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Technical Brief:
Digital Health Interventions for Supportive Supervision of Health Workers Providing Immunisation Services

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Executive Summary

Supportive supervision is widely used by immunisation programs as a strategy to improve the quality of health care worker performance, the coverage and demand for immunisation services, and ultimately health outcomes. Despite it being a foundation of health programs including immunisation programs, supportive supervision programs are not achieving their intended results. Digital health interventions applied in supportive supervision programs that are evidence-based and focused on quality improvement have improved key elements of supervision programs that have challenged implementation for decades.

Digital health interventions that support in-person supervisory visits, supplemental immunisation activities, and the ranking of health provider or health facility performance and, are implemented alongside other traditional supervision interventions, have been identified to improve the functioning of supportive supervision programs. These digital interventions have improved the monitoring, planning and prioritisation of supervision activities; the execution of in-person supervisory visits; healthcare worker learning post supervision visits; communication between the supervisor and healthcare worker; healthcare worker motivation and performance; supplementary immunisation activities; data capture, quality and analysis; commodity management, and the longitudinal care of priority clients. While robust outcome data on these enhancements are promising, studies are few and limited. Implementation experiences, however, report very promising results. Implementers and the evidence alike, highlight the need to consider the strength of the larger supportive supervision program, the maturity of the digital health ecosystem, the governance of both digital health and immunisation programs and, the enablers of digital literacy, government leadership and digital infrastructure when designing and deploying digital health interventions.

Gavi, the Vaccine Alliance, recognises the transformative potential that digital health interventions for supervision can have on immunisation programs. It has been prioritised for more in-depth exploration as part of Gavi's expanded approach from digital health information to digital health. This technical brief presents a synthesis of the published literature on the topic and insight from key informants on current implementation of promising digital health interventions for supportive supervision. The following are recommendations for investment in digital health interventions for supportive supervision within Gavi immunisation programs.

Key Recommendations

- **Evaluate promising digital health interventions** for supportive supervision and document impact on health care workers, health system and health outcomes related to immunisation.
- **Engage the Immunisation Agenda 2030 team** working on demand to study the potential impact of digital health interventions for supportive supervision on health care worker's motivation and other elements of behavior that affect the delivery of immunisation services and demand.
- **Prioritise the inclusion of digital health interventions** for supportive supervision in Gavi immunisation programming as a vehicle to strengthen health systems, reinforce investment in digital health information for immunisation, and act as a use case for investment in digital health interventions that will have benefits across health areas as a means of strengthening primary health care; prioritise countries included in The Big Catch-Up.
- **Invest in the evolution of promising Global Goods** for supportive supervision in immunisation programs.
- **Work with Gavi Alliance partners to align investment in digital health interventions** for supportive supervision with countries that are already investing in digital health and information systems, have a functioning supportive supervision program, and a global good already deployed for supportive supervision.
- **Support priority Gavi countries to understand the value of investment in digital health interventions** for supportive supervision programs and their effect on immunisation programs and health outcomes.

Background

Importance of supportive supervision to immunisation programs

Supportive supervision as defined by the World Health Organization (WHO) is a continuous process of helping health care workers to improve knowledge and skills related to the implementation of their job responsibilities. It has been shown to contribute to improved motivation and performance of health care workers (Bradley et al 2013). It fosters open, respectful, two-way communication, and facilitates problem-solving. It uses data to monitor performance towards goals and depends on regular follow-up with staff to ensure that new tasks are being implemented correctly (WHO 2008). Interest in supervision as a vehicle to manage health services and achieve program goals in low and middle-income countries was renewed when countries began expanding basic health services for delivery by paramedical and community health workers (Cueto 2004). As services moved beyond health facilities into communities it became increasingly important to link health workers with their supervisors. It remains a critical element of health programs today, particularly immunisation programs as they rely on facility-based and dispersed health workers to reach children with life saving immunisations.

Supportive supervision is intended to enable health care workers to offer quality services and improve program performance and coverage (Deussom et al 2022; Bailey et al 2016). Most routine supervision programs are designed as integrated programs where immunisation services are included along with other health areas being supervised, to be in line with clinical practice. This practice, known as integrated supportive supervision, is supported by the WHO. Supportive supervision programs specific to routine immunisation programs exist and have been shown to contribute to strengthening immunisation systems and improving vaccine delivery (Ryman et al 2005) but are less common. Despite their noted value, supportive supervision programs are often ill defined and vary greatly in their implementation depending on the health focus area, available funding and the presence of other health system inputs (Deussom et al 2022). Common gaps in supportive supervision include lack of real-time data for timely and effective feedback to health care workers (Tegegne et al 2018), a focus on quantity (reviewing records and data) with limited focus on service provision quality improvement (service delivery processes), and a limited ability of health workers to follow-up on issues identified during supervision visits (Renggli et al 2018).

A recent systematic review of supervision approaches in low-and middle-income countries found that digital health interventions, coupled with key health inputs and an evidence-based, quality improvement focus can improve program outcomes (Deussom et al 2022). Effective supportive supervision has the potential to improve immunisation services and optimise human resources to achieve immunisation goals.

Digital health interventions as an enabler for improved supportive supervision

The application of digital health interventions in supportive supervision programs can mitigate some commonly experienced challenges in supervision interventions, most notably improving adherence to service delivery standards, collecting and disseminating supervision data, supervisor/health worker communication and performance feedback (Deussom et al, 2022). As supervision programs consider the implementation of digital interventions to strengthen supervision programs it is critical to ensure that the foundational supportive supervision program is following current best-practices and is rooted in collaborative problem solving and quality improvement. Available evidence recommends the implementation of digital interventions in combination with traditional interventions to strengthen supervision programs (Rowe et al, 2018). Moreover, digital intervention should be designed as outlined in the Principles for Digital Development which include concepts of designing with the user in mind, inclusiveness, fit for purpose, do no harm, sustainability, reuse, transparency and data use.

As facility and community-based information systems are digitised, electronic patient records expand, national health enterprise architecture improves and digital literacy and connectivity increases the potential for digital health interventions to improve the delivery and impact of supervision programs increases exponentially.

Supporting Gavi's priorities

Scaling up vaccine coverage and reaching under-immunised and zero-dose children are foundational priorities for Gavi's 5.0 Strategy and prioritisation for Gavi 6.0. To accomplish these goals Gavi is committed to ensuring trust and confidence in immunisation services, expanding program coverage, responding to outbreaks and supporting countries to design services that respond to the specific needs of caregivers and underserved communities. The quality delivery of vaccination services by health care workers is at the centre of these commitments. In addition, the Digital Health Information Strategy 2022-2025 lays out Gavi's commitment to the digital transformation of immunisation information systems. Investment in digital supervision approaches builds off of and compliments the organisations' commitment to improved collection and use of digital health information systems in Gavi's programs. Building on the Digital Health Information Strategy, Gavi can leverage its convening power to bring immunisation and digital health stakeholders together at global, regional and country level to simultaneously address digital supportive supervision approaches that promote improved quality, coverage and scale of immunisation services.

Review of frameworks, literature and experiences

A rapid review of published, peer-reviewed literature was conducted to provide an overview of the state of evidence and experiences using digital health interventions for health care worker supervision [See Appendix A for details on the methods, criteria and results of the literature review.] In addition, key informant interviews were conducted with 18 digital health and immunisation experts to understand current usage of digital health interventions, gaps and needs in their implementation, and priorities for improvement and scale.

The review uncovered 20 articles in the peer-reviewed literature reporting on the use of digital health interventions for supervision of healthcare worker's routine and campaign immunisation activities in LMICs. The majority of these articles describe process evaluations, implementation research, feasibility studies or case studies in three main thematic areas: digital health interventions to support in-person supervisory visits, digital health interventions used during supplemental immunisation activities and, digital health interventions used to rank the performance of health providers or health facilities.

Digital tools to support in-person supervisory visits

A number of articles discussed digital versions of supervisory checklists that can be synchronised with a central database in place of paper-based reporting. These digital supervision checklists may be used to document performance during supplemental immunisation activities (SIA) such as campaign activities (Bello et al 2022; Bammeke et al 2023), cold chain monitoring (Das & Bora 2019), fixed-point delivery and routine immunisation (RI) (Lame et al 2023; Umar et al 2021; Tegegne et al 2018) or COVID-19 protocols (Haladou et al 2022). All of these examples involve the use of digital checklists during standard in-person supervisory visits. The digital records and transfer of supervisory data are sent to a dashboard or central database to facilitate performance comparison over time and target performance improvement interventions. These applications rarely involve sharing the data with the facilities or health care workers being supervised (see performance ranking, below). Although some studies attempt to document improvements in programmatic outcomes (Das & Bora 2019; Umar et al 2021; Tegegne et al 2018), these can not be attributed to the digitization of supervision checklists with any certainty. These interventions are not intended to provide real time monitoring (RTM) data (although some do) due to issues with data staging and internet connectivity

The majority of key informants reported on digital checklists that are part of a larger digital platform that guide health care workers through workflows as the primary application of digital health interventions to support routine supervision initiatives in integrated health programs. The most commonly cited digital health interventions include CommCare, the Community Health Toolkit (CHT), OpenSRP, ODK and Kobo Toolbox, all open source digital tools. The functionality of the tools are deployed depending on use cases, need, and maturity of the digital health ecosystem. In most

deployments the health care worker follows specific work flows related to their job duties and enters data on activities. The supervisor uses the intervention to monitor the health care worker's activities, track performance over time, manage medicines, ensure facility readiness for immunisation services, and plan supervision visits. The tool also improves data quality elements of accuracy, timeliness, and availability of data. Health care workers and supervisors can track progress against targets, and supervisors can better plan supervision and facility and community immunisation activities. Contrary to the published literature, key informants reported sharing data with the facilities and health care workers supervised.

Key informants described how the CHT, CommCare and OpenSRP offer additional functionality to support longitudinal client/household care, health care worker skill building, two-way communication between the health worker and supervisor, communication between the health care worker and the immunisation recipient (CommCare only), follow-up with zero-dose children according to the immunisation schedule, tracking immunisation defaulters and the analysis and presentation of program planning. Both tools provide training videos, FAQs and other resources for health care workers to access post supervision, or whenever they have service delivery questions. CommCare is currently exploring the use of chatbots as a virtual supervisor to facilitate problem solving and is applying the Prioritised Tasking Framework solution to enable users to review data and create task lists for health care workers and supervisors that are prioritised by program needs.

As outlined above, most respondents reported the primary use of digital supervision interventions as a tool to manage health worker performance in integrated health programs against coverage expectations. Almost all tools also provide resources for quality improvement but only a few provide resources to address health worker motivation and morale. This report is reinforced by the literature summarised above.

Two respondents noted the need to "go beyond the [checklist] tick box" that is the default of supportive supervision activities and do more than monitor performance.

Two examples of going beyond the check box were provided by respondents, the Coach2PEV intervention and the Health Network Quality Improvement System (HNQIS) solutions. Both interventions were developed specifically for supportive supervision with HNQIS targeting facility based health care workers implementing integrated health programs and Coach2Pev targeting community based immunisation health care workers. Both interventions are rooted in two-way communication, mentoring, and skills building for improved performance by providing a broader user experience for the supervisor and provider. Both digital health interventions assess and improve a providers' knowledge and skills in health service provision through self-assessments, supervisor coaching and digital micro-learning. The interventions generate performance improvement plans that facilitate learning and accountability to improve quality. A supervisor can use the digital health intervention to prioritise topics during supportive supervision visits and monitor improvements and quality trends over time. Both interventions prioritise performance based rewards and mild competition to motivate

performance. HNQIS can be integrated with the national information architecture and is being used in multiple health programs including immunisation programs. Coach2PEV is a mobile app that was designed specifically for immunisation programs and is currently only available in French. It includes a community of practice for institutional discussion on key topics, a performance e-dashboard and a social app to facilitate communication between providers and health workers and among health workers. It also includes training of supervisors in coaching modalities. This allows them to coach and motivate frontline vaccinators in addition to building clinical skills. These digital health interventions provide examples of promising solutions for overcoming chronic challenges with supportive supervision programs.

When asked about gaps in the stated digital health interventions for supervision, many respondents described gaps that are not necessarily related to the interventions themselves, but to leadership and governance of supervision programs in general. Often, supportive supervision is not prioritised in health programs, including EPI programs due to competing priorities and limited funding, lack of governance structures for supervision (active policies and expectations to guide programs) and limited human resources to meet the demand of supervision programs.

Gaps specific to digital health interventions for supervision include low digital literacy of frontline health workers and immature digital public infrastructure. One respondent noted that the data analysis ability of tools is often basic and that future enhancements should take analytics to a more advanced level to drive better performance. Another respondent discussed the value of human resource data collected by the digital health intervention. This data can be mined to illuminate who needs to be paid, how much they need to be paid, and what type of payment they receive. This data linked with mobile money payments can be used to overcome a chronic problem of late payments to health care workers and thus remove a barrier that negatively affects healthcare worker motivation.

Digital health interventions used during supplemental immunisation activities

Supplemental Immunisation campaigns (SIAs) involving door-to-door vaccination face the challenge of supervising mobile teams of vaccinators over short intense periods of activity (Gammino et al 2014). In an effort to improve accountability and monitor the performance of vaccinator teams, a number of implementation research and feasibility studies describe the use of RTM with geospatial technologies to track vaccinators to document the geographic locations visited during campaign activities and provide them with immediate guidance on corrective actions to improve the SIA. These digital health interventions either track the vaccinator teams (Oh et al 2016; Barau et al 2014; Chandir et al 2017; Gammino et al 2014; Touray et al 2016) or track the supervisor's digital reports during campaign activities (Bammeke et al 2023). The digital transfer of daily vaccinator or supervisor activity reports improves the timeliness of reporting and facilitates decision-making at the central level to manage gaps in coverage and equity (Oh et al 2016; Barau et al 2014; Gammino et al 2014). The use of vaccinator tracking in combination with geo-spatial maps and micro plans can reduce missed settlements (Chandir et al., 2017; Gammino et al., 2014; Touray et al., 2016).

One key informant also described the use of a digital health intervention to support real-time supervision of the distribution of insecticide treated nets during community-level malaria campaigns. Similar benefits were reported as those captured in the literature mentioned above with the addition of reductions in fraud cases stating that real-time monitoring of supplies provides proof that health workers are distributing commodities to the intended recipients.

Another key informant reported that,

> *Geospatial analysis is a great way to investigate decreases in coverage. We had a drop in zero does kids from 95% to 77%. We triangulated digital maps and satellite images to tailor our next SIA routes.*

Of note is that the studies and key informant feedback report on the one-way oversight and performance monitoring aspect of the technology and do not measure outcomes or benefits from the vacinator's perspective. Anecdotal reports indicate that some vaccinators try to tamper with the geo-location device to avoid this kind of oversight (Gammino et al 2014).

Digital health interventions used to rank the performance of health providers or health facilities

With the digitization of supervisory reports via apps and other digital tools, programs can more quickly and easily share performance results with different levels of the health system and with the facilities or providers to encourage improvements or celebrate achievements. The use of digital health interventions to track and share performance rankings is documented for immunisation programs (Zaidi et al 2020; Sowe et al 2023; Etamesor et al 2018), primary health care (Mboya et al 2016; Renggli et al 2018) and malaria programmes (Burnett et al 2019). These data are used by managers or supervisors to prioritise and monitor performance improvement (Etamesor et al 2018; Mboya et al 2016) and may be shared with the facility or provider as part of a supervision visit, to discuss changes or interventions for improvement and to celebrate successes (Renggli et al 2018; Zaidi et al 2020). Providers report that they appreciate receiving the performance report and being publicly recognized for achievements and for reaching targets (Zaidi et al 2020; Renggli et al 2018). The ability to clearly see their achievements and gaps in specific areas and solution-oriented suggestions for improvement is something that was lacking in the standard paper-based supervision procedure (Renggli et al 2018). Key informants reported similar benefits of sharing performance results with supervisors via data dashboards.One key informant noted the lack of such a dashboard in their community-based system and indicated that it will be prioritised in the next round of digital health intervention enhancements.

One study measured immunisation outcomes in relation to digital performance indicators shared with health facilities in The Gambia (Sowe et al 2021). Using data

linked in a digital immunisation registry, facilities were sent their monthly performance ranking of the hepatitis B vaccination timeliness indicator by SMS and were provided with paper wall charts to plot progress over time. Results after 1 year show a modest improvement in average timeliness of Hepatitis B delivery at birth in intervention facilities, but the change was not statistically significant and the overall timeliness was still less than 25% of births. There was no description of any accompanying support to the digital health intervention or theory of how the transmission of performance ranking might contribute to improved timeliness outcomes. Feedback from key informants indicate that within Coach2PEV and HNQIS, ranking is possible. In HNQIS, providers are scored by health area so supervision can be tailored. The feature is also perceived as motivational. It has been used to engender friendly competition between neighbouring facilities. When the data are shared appropriately it can be personally motivating as high-performing providers can receive non-monetary rewards for good performance. If done well, performance ranking can be a valuable tool to motivate health workers to improve, excel and provide high quality services.

> *We need to transform how we coach and motivate providers. If we want to reach equity in immunisation, we need to manage health workers in different ways.*

A study in Kenya examined a peer-mentoring support group chat for vaccinations to complement wider professional development and skills-based training between experienced senior staff and less experienced health workers delivering vaccines (Hossain et al 2021). Since these relationships were outside of formal (and sometimes intimidating) supervisory roles, the mentees expressed feeling more comfortable and supported by the peer-mentoring relationship. The group chat promoted fluid conversation and helped build the vaccinators' confidence. This topic was highlighted by multiple key informants as a vehicle to compliment formal supervision. It was noted that sometimes a supervisor can't be reached so group chat is a good alternative. It was also noted that during the peak of the COVID response, group chats were critical for providers to digest and understand regularly changing guidance from the Ministry of Health. One respondent also suggested adding features to digital health interventions for supervision such as chatbots so providers could get immediate and standard responses on frequently asked questions.

> *Chatbots can break the feeling of isolation among rural, remote health care workers.*

Governance of supportive supervision programs

The governance of supportive supervision programs was not addressed in the literature but emerged as an important theme in the key informant interviews. Health system governance, defined as "ensuring strategic policy frameworks exist and are combined with effective oversight, coalition-building, provision of appropriate regulations and incentives, attention to system design, and accountability" (Lehmann & Gilson 2015) was noted as a weak point for supervision programs in general. Multiple key informants mentioned that supervision programs suffer challenges related to lack of a schedule for where and when to conduct visits, lack of infrastructure for conducting visits (funding for vehicles or gas needed to travel to community health workers), and lack of incentives for performing visits. Specific to digital health interventions for supportive supervision, multiple respondents noted that the selection of digital health interventions for supervision programs needs to be led by the Ministry of Health and not donors or implementing partners. In the absence of local leadership, sustainability of digital health interventions are compromised.

> *"Local stakeholders need to be in the driver's seat when making decisions around tool selection and adoption."*

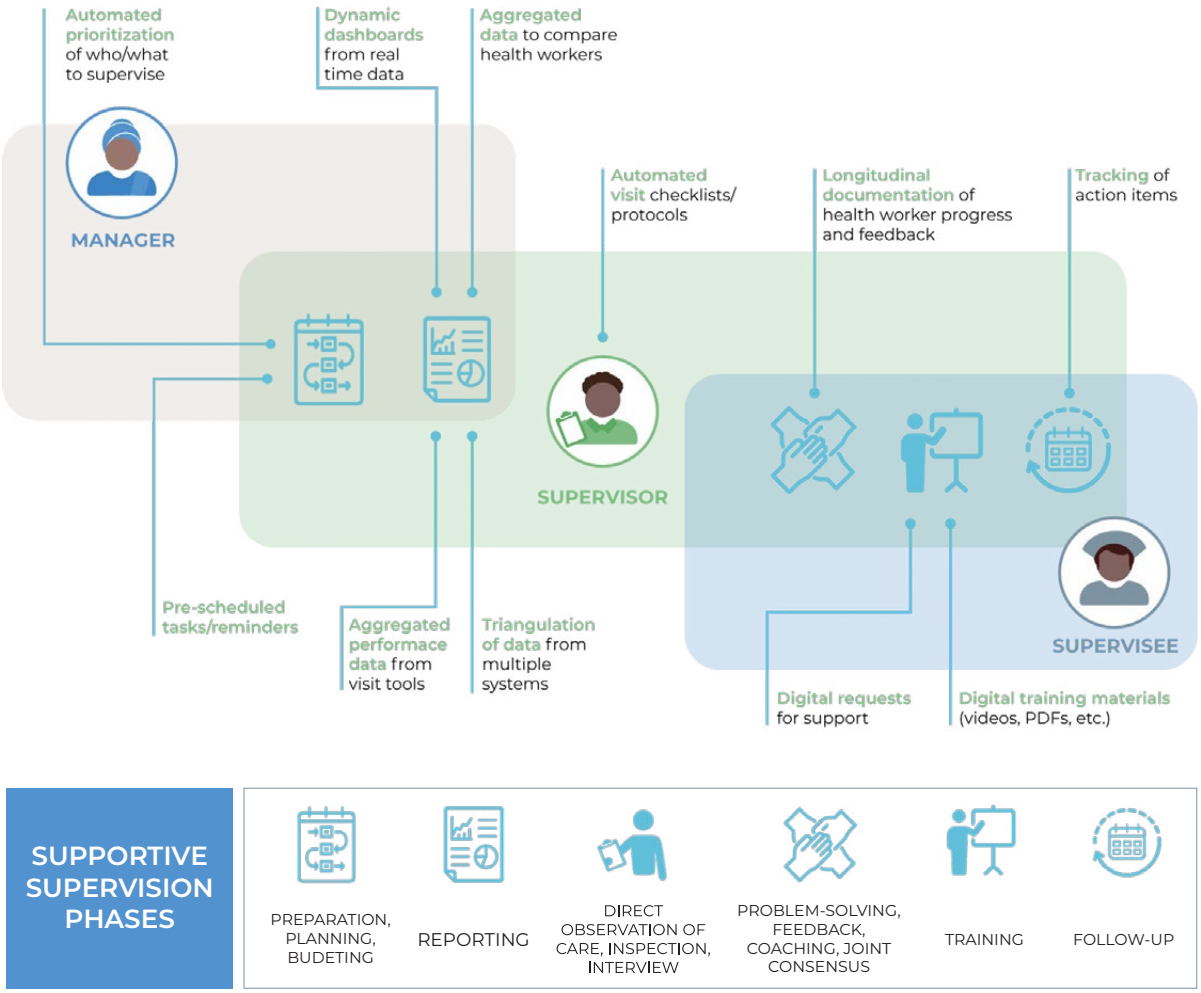
As digital health interventions are considered, respondents stressed that conversations need to lead with a vision for how the tool will fit into the digital health ecosystem, receive sustained funding, and be transitioned to facilitate institutionalisation. They suggested that if digital health interventions are not part of the strategic and funding conversations within the Ministry of Health, they will not be prioritised and may fail to achieve their intended results. Respondents also highlighted that they need to be considered in the whole of the information system architecture and digital ecosystem in order to facilitate interoperability, enhance efficiency and be sustainable. Also, it is critical to build on what already exists in the country related to the technology stack and the maturity of the digital ecosystem. The use of Global Goods was mentioned by multiple informants as a key to effective transition to government ownership and sustainability. It was suggested that effective governance promotes understanding of digital health interventions and therefore increased advocacy for investment.

Framework to guide decision making and implementation of digital health interventions for supportive supervision

Figure 1 (CHISU 2023) provides a helpful framework for decision makers to map digital health interventions to the supportive supervision process and move beyond program monitoring to facilitate quality improvement and improved healthcare worker support . Additional elements that are critical to enable effective implementation of digital health interventions are not included in the framework but are mentioned in the document accompanying the framework. These elements are noted as important considerations

when planning, designing and implementing digital health interventions for supportive supervision. They include considerations for platform selection, interoperability and external data sets, and data security, governance and ownership, digital literacy, building a culture of data use, device selection and management, physical infrastructure and gender considerations.

Figure 1. Digital approach to supportive supervision



Digital Approaches to Supportive Supervision: Guidance framework. County Health Information System and Data Use project. July 2023.

Key Considerations & Recommendations

This review of evidence and experiences with digital health interventions and approaches for health care worker supervision reveals that most applications of technology are applied to basic functions of performance monitoring, data transfer or digitization of reports and are predominantly aimed at supporting the supervisor's role. They tend to focus on supervision within a paradigm of oversight, inspection and corrective action. Except for the peer-mentoring program, there is a gap in documented examples of using digital technologies to facilitate two-way communication between supervisors and providers. There is also a dearth of evidence on the outcomes at the provider level in terms of how technology-facilitated supervision can impact health care worker's motivation and behavior, job satisfaction, ability to feel prepared and confident in their role and ultimately, how this impacts the provision of quality services, vaccination coverage and demand. While implementation reports describe digital tools with more robust features that support skill building and learning, two way communication, priority & tailored supervision planning, robust evidence is needed to inform strategy, policy and budgetary discussions within supervision programs. Figure 1 provides a framework that can guide research to investigate these important elements and decision making for how to address these gaps in digital health intervention development and implementation. The framework can also be strengthened with new components/ functionality as data become available on the effect of digital approaches on provider performance, vaccine coverage & quality and vaccine demand.

There is also minimal evidence of the role governance structures play in the implementation and adoption of digital health interventions in supervision programs, yet this is widely understood by key informants to be critical to the success of interventions. Country leadership that includes a vision, strategy and resources for digital health, consideration of digital ecosystems and information system architecture, and implementation that builds off of existing platforms and maturity are all considered critical to the success of digital health interventions for supportive supervision. Good governance was also cited as an important strategy to leverage existing digital health investments and avoid siloed programs. It is important to note that key informants highlighted that supportive supervision programs are often under-prioritised and underfunded due to competing demands.

Gavi, the Vaccine Alliance, recognises the transformative potential that digital health interventions for supervision can have on immunisation programs. It has been prioritised for more in-depth exploration as part of their expanded approach from digital health information to digital health. Specific recommendations for consideration include:

- Evaluate promising digital health interventions for supportive supervision and document impact on health care workers, health system, and health outcomes related to immunisation.

- Engage the Immunisation Agenda 2030 team working on demand to study the potential impact of digital health interventions for supportive supervision on health care worker's motivation (and other elements of behavior) that affect the delivery of immunisation services and demand.
- Prioritise the inclusion of digital health interventions for supportive supervision in Gavi immunisation programming as a vehicle to strengthen health systems, reinforce investment in digital health information for immunisation, and act as a use case for investment in digital health interventions that will have benefits across health areas as a means of strengthening primary health care; prioritise countries included in The Big Catch-Up.
- Invest in the evolution of promising Global Goods for supportive supervision in immunisation programs.See Appendix B for costing information.
- Work with Gavi Alliance partners to align investment in digital health interventions for supportive supervision with countries that are already investing in digital health information systems, have a functioning supportive supervision program, and a global good already deployed for supportive supervision.
- Support priority Gavi countries to understand the value of investment in digital health interventions for supportive supervision programs and their effect on immunisation programs and health outcomes.

Conclusion

This technical brief describes the potential of digital health interventions to address longstanding challenges within supervision programs and enhance the effectiveness and reach of immunisation programs, vital for improving health outcomes worldwide. It points to the need for prioritised investment in systematic evaluations to prove efficacy of the intervention and build the case for increased focus and investment. Promising and robust examples exist for the added value of digital tools for immunisation programs. These tools should be prioritised for research, further enhancement and scale as a strategy for Gavi to reach their program goals.

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Appendix A
Literature Review methodology

A semi-systematic review of published articles in peer-reviewed journals was conducted to better understand the applications, evidence and documented experiences with digital tools, technologies or approaches to provide supportive supervision to vaccinators and health workers who administer routine childhood vaccinations.

Documents were identified from a systematic database search using standard key words (see box below) and review of references in selected articles. From an initial 16,188 unique citations identified, 19 peer-reviewed articles related to the use of digital technologies for supportive supervision were included in the review. An additional 11 articles provide reviews, general background or frameworks on the supervision of health workers in low- and middle-income countries. The documents selected for full-text review represent a combination of process evaluation/implementation research, case studies, feasibility studies, project descriptions and one outcome evaluation. An ad hoc review of other unpublished documents, grey literature and project reports contributed to this review.

DETAILS OF SEARCH METHODOLOGY

Database Search Using Keywords

PubMed, Cochrane Library, Clinical Trials, and Google Scholar were searched for relevant literature from 2000 to 2024 using combinations of the following keywords:

vaccin*/ inoculat* / immuniz* / immunis* / jab / shot / EPI

mHealth / eHealth / Digital / Mobile / smartphone / remote / virtual / distance / real-time / online / internet / electronic / computer / technology / SMS / Whatsapp / RapidPro / tablet

supervision / support* / problem solv*/ advise / appraisal / validation / quality assurance / quality improvement / feedback/ performance / confidence / motivation / satisfaction / accountability / task-shift / workload / workflow / mentor*/ coach*/ supervis* / workforce / frontline / health worker / HW / FHW / provider / vaccinator / human resource* / manager*

Exclusion criteria

- Published before 2000
- In language other than English, Spanish, Portuguese or French
- non-LMIC setting
- zoonosis
- not a vaccine preventable disease
- not applicable to large scale immunisation programing
- supervision of community volunteers

Inclusion criteria

- A digital tool or technology to facilitate any aspect of supervision for health workers
- LMIC setting

Appendix B
Costing Digital Tools for Supportive Supervision

Implementing a new health care intervention as part of a country's national health system requires information on costs of intervention implementation and maintenance as well as information on the expected effectiveness of the selected intervention. When considering the cost-effectiveness of digital health interventions the same holds true, however data on both costs and effectiveness are nascent. Because digital technologies tend to develop both iteratively and quickly, and often have multiple intended users1, it can be challenging to apply the standard methods of cost and effect estimation. Related to cost, information is lacking on necessary financial resource requirements and investment guidance to achieve a successful digital transformation of health systems. Where information does exist, critical data is often missing as agreement on what should be included is lacking. This makes cost estimates unreliable.2 In the absence of robust guidance for national decision makers, this appendix is intended to assist Gavi and national immunisation program country stakeholders to understand the cost considerations when deliberating on the inclusion of digital tools for supportive supervision to improve immunisation programs. This appendix considers the following cost categories:

- National immunisation and supervision program readiness
- Digital health enablers
- Priority digital health intervention investment areas
- Illustrative country budget
- Cost savings/cost drivers

National Immunisation and Supervision Program Readiness

To ensure the success of a digital supportive supervision intervention in immunisation programs, a functioning national immunisation program and national supportive supervision program must be in place. The readiness of these programs will affect the ability to integrate the digital health intervention. This in turn affects the resulting program and health outcomes achieved by the digital health intervention. The Digital Implementation Investment Guide (DIIG) provides a tool to assess the current state of the programs and identify challenge areas for improvement that will inform the design of the digital health intervention.

1 https://link.springer.com/article/10.1007/s40273-024-01366-y
2 https://static1.squarespace.com/static/59bc3457ccc5c5890fe7cacd/t/64e5ed0a7fcc8c3e665ab71f/1692790028648/Digital-+Square+Costing+Resources+Overview_Final+8.18+%281%29.pdf

Digital Health Enablers

The maturity of the digital health ecosystem will affect the country's readiness and thus ability to integrate a digital health intervention into the receiving program. Specific to digital supervision tools in immunisation programs, the following digital health enablers are most proximally linked to the success of the intervention and should be assessed to understand their maturity, strength, and weaknesses.

- **Digital infrastructure** - A robust and flexible digital and digital health infrastructure in the country is necessary to accept the digital supervision intervention. Also critical is for the digital supervision solution to be implemented in accordance with the national digital health strategy and architecture.
- **Standards and interoperability** - Compliance with existing open-source health data standards that aim for reusable systems including interoperability of health information systems both at national and international levels will facilitate implementation, scale and sustainability of the digital supervision intervention. This also facilitates iIntegration into existing digitally enabled immunisation programs.
- **Digitally enabled health workforce** - The digital supportive supervision intervention will perform best if it is overlaid on a current digital intervention targeting health care workers in the delivery of immunisation programs. In this scenario, the health workforce is already digitally enabled and digital literacy is higher, thus facilitating the acceptance of the intervention by the primary intervention recipients (see cost savings, cost drivers section below).
- **Digital health worker registry** - Leveraging an existing digital health worker information system and specifically the digital health worker registry, facilitates the implementation of the digital supportive supervision intervention because key data/ workflow and interoperability elements are already established.

Maturity of these enablers will significantly affect the resulting program and health outcomes achieved by the digital health intervention. The Global Digital Health Monitor provides insights into the digital health maturity of countries across seven digital health enabling environment component areas.

Priority Digital Health Intervention Investment Areas

Budgeting for all costs associated with owning, operating and maintaining a digital health intervention is critical to its success. The expenditures categories over the lifecycle of the intervention fall into the three categories listed below.

- **Design and development phase** - functional requirements definition process, software licensing and customization, application installation and configuration, hardware and device needs, and interoperability costs.
- **Deployment phase** - end user testing, training, rollout, and the costs of connectivity and power.
- **Sustained operations** - integration and interoperability, voice and data services, maintenance, refresher training, transfer of ownership, scale-up, monitoring, evaluation and learning, program management and governance.

The Digital Implementation Investment Guide and the Total Cost of Ownership Tool are resources that can facilitate the articulation of detailed, comprehensive planning for digital health investment. For a detailed example of the costs associated with the implementation of a digital supportive supervision intervention see the illustrative country budget below.

Illustrative Country Budget

In this example from East Africa, 116 community health worker (CHW) supervisors were trained to use a digital supervision tool across four districts. The supervision tool allows supervisors to view performance data of CHWs they supervise and includes a supervision checklist that can be used to guide supervision visits. The country is at a digital health maturity level of 4 as defined by the Global Digital Health Monitor. The budget assumes the following:

- National community health program (including immusation tracking and education) and national supportive supervision programs are in place and functioning.
- The community health worker to supervisor ratio is approximately 10:1.
- All personnel/staff costs for the digital intervention are included in other existing program budgets such as the national supervision program budget and the national digital health/ICT program budget. This includes personnel time for program managers, supervisors, trainers, software developers, software engineers, etc.

Digital Intervention Budget

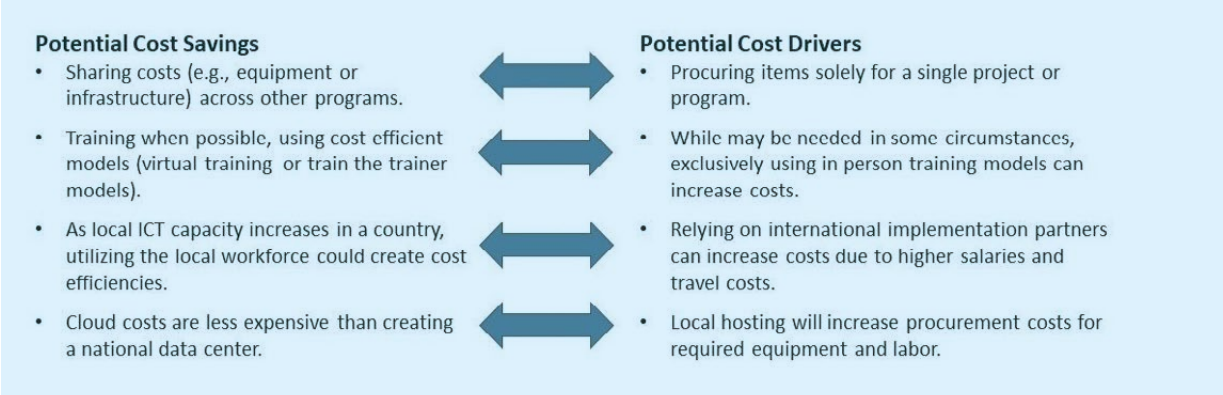
Category	Cost	Frequency	Units	Total
Design & development				
Requirements gathering	$ 3,577	1	1	$ 3,577.00
Phones, case, screen protector	$ 200	1	116	$ 23,200.00
Total				**$ 26,777.00**
Deployment				
User acceptance testing	$ 5,811	1	1	$ 5,811.00
Supervisor training	$ 13,750	1	1	$ 13,750.00
Total				**$ 19,561.00**
Sustained operations (annual costs)				
Supervisor data bundle	$ 7	12	116	$ 9,744.00
Refresher training	$ 13,750	1	1	$ 13,750.00
Dashboard hosting	$ 50	12	1	$ 600.00
Server hosting (AWS)	$ 80	12	1	$ 960.00
Total				**$ 25,054.00**
Grand Total				**$ 71,392.00**

The calculated costs per user/supervisor for the three categories are:

- Design and development phase USD 231
- Deployment phase USD 169
- Sustained annual operations phase USD 216

Cost Savings / Cost Drivers

As the national digital literacy grows, digital health ecosystems mature and programs scale, the ability to share digital health infrastructure and build on implementation experience creates potential cost savings for future digital health intervention implementation. The graphic below3 illustrates how growing digital health maturity can address potential cost drivers and result in potential cost savings. This is particularly relevant to the implementation of digital interventions for supervision because the intervention will rely on the foundational backbone of digital health worker interventions for service delivery and digital health informations systems that already exist in the country (e.g. CommCare, The Community Health Toolkit, OpenSRP and DHIS2).



Conclusion

The integration of digital tools for supportive supervision into national immunisation programs represents a promising avenue for improving immunisation program quality, effectiveness and health outcomes. The nascent nature of data on costs and effectiveness, coupled with the rapid development and iterative nature of digital technologies, poses challenges to traditional methods of cost estimation. Nonetheless, efforts such as the Digital Implementation Investment Guide and the Total Cost of Ownership Tool provide valuable resources for planning and budgeting for all stages of the intervention lifecycle. Key considerations when applying these tools to digital interventions for supportive supervision include assessing the readiness of national immunisation and supervision programs, evaluating the maturity of digital health enablers such as infrastructure, standards, workforce digital literacy, and existing health worker information systems.

As digital health ecosystems mature, programs scale and digital literacy grows, there is potential for cost savings through the sharing of digital health infrastructure and leveraging existing digital health interventions. This underscores the importance of continually monitoring and adapting to the evolving digital landscape to maximise the impact and cost-effectiveness of digital supportive supervision interventions in improving immunisation programs. By addressing these cost considerations, leveraging available resources and the transforming digital health ecosystem, stakeholders can integrate digital tools for supportive supervision into immunisation programs and contribute to improved immunisation outcomes on a national scale.

3 Key learnings from Digital Square and VitalWave's total cost of ownership work as reported on https://digitalsquare.org/blog/2022/12/1/how-much-do-digital-health-interventions-cost-a-new-tool-helps-countries-estimate