ability to enroll sufficient number of cases	Moderate	Low
Data on underlying health conditions	Limits ability to stratify results by certain risk factors	Moderate	Low
Data on prior infection	Limits ability to generate accurate VE estimates	Moderate	Low
Availability of appropriately skilled staff	Limits ability to adhere to study protocols	Low	Moderate
Acceptability of study implementation	Slows study implementation timeline; may challenge enrollment and data collection efforts	Low	Moderate
Ensuring participants represented source population	Limits representativeness of study	Low	Low
Selection of controls	Limits ability to achieve sufficient statistical power	Low	Low
Completion of follow-up (cohort design)	Limits ability to achieve sufficient statistical power	Low	Low
Availability of test results	Limits ability to accurately classify cases vs. controls	Low	Low
Data on age, location, calendar time	Limits ability to stratify or interpret results by key covariates	Low	Low