Digitalization of Civil Registration and Vital Statistics (CRVS) Systems in Africa

An assessment of the level of digitalization of CRVS systems in African countries

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All countries on the African continent were eligible to participate and the Bank and COMESA invited all countries to participate. Forty-three countries completed the assessment. The Bank and COMESA would like to thank all countries that took time to respond to the assessment. Additionally, the Bank and COMESA would like to extend their gratitude to the Governments of Egypt and Rwanda and in particular the National Identification Agency of Rwanda and the Egypt Ministry of Health and Population for agreeing to participate in case studies of their CRVS digitalization processes. We would like to thank Mrs. Josephine Mukesha, Director General at the National Identification Agency in Rwanda as well as Mr. Stephen Bugingo from the National Identification Agency in Rwanda for the assistance rendered and for providing information about the digitalization process in Rwanda.

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List of Acronyms

APAI-CRVS	Africa Programme on Accelerated Improvement of Civil Registration and Vital Statistics
CRVS	Civil registration and vital statistics
CRVS-DGB	CRVS Digitalization Guidebook
ICT	Information Communications Technology
IT	Information Technology

Definitions of terms

Civil registration office:	The government department responsible for civil registration of vital events, such as births, marriages, and deaths.
Cloud:	A network of servers and the services, software and databases provided over a network connection. Clouds may be limited to a single organization (private cloud) or available to multiple organizations (public cloud).
Cloud computing:	The use of services, software, and databases via the cloud.
Mobile application:	A software application designed for a mobile device.
On-premises hosting:	The act of hosting a software locally instead of on a cloud.
Open-source software:	A software for which source code is accessible and can be modified by a community of users (as opposed to proprietary software).
Proprietary software:	A copyrighted software of which the source code is kept secret by the company who developed it (as opposed to open-source software).
Server:	A computer program or a device providing resources to other computers over a network.

Executive Summary

Civil Registration and Vital Statistics (CRVS) systems are critical for recording and managing vital events such as births, deaths, marriages, and divorces. These systems play a crucial role in generating accurate and reliable data for various purposes, including public health, social welfare, and national planning. In recent years, there has been a growing trend towards digitalization of CRVS systems, leveraging technology to enhance efficiency, accuracy, and accessibility of vital registration processes.

The digitalization of CRVS systems involves the use of modern technologies such as digital platforms, electronic forms, biometric identification, and data analytics to transform traditional paper-based registration processes into streamlined and automated systems. This has several benefits, including improved data quality, reduced administrative burden, increased data security, and enhanced service delivery. Digital CRVS systems also enable interoperability, allowing for seamless data exchange and integration with other information systems, which can contribute to improved coordination and decision-making.

One of the key drivers of digitalization in CRVS systems is the increasing demand for timely and accurate data for evidence-based policy making and planning. Digital systems can capture data in real-time, providing up-to-date information for monitoring and evaluation of programs and policies. Digital CRVS systems also have the potential to reach vulnerable and marginalized populations who may face barriers to accessing traditional registration processes, thus promoting inclusivity, and leaving no one behind. Recognizing its importance, several African countries have included digitalization in their plans to improve their CRVS systems and have been making efforts towards this end.

In October 2022, the African Development Bank in partnership with the Common Market for Eastern and Southern Africa assessed the status of digitalization of civil registration and vital statistics systems (CRVS) in Africa. The assessment looked at the status of African countries in terms of digitalization of CRVS systems by also identifying the challenges, lessons and potentials based on country experiences.

The following are the key findings:

1. A total of 43 countries responded to the assessment. The assessment found that 28 countries covered in this assessment have legislation that has provisions for linking or interfacing with other information systems.

2. In 10 countries, all civil registration offices at the district-level countrywide have digitalized CRVS business processes (notification, validation and verification, registration, certification, information-sharing, storage, and archiving, querying, and searching, compilation of vital statistics, and information sharing). The CRVS systems in these countries also have advanced functionalities such as fraud detection, ability to send user alerts, store and send encrypted data, deactivation of a user-login after a predetermined number of unsuccessful login attempts, password expiration and modern analytical analysis tools such as dashboards and visualizations.

Another twelve countries have digitalized their CRVS business processes as well but only in civil registration offices located in cities and towns in urban areas only.

3. Fourteen countries have a national database only thus have not digitalized their CRVS business processes but have digitized civil registration records. These countries send scanned electronic copies of the paper civil registration records from the districts to the capital for consolidation in the national database. Only 7 of the 43 countries have exclusively paper based CRVS systems and do not have electronic databases where electronic copies of civil registration records can be maintained. Thus, these countries have neither digitized their archived civil registration records nor digitalized their civil registration business processes; the business processes remain paper based.

4. The assessment also found that CRVS software in 17 countries are using other basic IT functionalities such as working in offline mode, tablet, or mobile phone application capabilities. Twelve countries in this assessment have software with mobile device functionality.

5. Most of the countries have dedicated IT staff responsible for the management of the IT infrastructure. Thirty-nine countries are planning to improve their IT infrastructure.

6. Digitalized national identity management systems exist in 37 countries; 23 countries have managed to create interoperability between the digital identity management systems and the CRVS information systems.

7. The assessment found that 25 countries have collaborative arrangements with the Ministry of Health for facilitating the transfer of birth and death notification records to the civil registration offices. Twenty-six countries have patient-level electronic health record systems. However, only 6 countries currently have interoperability between the CRVS IT systems and the patient-level electronic health record systems.

8. Several challenges were mentioned by the countries, and they include: inadequate funding; unreliable and inconsistent supply of electricity; inadequate office space; and limited access to the internet for the transmission of data from the local offices to the regional offices or the headquarters. Other challenges cited are inadequate IT equipment such as computers and scanners; inadequate IT capacity and inadequate legislation to support the transfer of data to other institutions.

Background

Civil Registration and Vital Statistics (CRVS) system provides the basis for the development of a national population register as well as a system of unique identification as such supporting creation and updating of basic administrative data on population. As a result, CRVS systems are strongly recognized for their importance in good governance, and development planning, monitoring and evaluation. Basic administrative data on identity, location and size of a population are crucial in development planning and delivery of public services. Civil registration is recognized by the UN as being the most reliable source of vital statistics (UN, 2014). Additionally, vital statistics that are compiled from civil registration are believed to be relatively free from certain types of errors, making them beneficial in evidence-based policy making and program development.

Well-functioning CRVS systems are important in supporting the implementation and monitoring of Agenda 2030. CRVS systems are ideal in providing comprehensive, robust, and sustainable systems for identity management and improved individual records and data on birth, death and causes of death that are basic to ensure inclusion.

To contribute optimally to legal identity management as well as sustainable development goals data requirements, CRVS systems need to be supported by information communication technology (ICT) and digitalization.

Digitalization generally refers to increased use of IT systems, resulting in the automation of business processes thereby making it easier to make use of electronic tools to collect, transmit and store CR information/data. Some of the features of digitalized CRVS systems include improved access and indexing, searching and retrieval of stored records. Digitalized CRVS systems also provide better ordering for searching and retrieval, allow for validity checks for data quality, research, and decision support.

Information and communications technology (ICT) is believed to have the potential to provide transformation in civil registration and vital statistics (CRVS) systems through extending registration coverage, standardizing and streamlining CRVS processes, integrating data from multiple systems and securely storing data at scale, all in a cost-effective way.

Recognizing its importance, a number of African countries have included digitalization in their plans to improve their CRVS systems and have been making efforts towards this end.

Therefore, this assessment aims to shed light on the outcome of these efforts, of digitalizing CRVS systems, by African countries. The assessment looks at the status of African countries in terms of digitalization of CRVS systems by also identifying the challenges, lessons and potentials based on country experiences.

Objectives

The objectives of the study were to assess:

a. the status of CRVS systems in terms of digitalization and use of innovative technologies
b. the status of the implementation of digitalization and come up with recommendations on enhancement mechanisms.

Literature review

Digitization and digitalization are two terms that are often used interchangeably, but they have different meanings:

- Digitization refers to the process of converting analog information into digital form. This can involve scanning paper documents, converting audio or video recordings, or creating digital images of physical objects. The goal of digitization is to create a digital copy of an analog object or piece of information.
- Digitalization, on the other hand, is the broader process of using digital technologies to transform business processes and create new value propositions. This can involve using data analytics, automation, artificial intelligence, and other technologies to improve efficiency, enhance customer experiences, and develop new products or services. Digitalization involves not just creating digital copies of analog information but using digital technologies to drive innovation and growth.

Digitization and digitalization are both necessary because a new system must also process historical data that is not in electronic format. The digitalization of CRVS systems can bring about numerous benefits that can significantly improve the accuracy, completeness, and timeliness of vital statistics data.

Importance of digitalization of CRVS systems

The major contribution of digitalization to CRVS systems is the improvement of the efficiency and overall performance of CRVS business processes, covering all CRVS milestones i.e., Notification; validation and verification; certification; information-sharing; storage and archiving; compilation of vital statistics; quality control of vital statistics; generation of vital statistics and dissemination of vital statistics (Cobos et al., 2018).

Improved Data Quality

One of the most significant benefits of digitalization of CRVS systems is the improvement of data quality. Digitalization can reduce errors caused by illegible handwriting, misplaced, or lost records, and incomplete data entry. Additionally, digitalized systems can improve the accuracy of data by automating data verification processes, such as checking for duplicate records or invalid data. A study conducted in Bangladesh found that the digitalization of their CRVS system resulted in a significant increase in the accuracy and completeness of vital statistics data (Bhuiyan et al., 2021).

Enhanced Data Accessibility

Digitalized CRVS systems can also enhance data accessibility. Digital systems can allow for real-time data entry, making data available immediately to those who need it (APAI-CRVS). Additionally, digital systems can enable remote access to data, allowing for more efficient and timely data analysis.

Record search and retrieval

Records can be easily searched, retrieved, and shared across different agencies and jurisdictions (Mathenge et al., 2021). This can help streamline administrative processes and facilitate the exchange of information between different entities, such as hospitals, government agencies, and vital statistics offices.

Improved Data Analysis

Digitalization of CRVS systems can also enable more efficient and accurate data analysis. Digital systems can allow for the use of data analytics or dashboards and machine learning algorithms to identify trends and patterns in data that may not be visible with manual analysis.

Enhanced Interoperability

Digitalization of CRVS systems can also enhance interoperability between different systems (APAI-CRVS). Digital systems can enable the seamless transfer of data between different systems, allowing for more efficient and effective data sharing. Additionally, digital systems can enable the integration of data from different sources, such as health facilities and civil registration offices, providing a more comprehensive view of vital statistics data.

Enhanced Security and Privacy

Digitalized CRVS systems also offer enhanced security and privacy. Digital records can be protected through encryption and access controls, reducing the risk of unauthorized access and identity theft (AbouZahr et Al, 2015). They also mitigate the loss of records through backup, and disaster recovery systems (APAI-CRVS). In addition, these systems can be designed to comply with international data protection standards, protecting the privacy of individuals. This ensures that sensitive data is protected from unauthorized access, theft, or loss.

Potential challenges associated with CRVS digitalization.

Despite the benefits of digitalization of CRVS systems, there are also challenges that need to be addressed if the benefits of digitalization are to be realized.

Infrastructure and Connectivity

Digitalizing CRVS systems requires adequate infrastructure and connectivity. Additionally, the success of the digitalization may depend on reliable electricity, internet connectivity, and hardware such as computers and mobile devices. In many low- and middle-income countries, the lack of reliable internet connectivity and electricity supply may limit the adoption and effectiveness of digital CRVS systems (Khan et al., 2019).

Technical capacity and expertise

Digitalization of CRVS systems may require technical expertise that may not be readily available in some settings. Digitalizing CRVS systems requires skilled personnel to develop, manage, and maintain the system. This can include expertise in system design, software development, and data security. Therefore, building the necessary capacity and expertise is crucial for the success of the digitalization process (Mikkelsen et al., 2020). In addition, some countries may face challenges in recruiting and retaining qualified personnel with the necessary technical skills.

Data privacy and security

Digitalization may introduce new risks to data privacy and security as electronic records are vulnerable to hacking and cyberattacks. This can raise privacy and security concerns, particularly around the storage and transmission of sensitive personal information. Adequate measures must be put in place to protect the privacy and security of data, including strong data encryption, firewalls, and user authentication. The digital CRVS system must comply with national and international data privacy and security regulations (ADB, 2020).

Limited Interoperability

The architecture of a well-functioning CRVS system requires that it interfaces with other information systems either when sharing data (e.g., to the national identity register/ population register) or receiving data from sources such as the health information system. This requires that the platform (both for the CR and other external platforms) at par from a digital perspective which is not always the case. For example, a CR office may want to share or receive data electronically from the health information system but fail if the system isn't digitalized and built to support interoperability (Mathenge et al., 2021).

Financial sustainability

Digitalization of CRVS systems can require significant upfront investment in infrastructure, technology, and human resources. Significant financial investment to support hardware, software, and infrastructure development will be required. Ensuring the financial sustainability of the digital CRVS system is crucial for its long-term success (See Rwanda case study in the appendix I for the cost of digitalization).

Legal and regulatory barriers

Digitalization of CRVS systems may require changes to existing legal and regulatory frameworks. For example, electronic systems may need to comply with data protection and privacy laws, as well as legal requirements for the registration of vital events. In some cases, legal and regulatory frameworks may need to be updated or revised to accommodate digitalization (see Rwanda case study in the appendix I).

Political Will

Digitalizing CRVS systems requires political will and commitment from policymakers. In some cases, policymakers may not prioritize this effort due to other competing priorities. In countries where this has

been a success, there was strong political will to ensure this effort was a success. An example of this is Rwanda (See Rwanda case study).

Best practices for the Digitalization of CRVS systems

Digitalizing CRVS systems is a complex and multifaceted process that requires careful analysis, design and implementation. A comprehensive outline of recommended actions to be undertaken when embarking on a CRVS digitalization project are provided in the APAI-CRVS digitalization guidebook. Some of the things to consider are:

I. Preparatory activities pertaining to the governance and organization of the CRVS digitalization project

a. Conduct comprehensive assessment and develop a CRVS strategic plan.

Prior to embarking on a digitalization project, it is essential to conduct a comprehensive assessment of the current CRVS system including existing CRVS business processes to determine the system's strengths, weakness, and redundancies identify the gaps and needs and also identify the opportunities for improving the system's performance including those pertaining to digitalization. The assessment should facilitate a redesign of business processes (where necessary), for which the CRVS digitalized system would be built on. A major output of the assessment is a comprehensive CRVS strategy and improvement plan (See Rwanda case study) which would include digitalization as one of the prioritized strategies for improvement. The digitalization project should therefore be a constituent of the national CRVS strategy and action plan and as such should align to the defined vision, mission, goals and objectives of the national CRVS system and correlate to other strategies and actions outlined within the national CRVS strategy and action plan. It should be noted that digitalization of ineffective CRVS business processes would result in similarly ineffective business processes and outputs (Mathenge et al., 2021).

b. Ensure stakeholder engagement.

It is important to engage all stakeholders, including government agencies, civil society organizations, and the private sector, in the design and implementation of digitalized CRVS systems. This helps to ensure that the system meets the needs of all stakeholders and that there is buy-in from key players (see Rwanda case study).

c. Establish a governance structure.

Establishing a national CRVS coordination body, with representatives from all key relevant stakeholders, such as government ministries or departments with clearly defined roles for each stakeholder is vital for the success of the national CRVS system and the digitalization project. It is recommended that such a governance structure is established and operates on a permanent basis beyond the project as the overall oversight body of the CRVS improvement initiative. (See Rwanda case study).

II. Key technical considerations and/or requirements for digitalization of CRVS systems

These considerations are not exhaustive and are only a selection from a broader list.

a. A robust legal framework.

A legal framework is essential for the successful implementation of a digitalized CRVS system. The legal framework should comply with a country's legislation on CRVS as well as with any additional related legislation or policy. It should also define the legal basis for data collection, storage, and dissemination (Mathenge et al., 2021).

b. Interoperability functions

CRVS IT systems should be able to share data with other agencies/ departments/ministries within a country and regionally, as appropriate (based on the legal mandate). As such the digitalization project should build capacity for interoperable systems while ensuring that protocols for securing persons data are observed (Mathenge et al., 2021).

c. Skilled human resources

Implementation of a digitalized CRVS system must address the capability of IT personnel to maintain the system efficiently. If such skills are lacking, consideration could be made to outsource such skills while developing local capacity in IT skills (Mathenge et al., 2021).

d. Data privacy and security.

Digitalized CRVS systems must adhere to strict data privacy and security standards to protect the confidentiality and integrity of personal data. This includes the use of encryption, secure authentication mechanisms, and regular data backups (Mathenge et al., 2021).

e. Easy access to data

The CRVS IT system should be easily accessible to stakeholders in standardized formats and avoid proprietary formats for storing data. The IT system should include dashboards and visualizations (Mathenge et al., 2021).

f. Inclusion of all CRVS milestones

The digitalization of the CRVS IT system should accommodate the automation of all milestones. These milestones are:

- notification
- validation and verification
- registration
- certification
- information-sharing
- storage and archiving
- compilation of vital statistics

- quality control of vital statistics
- generation of vital statistics and
- dissemination of vital statistics

g. CRVS digitalized system capabilities.

A digitalized CRVS system should have the capability to detect any duplicates and assignment of user rights to delete such records. The CRVS system should also allow for the querying and searching of current and historical records and allow users to make corrections and amendments. Other features that can be included in the system are the ability to detect fraud, the ability to work in offline mode in countries where internet connectivity may be a challenge, and mobile device capabilities will be especially useful when working in offline mode. The system can also be designed to send alerts to clients (Mathenge at al., 2021).

h. Disaster mitigation

A digital CRVS system should include mitigation measures to safeguard data. Disaster mitigation measures should include among others the use of uninterrupted power supply (UPS) in case of power outages; daily backups and ensuring the premises have adequate security (Mathenge et al., 2021).

i. CRVS software options

A country could choose to develop its own CRVS software, procure commercially available software or decide to use community-supported open-source software whose source code is freely available. Commercially developed software may be favored over custom-developed software because the functionalities required for IT systems for CRVS are standardized and have already been tested. However, countries should gain an understanding of the pros and cons of each option and make decisions that are appropriate to the country context (Mathenge at al., 2021).

j. Data hosting options

When implementing digital CRVS systems, countries need to select where the CRVS data will be hosted, maintained, and accessed; will the data be hosted in the country, or outsourced to a service provider. A number of issues have to be considered before a decision is made such as the availability of uninterrupted electricity, skilled IT personnel to maintain the server, security and privacy protocols and anti-virus software (Mathenge et al., 2021).

Methods

The assessment questionnaire

The Pacific Community (SPC), Vital Strategies and the Swiss Tropical and Public Health Institute developed a document that outlines the best practice guidelines for digital CRVS systems including: principles for the design and implementation of digital CRVS systems, key functional and non-functional requirements, Options for licensing of digital CRVS systems and their benefits and risks, different service and hosting

options and their benefits and risks and considerations for procurement of digital CRVS systems. These guidelines provide general guidance to consider when undertaking a CRVS digitalization project. This document does not include a tool or questionnaire for assessments, but the guidance contained therein is sufficient to formulate a tool. The questionnaire design was based on a selection of key principles, functional and nonfunctional requirements and guidance provided on the licensing and hosting options for digital CRVS systems provided within these. Using the best practice guidelines for digital CRVS systems document, the following key variables were identified for evaluation through this study:

- Existence of Legislative framework to ensure that all privacy and security concerns are covered as well as having a legal basis for data sharing
- Determine whether there is interoperability with other data systems
- Capability of IT personnel to maintain the system efficiently
- Data privacy and security standards such as password expiration
- Accessibility of the data
- Capability of IT system to display results in dashboards and visualizations
- Automation of milestones: notification, validation and verification, registration, certification, information-sharing, storage and archiving, compilation of vital statistics, generation of vital statistics and dissemination of vital statistics
- Existence of enhanced IT system capabilities such as querying and searching of current and historical records; allow users to make corrections and amendments; able to detect fraud; the ability to work in offline mode; mobile device capabilities; and send alerts to clients
- Disaster mitigation measures to safeguard data through the use daily backups
- CRVS software options to consider; commercially available software or community-supported open-source software which is freely available and
- Data hosting options

These key variables were used as a basis for designing the questionnaire that was used in the assessment. The draft tool was shared with the African Development Bank and UNECA for their review and input. While the questionnaire could have included a lot more questions, it was restricted to the key variables identified above to encourage countries to participate in the assessment.

The estimated time to complete the survey was approximately 30 minutes. An electronic questionnaire was developed in Google forms. The questionnaire was developed in three languages (English, French and Portuguese). Data collection was done electronically.

Inclusion criteria

All African countries were eligible to participate in the assessment. A total of 52 countries on the continent were contacted and invited to participate. Algeria and Libya were not contacted as the contact information for the CRVS offices could not be found.

Response rate

Forty-three countries completed the survey, achieving a response rate of 82.7%.

Data analysis

Data analysis was done using statistical analysis software, Stata. Descriptive analyses were done, and tables and charts were generated.

Results

Legal Framework for Civil Registration and Vital Statistics

The legal framework is an essential component for the efficient management, operation, and maintenance of the registration system. The results show that all responding countries covered in the survey have provisions for the registration of vital events (births, deaths, marriages, divorces).

The drive to digitalize CRVS systems in Africa could be hindered by inadequate legislation. Having the correct legislation that supports linking or interfacing with other datasets may be crucial in improving the efficiency of CRVS systems including enabling access of information from other systems. A strong legal and regulatory framework aligned with best practices is fundamental to a successful CRVS system. Of the 43 countries covered in this assessment, 15 countries do not have legislation that has provisions for linking or interfacing with other information systems. While this assessment did not solicit detailed information about the legal framework, it is likely that some of the countries have outdated CRVS laws that could stifle innovations such as the digitalization of CRVS systems, and linkages to emerging national identity management systems where these do not currently exist. The rapid adoption of ICT solutions, as well as advancements in creating linkages between CRVS and national identification systems, increases risks for protecting personal and confidential data. The design and rollout of these tools require safeguards in the form of policies, laws, and standards for data governance.

Table 1: Legislation that has provisions for linking or interfacing with the other databases

	Number	**Percent**
No	15	34.9
Yes	28	65.1
Total	43	100

In about 53% of the countries, the lowest level of administration at which registration of vital events occur is the district, and 39.5% of the countries indicated that the sub-district is the lowest level. In three countries (7.0%), vital events are registered at the national level. These countries include Djibouti, Gambia, and South Sudan.

Table 2:Administrative levels at which registrations of vital events are done

	Number	Percent
District	23	53.5
National	3	7.0
Sub-District	17	39.5
Total	24	100.0

Digitalization of CRVS Systems

Except for 7 countries, all countries that responded to the assessment indicated that they have electronic databases where civil registration records are maintained. Ten countries (23.3%) stated that all their civil

registration offices countrywide have digitized databases and all entry of vital events is done electronically. These countries are Angola, Botswana, Chad, Egypt, Eswatini, Gambia, Liberia, Mozambique, Namibia, and Rwanda. Four countries have electronic databases in urban towns only (9.3%; Djibouti, Niger, Nigeria and São Tomé and Príncipe). Seven countries (16.3%) do not have an electronic database in the country for maintaining civil registration information. These countries are Burundi, Central African Republic, Guinea, Guinea Bissau, Somalia, South Sudan and Togo).

Table 3: Does the country have computerized databases where civil registration records are maintained

	Number	Percent
No electronic CRVS database in the country	7	16.3
Only cities have electronic databases	8	18.6
Has national database	14	32.6
All district offices countrywide have databases	10	23.3
Only towns in the urban areas have electronic databases	4	9.3
Total	43	100.0

Figure 1 shows the steps of the registration process that are digitalized in countries with electronic databases. The digitalization of registration processes for the consolidation of data nationally, issuance of certificates, search and data recovery of electronic database and validation of a registration appear to be more common among the countries than the completion of the declaration form and sharing of data with the national statistical offices and other institutions. While progress has been made in the digitalization of these processes, the processing of vital events should accommodate and/or support all milestones of civil registration (notification, validation and verification, registration, certification, information-sharing, storage and archiving, compilation of vital statistics, quality control of vital statistics, generation of vital statistics and dissemination of vital statistics).

A well designed CRVS IT system should allow users to search and retrieve records from the system. Searching for recent and historical records is a basic functionality of a digitalized CRVS system. Among countries with electronic databases, all countries except for Angola, Cameroon, Congo, Djibouti, Gambia, Madagascar, and the United Republic of Tanzania have the capability to search and recover old registration records. As countries plan to upgrade their CRVS IT systems, it is necessary to include the search and retrieve functionality.

Figure 1: Steps of the registration processes that are digitalized.

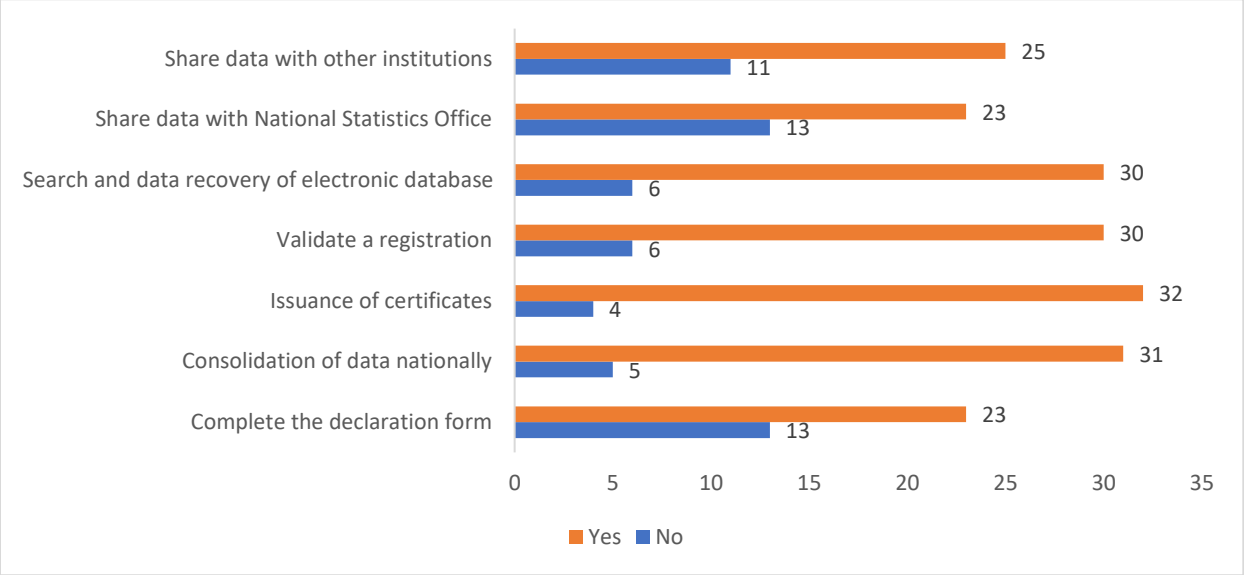


Table 4 shows the number of countries with software that has the capability to search for and recover old registration records. Among countries with electronic databases, all countries except for Angola, Cameroon, Congo, Djibouti, Gambia, Madagascar, and the United Republic of Tanzania, have the capability to search and recover old or archived registration records.

Table 4: Does the CRVS software have functionality for searching and data recovery of the old registration records

	Number	Percent
No	7	16.3
Yes	29	67.4
N/A	7	16.3
Total	43	100.0

Information Technology and Data Management

Table 5 shows the mode of transmission for registration records from one administrative level to another. In 21 countries (48.8%; Angola, Benin, Botswana, Burkina Faso, Chad, Côte d'Ivoire, Egypt, Eswatini, Gambia, Ghana, Lesotho, Liberia, Malawi, Morocco, Mozambique, Namibia, Rwanda, Sudan, and Tunisia), all registration records are transferred electronically from the local offices to regional offices, and onward to a central office. Paper copies are used throughout the system to transfer birth and death records to a central storage facility in 11 countries (25.6%; Burundi, Central African Republic, Ethiopia, Guinea, Guinea Bissau, Madagascar, Senegal, South Sudan, Somalia, Togo, and the United Republic of Tanzania). Paper copies are sent from local offices to the regional office and processed there for electronic transmission to the central office in Niger, São Tomé & Príncipe, Sierra Leone, South Africa, Uganda, and Zimbabwe.

Table 5: How are birth and death records transmitted from local and regional offices to a central storage in the capital city

Mode of transmission	Number	Percent
All information is exchanged electronically	21	48.8
Paper-based at local, electronic at regional level	6	14.0
Paper copies are used throughout the system	11	25.6
The system is still mainly paper based	5	11.6
Total	43	100.0

Table 6 shows the number of countries that either host their own data or outsource the service to a commercial entity. Nearly three-quarters of the countries (72%) host their own data using local servers within their countries. Six countries (14%) are using outsourced services for hosting their CRVS data. These countries are Botswana, Chad, Côte d'Ivoire, Eswatini, Gambia and Kenya. When planning to digitalize a CRVS system, countries need to decide where the IT system and data will be hosted, maintained, and accessed. Some of the technical aspects that need to be considered include the availability of skilled IT personnel to manage these systems, uninterrupted power supply, server space, security, and privacy protocols.

Table 6: Does the civil registration office in the country host its own data or outsources

Data Hosting	Number	Percent
Outsourced system	6	14.0
Self-hosted system	31	72.0
N/A	6	14.0
Total	43	100.0

Table 7 shows the type of software that the countries are using for CRVS. The assessment found that 72% of the countries currently use custom developed software for their CRVS data systems. Four countries (Gambia, Ghana, Mali, and Zambia) are using commercial off-the shelf software while Congo and Mozambique are using community-supported open-source software.

There are many factors that are considered when establishing CRVS IT systems. One consideration is whether to build a custom-developed software whereby the software is designed to suit the prescribed needs of the users. The second consideration is whether to procure commercial off-the-shelf CRVS software whereby the software is readily available for use or procuring community-supported open-source software whose source code is freely available and there is community support for continued development. The advantage of the tailor-made software is that it can be built according to specific needs based on the country context, but it may take time to build and requires highly skilled software developers to develop and maintain it. Additionally, it may be uncertain whether it will work as planned. With commercial off-the-shelf CRVS software, it is possible to examine available software systems on the market that have already been proven. Commercially developed software may be favored over custom-developed software because the functionalities required for IT systems for CRVS are standardized across countries and have already been tested though some modifications may still be needed for it to be aligned to the country's context.

However, purchasing a commercial off-the-shelf software also means relying on the implementing vendor for ongoing support. There is a risk of the vendor becoming unable to provide the required support. With regards to open-source community-supported software, there are no upfront costs though customization, configuration and implementation may require some investments. Additionally, there may not be technically competent computer programmers familiar with the programming language used in the software.

Table 7: What type of CRVS IT systems does the civil registration office in the country use

CRVS IT software	Number	Percent
Commercial off-the shelf software	4	9.3
Community-supported open-source software	2	4.7
Custom developed software	31	72.1
N/A	6	14.0
Total	43	100.0

Figure 2 shows the distribution of countries by the capabilities of the CRVS software in use. Depending on the availability of resources in a country, the CRVS software may have other more advanced functionalities such as fraud detection, online and offline access options, mobile device capabilities and the ability to send user alerts. Of the 37 countries with electronic CRVS systems, the software in use in 29 countries has the capability to deactivate a user-login after several predetermined login attempts and fraud detection; six countries do not have such security protocols. Another 28 countries can detect fraud while 9 countries are unable to do so. Other security-enabled features such as user-password expiration have been observed in 27 countries and the capability to store and transfer encrypted data have been observed in 25 countries. The rest of the countries' CRVS systems are vulnerable to fraud. The digitalization of CRVS business processes should be in harmony with the legislation on CRVS as well as other related legislation that relate to privacy, security, and data sharing. If these are not yet harmonized, the countries must endeavor to update the legislation. Plans should be developed to keep the security measures of the CRVS IT system up to date for the lifetime of the system.

CRVS IT systems in 17 countries have the capability to work in offline mode. This functionality is very relevant in countries where internet connectivity is a challenge and does not necessarily imply that CRVS IT systems that do not have such functionality are less advanced. Similarly, countries that have challenges with either internet connectivity or consistent power supply or working in remote areas could develop software that has mobile device capabilities. A mobile application that works offline and seamlessly connects to remote servers is preferred. Twelve countries in this assessment have software with mobile device functionality. The ability of CRVS IT systems to send user alerts was reported in 16 countries. User alerts sent to clients through SMS or social media can help improve service delivery.

Figure 2: CRVS software capabilities

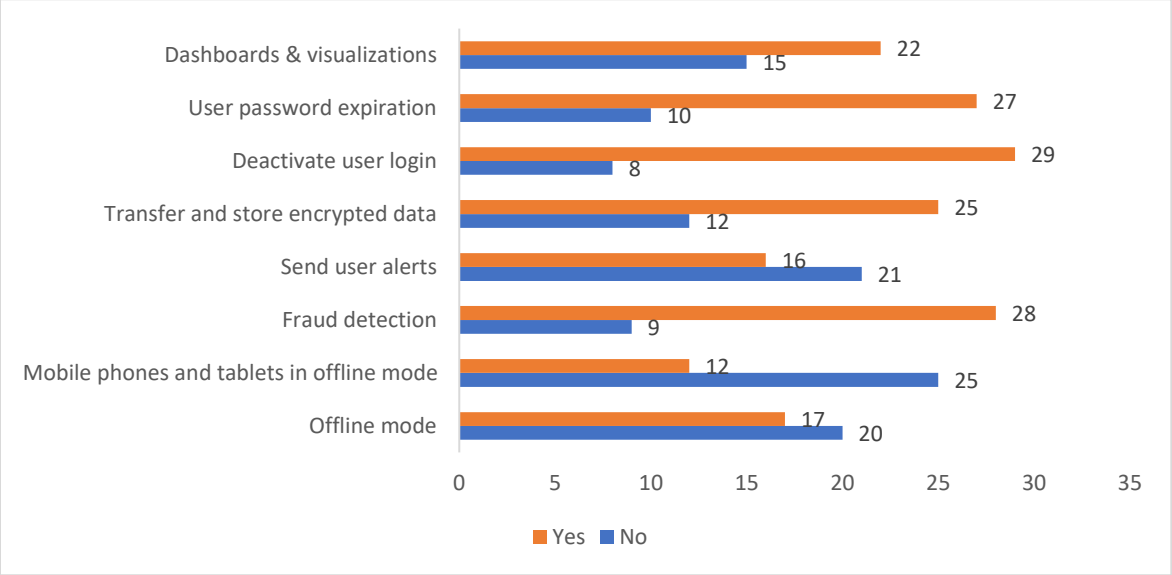


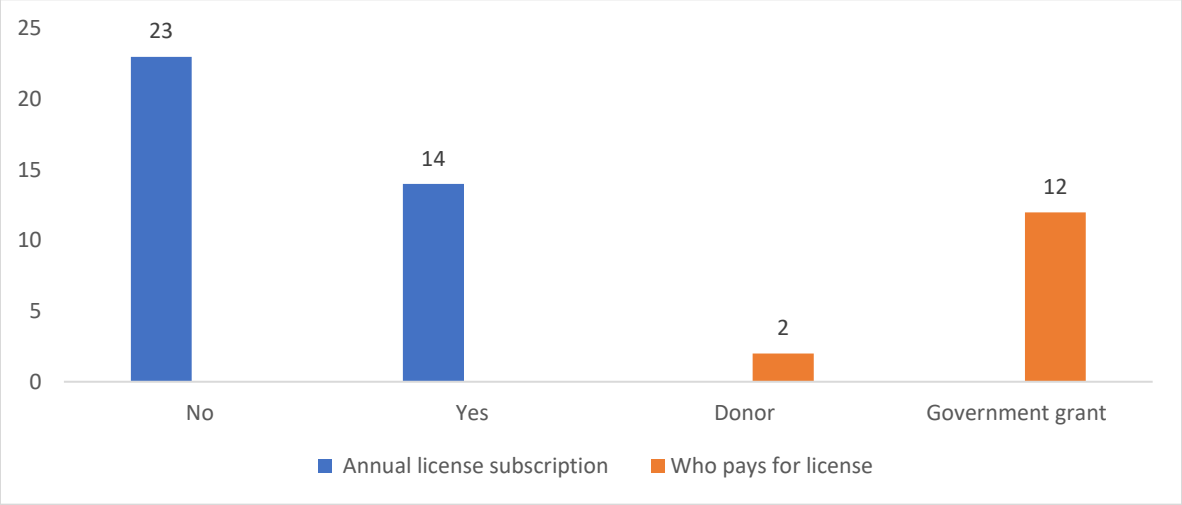
Table 8 shows the capabilities of CRVS software currently in use among ten countries with the largest digital coverage of CRVS systems in Africa. Only two countries, Chad and Gambia have software that has all the capabilities assessed in the survey. The software the two countries are using have the capability to work in offline mode, can work on either mobile phone or tablet in offline mode, can detect fraud, can send user alerts to registered clients, can store, and send encrypted data, can also deactivate a user-login after a predetermined number of unsuccessful login attempts, has password expiration and has dashboards. The software in use in Egypt, Mozambique and Rwanda has all capabilities except for the offline capabilities while Botswana is using software that does not work in offline mode and does not send user alerts. However, it is important to note that in countries where connectivity to the internet is a challenge, the ability of the CRVS IT system to function in both online and offline modes is essential. Only three countries (Chad, Gambia, and Liberia) have software with such capabilities; such capabilities may not be relevant to the other countries.

Table 8: CRVS Software capabilities among the 10 countries with electronic databases in all CRVS offices countrywide

Country	Offline mode	Mobile/Tablet in offline mode	Fraud detection	User alerts	Store encrypted data	Deactivate a user-login	Password expiration	Dashboards
Angola			Yes			Yes	Yes	
Botswana			Yes		Yes	Yes	Yes	Yes
Chad	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Egypt			Yes	Yes	Yes	Yes	Yes	Yes
Eswatini			Yes			Yes	Yes	
Gambia	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Liberia	Yes	Yes						Yes
Mozambique			Yes	Yes	Yes	Yes	Yes	Yes
Namibia						Yes	Yes	Yes
Rwanda			Yes	Yes	Yes	Yes	Yes	Yes

Figure 3 shows the number of countries that either pay or do not pay annual license subscription for the software. Twenty-three countries have CRVS software that does not attract an annual license fee. Fourteen countries reported that they pay annual license subscriptions for the software. In most of the countries that require annual license subscriptions, these costs are covered by the governments.

Figure 3: Annual license subscriptions for CRVS software



Over 80% of the countries have dedicated staff members responsible for the management of the IT infrastructure except for seven countries. Côte d'Ivoire, Guinea Bissau, Mali, Senegal, Somalia, South Sudan, and Togo do not have dedicated IT staff. The implementation of complex CRVS software and IT infrastructure could lead to significant difficulties in maintaining complex IT solutions over the lifetime of the system.

Table 9: Does the civil registration office have dedicated staff members responsible for the management of the IT system

	Number	Percent
No	7	16.3
Yes	36	83.7
Total	43	100.0

Table 10 shows the number of countries planning an evolution of their IT systems. All countries except for Guinea Bissau, Namibia, Sudan, and the United Republic of Tanzania are planning an evolution of their IT systems. It is imperative that any CRVS IT system be designed to meet CRVS principles and standards developed by the United Nations which depict a well-functioning CRVS system. Additionally, the IT system should be designed to meet both the current and future needs of other stakeholders that may interact with the system.

Table 10: Is the civil registration office in the country planning for an evolution of the IT system

	Number	Percent
No	4	9.3
Yes	39	90.7
Total	43	100.0

Existing initiatives that might inform the design of the digitalized CRVS systems

Figure 4 shows the number of countries that have national identification systems that are digitized. Thirty-seven countries in the assessment have digital national identity management systems except for Burundi, Cameroon, Ethiopia, Madagascar, Niger, and Somalia. Twenty-three of these countries have interoperability between the digitalized CRVS systems and the national identity databases. CRVS systems are multisectoral, requiring linkages with other data systems such as the population registries, health information systems, educational data systems and other data platforms which could be a source of information for validation and verification.

Figure 4: Countries with national identification databases linked to the civil registration system

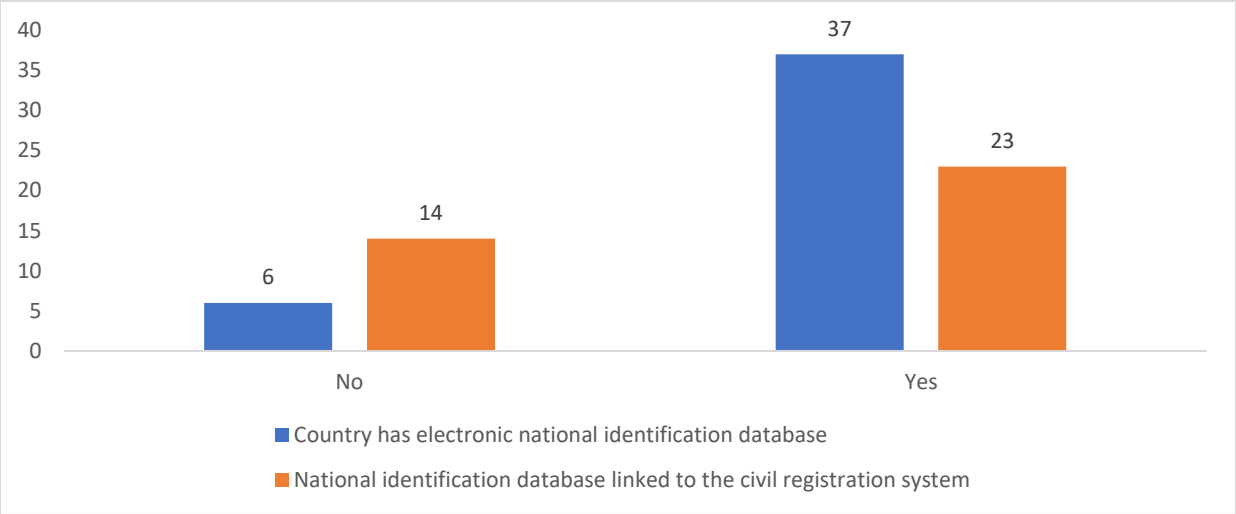
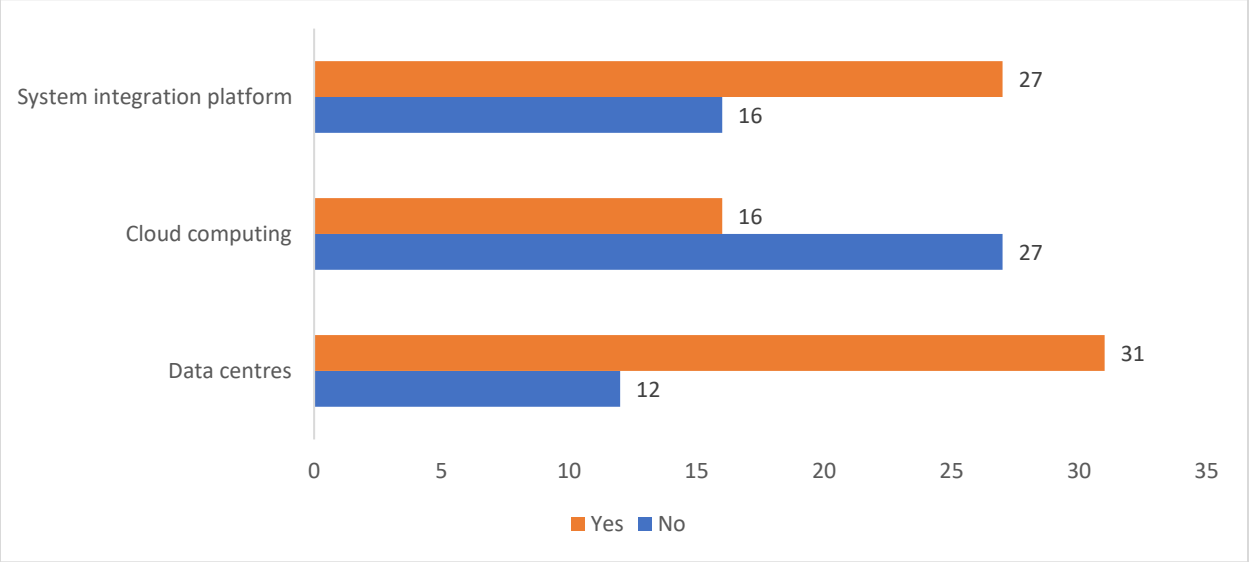


Figure 5 shows the distribution of countries by the eGovernment infrastructure. Thirty-one countries have data centres, and 27 countries have system integration platforms. Cloud computing, however, appears to be a challenge in most countries with 16 countries having access to cloud computing. Despite this, there are existing opportunities in most countries that could be exploited.

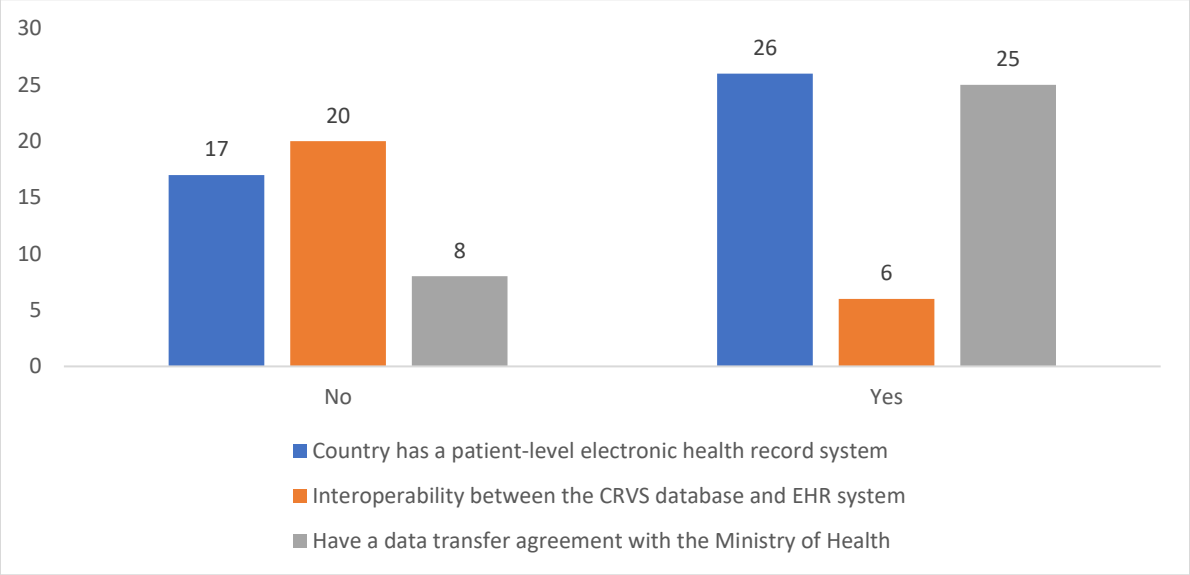
Figure 5: e-Government technical infrastructure



System Integration Opportunities

Twenty-five countries have collaborative arrangements with the Ministry of Health for facilitating the transfer of birth and death notification records to the civil registration offices. The following eight countries do not have data transfer agreements with Ministries of Health in their countries: Burundi, Central African Republic, Liberia, Niger, Senegal, Tunisia, Uganda, and Zimbabwe. Twenty-six countries have patient-level electronic health record systems. Despite this, there is limited interoperability between the CRVS IT systems and the patient-level electronic health record systems in these 26 countries. Botswana, Cameroon, Chad, Eswatini, Mozambique, and Rwanda are the only countries that have interoperability between the EHR systems and the CRVS systems. This is an opportunity that could be leveraged for the transfer of data on vital events. It is clear from this assessment that CRVS systems in the countries may have limited multisectoral linkages. This means that the CRVS systems in some of these countries may not be recording a significant proportion of births and deaths that are captured in other digital systems such as electronic health record systems. Additionally, there is lost opportunity for the verification of data captured in CRVS systems. Countries should be encouraged to enter formal data sharing arrangements to facilitate the transfer of information from stakeholders such as the Ministries of Health, Ministries of Education etc. Even though CRVS offices tend to receive data from other CRVS stakeholders, they are expected to produce vital statistics.

Figure 6: Interoperability between the CRVS database and the patient-level electronic health record system



Most countries reported that there are other systems that may have the potential to be a source of vital event information. Similarly, most countries reported that there are other data that are already being captured for purposes other than civil registration that closely resemble vital events. These opportunities could be harnessed through interoperability between systems.

Figure 7: Other systems that may have the potential to be a source of vital event information

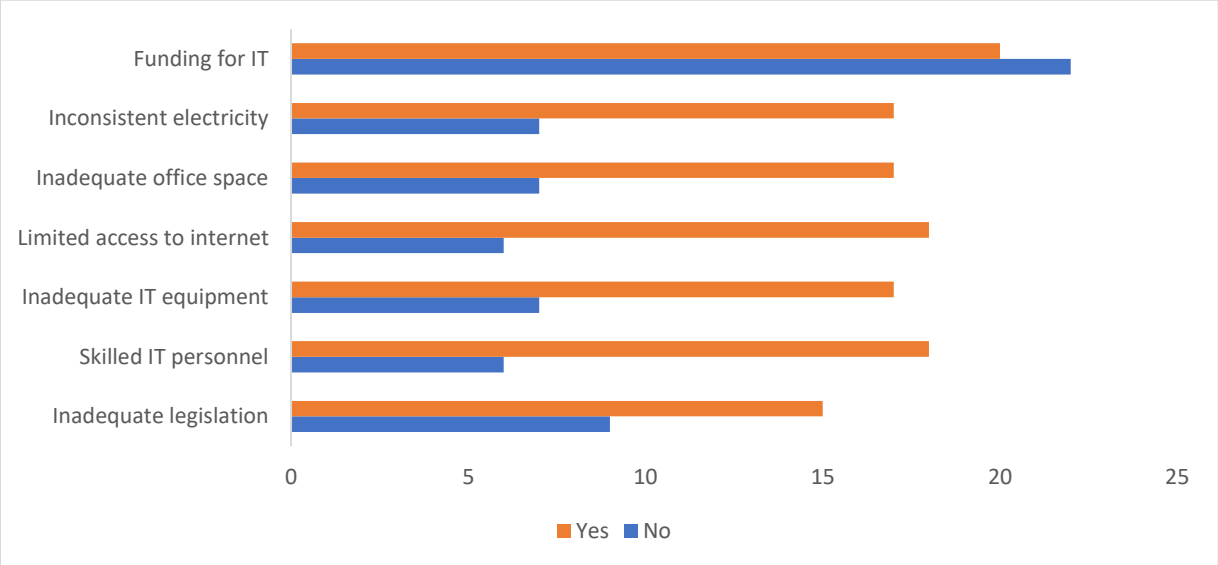
Gaps and Challenges

Figure 8 illustrates the challenges countries have encountered in their digitalization drive. Even though most of the countries stated that funding for the maintenance of IT infrastructure is provided, several countries indicated that funding is a major obstacle. Other challenges mentioned include unreliable and inconsistent supply of electricity, inadequate office and other physical infrastructure, and limited access to the internet for the transmission of data from the local office to the regional office or the headquarters. Other challenges are inadequate IT equipment such as computers and scanners, few or no skilled IT personnel and inadequate legislation to support the transfer of data to other institutions.

A lot of the countries in the assessment indicated that they have challenges of unreliable and inconsistent electricity supply. An inconsistent supply of electricity could affect the civil registration IT infrastructure and result in the loss of data if there are no mitigation plans in place. It is necessary to place measures in place to mitigate such risks to ensure the sustainability and stability of the CRVS system. Civil registration IT systems must include mechanisms to either export or safely store and retrieve data in the case of an adverse event such as power outage, natural disaster, or IT hardware failure.

The resilience of digital systems to withstand disasters and cyber threats is crucial for effective disaster management. Countries with robust cybersecurity measures, backup and recovery mechanisms, and contingency plans for cyber incidents can protect critical digital infrastructure, prevent data breaches, and ensure the continuity of digital services during disasters. The presence of clear policies, regulations, and legal frameworks governing the use of digital technologies in disaster management is crucial. Countries with well-defined policies and legal frameworks that address issues such as data privacy, information sharing, and interoperability of digital systems can ensure efficient and effective use of these technologies during disasters.

Figure 8: Gaps and challenges



Conclusion

The digitalization of CRVS systems can bring about numerous benefits that can significantly improve the efficiency and performance of CRVS systems including in service delivery to the public, as well as accuracy, completeness, and timeliness of vital statistics data. Improved data quality, enhanced data accessibility, improved data analysis, and enhanced interoperability are just a few of the benefits that digitalization can provide. Forty-three countries out of the 52 countries that were asked to participate responded to the assessment.

A strong legal and regulatory framework aligned with best practices is fundamental to a successful CRVS system. The assessment found that 28 countries covered in this assessment have legislation that has provisions for linking or interfacing with other information systems. This is important as rapid adoption of new technology, and creating interoperability between CRVS digital systems and other databases may increase risks for protecting personal and confidential data. The implementation CRVS digital solutions will require safeguards in the form of policies, laws, and standards for data governance.

Considerable progress has been made on the continent with regards to the digitalization of CRVS systems although the assessment found that countries in Africa are at different levels of digitalization of their CRVS systems. In 10 countries, all civil registration offices at the district-level countrywide have digitalized CRVS business processes (notification, validation and verification, registration, certification, information-sharing, storage, and archiving, querying, and searching, compilation of vital statistics, and information sharing). The CRVS systems in these countries also have advanced functionalities such as fraud detection, ability to send user alerts, store and send encrypted data, deactivation of a user-login after a predetermined number of unsuccessful login attempts, password expiration and modern analytical analysis tools such as dashboards and visualizations. Another twelve countries have digitalized their CRVS business processes as well but only in civil registration offices located in cities and towns in urban areas only.

The rest of the countries have a combination of digitized CRVS and paper-based systems. Fourteen countries have a national database only thus have not digitalized their CRVS business processes but have digitized civil registration records. These countries send scanned electronic copies of the paper civil registration records from the districts to the capital for consolidation in the national database. Only 7 of the 43 countries have exclusively paper based CRVS systems and do not have electronic databases where electronic copies of civil registration records can be maintained. Thus, these countries have neither digitized their archived civil registration records nor digitalized their civil registration business processes; the business processes remain paper based.

The assessment also found that CRVS software in 17 countries are using other basic IT functionalities such as working in offline mode, tablet, or mobile phone application capabilities. These features are particularly useful in settings with limited internet connectivity and inconsistent electricity supply, a challenge cited by 17 countries. Where consistent electricity supply is a challenge, software with mobile application capabilities that works offline and seamlessly connects to remote servers is preferred. Twelve countries in this assessment have software with mobile device functionality. This is a basic IT architectural option that should be considered as a necessary component for future systems.

Most of the countries have dedicated IT staff responsible for the management of the IT infrastructure. Implementation of CRVS digitalized systems will require competent IT personnel for maintaining the IT

network over the lifetime of the system. Thirty-nine countries are planning to improve their IT infrastructure; having skilled personnel is critical for sustainability.

Digitalized national identity management systems exist in 37 countries; 23 countries have managed to create interoperability between the digital identity management systems and the CRVS information systems. Thus, these countries can exchange data between the two different systems, and most importantly the systems will allow for the verification of information for the declarants.

With regards to opportunities for systems integration, 25 countries have collaborative arrangements with the Ministry of Health for facilitating the transfer of birth and death notification records to the civil registration offices. Twenty-six countries have patient-level electronic health record systems. However, only 6 countries currently have interoperability between the CRVS IT systems and the patient-level electronic health record systems.

There are also challenges associated with the quest for digitalization of CRVS systems. Several challenges were mentioned by the countries, and they include: inadequate funding; unreliable and inconsistent supply of electricity; inadequate office space; and limited access to the internet for the transmission of data from the local offices to the regional offices or the headquarters. Other challenges cited are inadequate IT equipment such as computers and scanners; inadequate IT capacity and inadequate legislation to support the transfer of data to other institutions.

Recommendations

1. Digitalize CRVS business processes: It is in the best interests of the countries to digitalize CRVS systems to improve their efficiency, accuracy, and accessibility.
2. Conduct an assessment, based on APAI-CRVS guidelines, of the current CRVS system: Before embarking on digitalization, it is essential to understand the existing system's strengths and weaknesses. This assessment should include identifying the legal and institutional frameworks, the data collection and management processes, the human resources, the technological infrastructure and any potential challenges that may arise/ influence the digitalization process.
3. Develop a comprehensive digitalization strategy: Based on the assessment, the country should develop a roadmap for digitalizing the CRVS system. The strategy should define the objectives, the scope, the timeline, the budget, and the stakeholders involved. It should also prioritize the most critical components of the system for digitalization.
4. Engage with stakeholders: The digitalization of the CRVS system will impact various stakeholders, including government agencies, civil society organizations, and citizens. Therefore, it is essential to engage with these stakeholders to ensure their needs and concerns are addressed throughout the process.
5. Invest in technological infrastructure: Digitalizing CRVS systems requires a robust technological infrastructure, including hardware, software, and connectivity. Countries should choose appropriate technology that meets their specific context, needs and capacity. This would require selecting a software system that is flexible enough to be adapted to the country's unique requirements. Countries should also consider investing in mobile applications especially in settings where electricity and internet connectivity are a challenge.,
6. Train and engage human resources: The success of digitalizing CRVS systems depends on the capacity and motivation of the human resources involved. Countries should have robust capacity development plans for IT staff and also take into account staff turnover and rigorous changes in knowledge in the technology space. This plan should be embedded within the digitalization strategy and be adequately resourced.
7. Ensure data privacy and security: Digitalization of CRVS systems can create new risks for data privacy and security. The country should develop and enforce laws, regulations, and standards to protect personal information, prevent data breaches, and ensure data interoperability.
8. Monitor and evaluate the implementation: To assess the impact of digitalizing CRVS systems, the country should establish a monitoring and evaluation framework. This framework should include indicators, benchmarks, and feedback mechanisms to track progress, identify challenges, and make necessary adjustments.
9. Consider adopting the CRVS digitization guidebook. CRVS digitization guidebook is an online resource that provides guidance to countries on digitalizing Civil Registration and Vital Statistics (CRVS) systems. It was commissioned by the African Development Bank for the African Programme for the Accelerated Improvement of Civil Registration and Vital Statistics (APAI-CRVS) and was developed with the support of Plan International and Jembi Health Systems. The guidebook is designed to lead the user through a logical sequence of activities to implement a comprehensive digitalized CRVS system. It is organized into 3 phases (Preparation, Analysis and Design, Implementation), the activities contain a set of descriptive steps, supplemented with supporting Toolbox assets. A graphical representation of the phases and activities enables the user to visualize the process.

Best practices for the implementation of a digital CRVS systems: Another resource that can be used by the countries available to the countries the 'Best Practice Guidelines for Digital Civil Registration and Vital Statistics (CRVS) Systems'. The guidelines cover the following:

a. Principles for the design and implementation of digital CRVS systems, covered in section I;
b. Key functional and non-functional requirements of digital CRVS systems, covered in section II;
c. Options for licensing of digital CRVS systems and their benefits and risks, covered in section III;
d. Service and hosting options for digital CRVS systems and their benefits and risks, covered in section IV; and
e. Key considerations to make prior, during and when procuring digital CRVS systems, covered in section V.

Digitalizing CRVS systems is a complex process that requires a comprehensive approach, involving legal, institutional, technical, and social factors. The recommendations outlined above can help countries to plan, implement, and monitor the digitalization of their CRVS systems.

Appendix 1

Case study: Digitalization of CRVS business processes in Rwanda

Introduction

Rwanda, commonly known as "the land of a thousand hills'' is situated in East – central Africa. It lies 121 Km South (75 miles) of the equator in the tropic of Capricorn, 1416 kilometers (880 miles) west of the Indian Ocean and 1250Km (777 miles) east of the Atlantic Ocean – literally the heart of Africa. Rwanda is bordered by Uganda to the north, Tanzania to the east, Burundi to the south and the Democratic Republic of Congo to the west. The country has a temperate climate, with two rainy seasons (February to April, November to January).[1]

Rwanda is currently composed of two layers of government (central and local). The country is divided into four Provinces and the City of Kigali which are also further divided into 30 districts. Moreover, the districts are further divided into 416 Sectors. Additionally, the sectors are further divided into 2148 cells and lastly, these cells are divided into 14837 villages. All these subdivisions are headed by different people at every level, and they all have different roles though directing towards the same cause.[2]

Civil registration system

Registration of vital events begun during the colonial period although it was only for citizens of the colonizing nations until Rwanda attained its independence[3]. The laws governing civil registration require that the following events are registered: births, deaths, marriages, divorces, annulments of marriage, adoptions, legitimizations, recognition of a child born out of wedlock, and guardianship to a minor or a person of full age[4]. The National Identification Agency (NIDA) under the Ministry of ICT and Innovation is responsible for civil registration in Rwanda. The Ministry of Local Government is responsible for the regulatory framework and policies relating to CRVS, but also oversees civil registration service points at sector and cell levels[5]. The National Institute of Statistics of Rwanda (NISR) is responsible for consolidating, analyzing, and disseminating vital statistics, while the Ministry of Health has the mandate for oversight and governance role over health facilities[6]. The Ministry of Justice provides data on divorce. According to the CRVS strategy for 2017-2022, Rwanda sought to increase birth and death registration and certification to 95% and 90% respectively against global targets of increasing them to 90 and 70 percent by 2025.[7]

Web-based CRVS system

The National Institute of Statistics of Rwanda (NISR) is responsible and mandated by law for the collection, compilation, and dissemination of vital statistics from the civil registration system. To improve the quality

[1] https://www.migration.gov.rw/about-rwanda
[2] https://www.gov.rw/government/administrative-structure
[3] CRVS National CRVS Plan 2017-2022 https://statistics.gov.rw/publication/crvs-national-strategic-plan
[4] https://www.refworld.org/docid/5ebc1d1b4.html
[5] NIDA is a government institution affiliated to the Ministry of ICT and Innovation; The Ministry of Local Government oversees CRVS on policy level
[6] NISR Website: https://www.statistics.gov.rw/about-us
[7] CRVS National CRVS Plan 2017-2022 https://statistics.gov.rw/publication/crvs-national-strategic-plan

and frequency of the collection and dissemination of vital statistics, the NISR, in collaboration with the Ministry of Local Government, the Ministry of Health, and NIDA, developed a web-based application system known as the Web-based CRVS system [8]that facilitates the collection, storage, and production of vital statistics data generated from civil registration. [9]The web-based application was launched in 2015 and its integration with the National Centralized and Integrated CRVS (NCI-CRVS) System allows collection, compilation and dissemination of vital statistics by the NISR.

National Population Register

The National Population Register (NPR) is the repository that contains a complete list of the inhabitants of the country. The purpose of the National Population Registry is to facilitate the issuance of the national identity card with 2D technology to those aged 16 years and above as well as hosting electronic population registration forms: first registration, change of marital status, change of address and death registration. In addition, NPR is a centralized system which provides to all registered citizens a unique identification number. Since 2015, the National Population Registry has been decentralized up to the Sector level.[10]

Rwanda updated the NPR in 2007 and registered most of its citizens in a computerized database. The identity data contained in the NPR is a minimal set of searchable alphanumeric fields which includes name, date of birth, place of birth, sex, address, and name of parents. It does not include any sensitive data such as race, ethnicity, religion, social origin, beliefs, group memberships, physical or mental disability, or health status; nor does it include biometric information. Biometrics are included in the national ID card database.[11]

Link with national identification system

An existing identification (ID) system is linked to civil registration. In addition to civil registration, NIDA is also responsible for population registration, and issuing the national ID credential[12]. Rwanda's identification system that is integrated with the NPR and the NCI-CRVS system, covers only those 16 years of age and older and contains biometric data. These individuals are required to visit an enrollment centre within six months of their 16th birthday to complete their biometric enrollment and apply for a national ID card.

Assessment of the CRVS system

In 2016, Rwanda conducted a comprehensive assessment of the CRVS system whose primary objective was to determine how well the CRVS system was functioning and identify challenges. The challenges identified in the assessment include an unconducive policy and legislative environment; the absence of a coherent CRVS organizational structure and limited financial and human resources. The country

[8] A system for the collection of vital statistics: https://crvs.statistics.gov.rw
[9] NISR Website: https://www.statistics.gov.rw/about-us
[10] https://www.id4africa.com/2016/files/ID4Africa2016_The_Identity_Ecosystem_of_Rwanda_eBooklet.pdf
[11] Ibid
[12]Presidential Order N° 072/01 Of 09/12/2022 Governing The National Identification Agency https://www.nida.gov.rw/index.php?eID=dumpFile&t=f&f=59004&token=1d1d9116b0e7460937f7ac854071738c91f2b171

developed a CRVS strategic plan to resolve these challenges and strive to attain complete registration of all vital events with specific focus on births, deaths, and ascertainment of causes of death. [13]

Following the assessment, Rwanda amended the law governing persons and the family. Rwanda passed a new Births and Deaths Order in 2020, which decentralized birth and death registration for the first time. Changes made by the new law include extending the powers of civil registrars previously at the sector level to more decentralized structures specifically cells and health facilities. By bringing civil registration closer to the public at health facilities and cell levels where the two major life events of birth and death occur, direct and indirect costs associated with long distances to registration offices, previously borne by the public were either reduced or eliminated[14].

CRVS Governance and Coordination

The government successfully integrated CRVS governance into existing government structures, which immediately improved CRVS coordination. At the national level, the National CRVS Steering Committee was established, while Local Government coordination committees were established at the subnational level. This structure allows local authorities to closely monitor and coordinate the progress of CRVS strengthening activities. The results of this effort include the standardized death registration process and the adoption of a new plan for integrated CRVS activities. These outcomes provided a foundation for the accelerated improvement of the overall CRVS system in the country.

Rwanda has established a high-level coordinating CRVS committee which is part of the governance cluster. The committee is made up of five Ministers from the Ministry of Local Government; Ministry of Gender and Family Promotion; Ministry of Justice; Ministry of Health; and Ministry of ICT and Innovation. [15]

The next level of coordination is the Steering Committee. It is composed of the permanent secretaries of the above five ministries and the director generals of six agencies: National Identification Agency; Law Reform Commission; Emigration and Immigration; National Commission for Children; National Institute of Statistics; and Rwanda Biomedical Centre/Ministry of Health.

The CRVS project set up, the Infrastructure and the CRVS human resources

At the onset of the CRVS improvement process, a separate project to run the operations was initiated. The 4 years' project was subdivided into three major parts: a) System development which involved putting in place the CRVS architecture, designing the CRVS business process maps (BPMs), defining CRVS Use cases and the development of the 9 civil registration modules. This part also involved the recruitment of project consultants and staff[16], b) The training of end users on the CRVS system. The phased deployment of the

[13] Rwanda CRVS comprehensive assessment Final report: https://www.statistics.gov.rw/publication/rwanda-civil-registration-and-vital-statitics-crvs-systems

[14] Law no. 1 of 02/02/2020 Government persons and Family https://gazettes.africa/archive/rw/2020/rw-government-gazette-dated-2020-02-17-no-6.pdf

[15] In 2016, the government institutionalized a cluster framework bringing together Ministries (and affiliated agencies) and determined membership and composition of those clusters. There are three clusters: The Economic, the Social and the Governance clusters. The major function of a cluster is to focus on issues requiring broad consultation in a specific sector, fast track implementation of strategic decisions as well as initiate new policies and strategies.

[16] The project consultants were: The project coordinator, the chief CRVS architect, the CRVS Business analyst, the CRVS operations coordinator and the CRVS Specialist. This team worked hand in hand with staff from NIDA and staff from other CRVS stakeholders.

CRVS modules goes hand in hand with the training of end users. These include 832 Civil registrars and civil registration officers at Sector level, the 2,148 civil registrars at Cell level, in 39 embassies and more that 612 civil registrars at Health Facilities, and c) The behavior change communication campaigns for the users, stakeholders and the general public. Regarding the CRVS infrastructure, hardware and software equipment were procured both for the primary and secondary sites. Furthermore, laptops and tablets have been procured for users at cell level and for sustainability purposes, the local governments will ensure provision of internet, maintenance and replacement of the equipment moving forward.

The project budget was $9 Million, where the Government of Rwanda (GoR) contributed $6 Million (66%) and the World Bank Group (WBG) through the Global Financing Facility (GFF) contributed $3 Million (33%).

Digitalization of CRVS Business Processes

NIDA has digitalized and modernized the CRVS system to deliver services and issue certificates at points of service. It has created the National Centralized and Integrated CRVS System (NCI-CRVS) that captures data on vital events and produce statistical data that is shared with the public. The NCI-CRVS System was launched in 2020.[17]

The- NCI-CRVS has digitalized business processes for all the nine vital events as provided for by legislation. These vital events are births; deaths; marriages; divorce; annulment of marriage; adoption; recognition of a child born out of wedlock, legitimations, and guardianships. The digitalization process of civil registration events took an incremental scaled-up implementation approach in a period of four years (2017/2018-2022/2023) starting with births and deaths in 2019/2020, marriages; divorce; annulment of marriage in 2020/2021, Adoptions and Recognitions in 2021/2022 and Guardianships and Legitimizations in 2022/2023 The system records data for each Rwandan and issues civil registration certificates.

The NCI-CRVS has interoperability capabilities to link the CRVS and the NPR using a unique identification number assigned at birth. This system is already functional in hospitals for live births and deaths occurring there and at the cell level, the lowest administrative points of contact with the population for events occurring in the community. The new system allows notification by nurses and declaration by the person accompanying the mother or the mother herself. Registration is therefore done at the health facility. The informant provides his or her telephone number so that once registration is done, a message is sent with the national registration number. The NCI-CRVS is now in almost 612 health facilities (public and private) with maternity services directly involved in the registration of births.

The notification and registration of marriages, divorces, and marriage annulments will be integrated into the Ministry of Justice's electronic records management system. After the court proceedings, notifications will be sent to the civil registration agency to allow for the completion of the process and the issuance of the respective certificates.

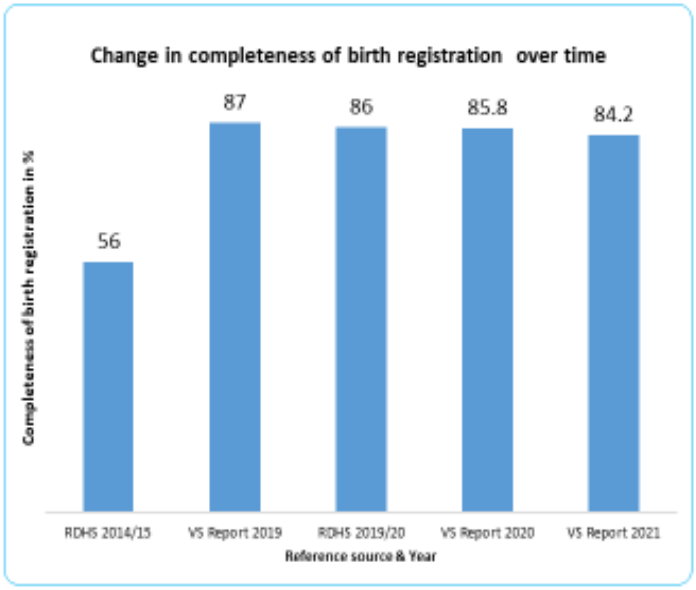
The notifications of adoptions, legitimation, recognition, and guardianship are done at the sector level. The NCI-CRVS is linked to the NISR for the dissemination of CRVS data and the extraction of vital statistics to produce the reports. The NPR is automatically updated as information is entered into the NCI-CRVS database.

[17] Tuoane, M et al. In Rwanda, making every life known is enhancing human capital, World Bank blog, February 2021 https://blogs.worldbank.org/health/rwanda-making-every-life-known-enhancing-human-capital

The digitization of civil registration brought about an increase in civil registration completeness. On birth registration for example, registration completeness rose from 56% in 2015 to 87% in 2019, despite the interruption that culminated from the outbreak of the COVID 19 between 2020 and 2021 but with prospects of picking up in 2022. For the same event, timely registration also increased from 78% in 2019 to 93.7% in 2021[18]

Vital events registration status in figures, 2019-2021

Registration status	2019	2020	2021
Completeness of birth registration in %	87	85.8	84.2
Percentage of timely registered births	78	72.3	93.7
Completeness of death registration in %	31.4	29.9	26.2
Percentage of timely registered deaths	68.6	62	68
Number of official marriages registered	48,526	30,859	33,809



Technological considerations

The NCI-CRVS system was developed by the local company. The database used is mongoDB as it provides flexible schema easily adaptable to evolving requirements. Furthermore, it is built to scale up quickly while supporting transactions logging and multiple data types.

Data hosting uses primary and secondary infrastructure with live mirroring between the two sites. The advantage of hosting in the national datacenter is to ensure 24/7 support and availability of system.

The NCI-CRVS system is web-based to allow access from various locations (more than 3000) and load balancing to allow the application to grow on-demand and ensure high systems availability.

Birth registration

NIDA and its stakeholders determined that the low rate of registration was due to the process of registration that required a declarant to go home after delivery of a child and go to the registration office in the sector within 15 days of the child's birth to have the child registered. This meant making another

[18]NISR website: https://www.statistics.gov.rw/publication/1825

journey to the sector. There was low incentive to make this journey and have the child's birth registered due to the financial burden related to transport and limited appreciation for birth registration.

Registration of births in health facilities

Following the assessment, the legislation was amended in 2020 to include a provision that every child that was born in a health facility should be registered immediately after birth. The maternity register includes all the information that is required by the civil registrar to permit the birth to be officially registered. the data manager extracts the birth information from the maternity register and records the birth in the National Centralized and Integrated CRVS System. The birth declarant presents before the registrar at the civil registration office within the health facility to declare the birth[19]. The birth is registered in NCI-CRVS and a unique national ID number (NIN) is generated. The NCI-CRVS automatically sends the details of the registered birth to the National Population Registry (NPR). The NPR automatically saves the record and generates an application number linked to the NIN generated in NCI-CRVS. The NIN is used by different stakeholders for various purposes. The NCI-CRVS system generates the birth certificate and makes it available through the Government of Rwanda e-service portal, Irembo. [20]

Standardized recording of facility deaths

Previously, different versions of death certificates were utilized across different regions of Rwanda, creating inconsistencies in the information collected about the deceased. All hospitals throughout Rwanda have adopted the recommended WHO international medical certification of cause of death (MCCD) standard tool and all physicians have been trained on using the form. Additionally, MCCD course content was embedded in Rwanda's core curriculum for the Bachelor of Medicine and Bachelor of Surgery.

Registration of community births

When a birth occurs in the community, the community health worker or village chief records the information and informs the executive secretary at the lowest administrative unit (cell) for registration. The executive secretary at the cell notifies and registers the birth in NCI-CRVS, a unique NIN is generated for the birth, and the birth record is automatically sent to the NPR.

Registration of deaths at health facilities

When a death occurs at the health facility, a medical doctor completes the medical certificate of the cause of death and the death notification form. The data manager at the health facility health notifies the death in NCI-CRVS. The next of kin declares the death to the civil registrar and who registers the death in NCI-CRVS.

Registration of community deaths

When a death is reported in the community, the village chief notifies the death to the executive secretary at the cell, and the family of the deceased declares the death to the executive secretary. The executive secretary notifies and registers the death in NCI-CRVS, which will generate a unique NIN and send the

[19] Law no. 1 of 02/02/2020 Government persons and Family https://gazettes.africa/archive/rw/2020/rw-government-gazette-dated-2020-02-17-no-6.pdf

[20]Irembo is an eGovernment platform that allows for access and provision of government services in Rwanda https://support.irembo.gov.rw/en/support/solutions/articles/47001193156-how-to-apply-for-a-birth-certificate

record to the NPR. The NPR will update the decedent's profile to deceased. The death certificate can be obtained from the Irembo portal.

To determine the cause of death, the civil registrars at the cell level complete the WHO standard verbal autopsy questionnaire for all community deaths. The data are uploaded to a central repository for analysis.

Rwanda is still encountering challenges with death registration. According to the CRVS Strategic Plan 2017/18-2020/2021, about 60% of deaths occur in the community and registration of these deaths remain low.

Challenges encountered and Solutions.

- **Challenge:** Identification of stakeholders, their needs, expectations, and responsibilities and aligning them with strategic direction.
- **Solution:** Identified and engaged all potential stakeholders right from start; multi-stakeholder engagement for systems/ process improvement
- **Challenge:** Alignment of annual activity plan with internal activities of stakeholder.
- **Solution:** Joint CRVS action planning with all stakeholders
- **Challenge:** Low death registration rate especially for community deaths:
- **Solution**: Strengthen Monitoring and feedback to registrars especially at cell level
- **Challenge:** Difficulty designing outreach programs to reach the end-user and citizens
- **Solution:** Introduced online training methods: Video tutorials, systems ticketing; TV Spots, Celebrity mentions, Billboards and banners, TV radio, Web advertisements, Town Hall meetings
- **Challenge:** Updating old CR records
- **Solution:** Phased digitization of old paper CR records; Integration with existing registries
- **Challenge:** Low completeness of death registration
- **Solution*:*** Public announcements to increase public awareness
- **Challenge:** Data quality improvement
- **Solution*:*** Continuous training of technical staff
- **Challenge:** Outbreak of COVID-19 pandemic affected scale up and capacity building of new CRs
- **Solution*:*** online training tool and tutorials for continuous self-improvement
- **Challenges:** Timely notification of divorces and other events requiring court ruling
- **Solution:** Integration with Integrated Case Management System (IECMS) of the justice sector for timely notification of events occurring in courts (divorce; adoption…)

Key Lessons and Recommendations

Ensure effective coordination among stakeholders

Effective and efficient institutional, technical, and policy coordination from the highest to the lowest level of the administrative structure is critical for success. Coordination is essential to ensure that all stakeholders speak the same language: this makes it possible to develop and improve multi-stakeholder systems such as civil registration and identification. A clear scope of work and separation of responsibilities among stakeholders is needed.

Create interoperability between existing systems

Create linkages between the civil registration system and an electronic National Population Register (and consequently, the national identity systems. In Rwanda, the NCI-CRVS uses data already populated in the NPR for the registration of events. For example, when registering a newly born child, there is no need to enter the mother's information as it is already stored in the NPR. As the NCI-CRVS has interoperability with the NPR, the NCI-CRVS pulls the biodata for the mother from the NPR. This enables the user to authenticate and validate the information of the declarant and minimizes errors and saves time. Links between a civil registration system and an NPR are highly desirable: this ensures that identity information is provided in a robust and consistent way from cradle to grave.

Establish online services as an integral part of the process

The government has put in place a scalable identity verification service, which it makes available to the various parties that go through the required information security certification. Online identity services are also a fraud-combating tool in any identity ecosystem. If the Rwandan ID card is falsified, the falsification would be detected during the online identity verification, since no unauthorized alteration can be made to the database. These services are also essential for facilitating the electronic integration of different registers.

Operate at a break-even level

Rwanda has attained self-sufficiency in this area: it does not burden people with high fees, nor does it require government funds to operate. For several years now, the system has operated at a break-even level, where its entire budget is covered by fees from the services it offers. The country is able to do this while maintaining a subsidized identity card by using its infrastructure to offer other types of IDs at a higher price to those who need and can afford them (such as driver's licenses, foreigner IDs, and travel documents).

Appendix 2

Case study: Digitalization of CRVS business processes in Egypt

Introduction

Egypt, a country linking northeast Africa with the Middle East, dates to the time of the pharaohs. Millennia-old monuments sit along the fertile Nile River Valley, including Giza's colossal Pyramids and Great Sphinx as well as Luxor's hieroglyph-lined Karnak Temple and Valley of the King's tombs. The capital, Cairo, is home to Ottoman landmarks like the Muhammad Ali Mosque and the Egyptian Museum, a trove of antiquities. It is bordered by Libya, Sudan, and the Red Sea. Egypt has the Suez Canal which is the main route linking Asia and Africa. According to the Central Agency for Public Mobilization and Statistics (CAPMAS), Egypt's estimated population is 105 million people https://www.capmas.gov.eg/.

Civil registration system in Egypt

Civil registration in Egypt begun in 1839, though only births and deaths were being registered. In 1907, the Ottoman Empire made a decree that expanded record-keeping by penalizing those who were deemed to be noncompliant. Thus, civil registration coverage is higher from 1907, and low prior to that. Currently, 4417 local health units register births and fetal deaths. Registration of marriages and divorces is done by the Family Affairs Courts and 2 Real Estate Publicity Departments. Administratively, Egypt is divided into 27 governorates, with cities, and towns and villages. The country's 4,417 local health units register births, deaths, and fetal deaths. The completeness of births and deaths statistics for Egypt is around 98%.

CRVS Legal Framework in Egypt

The civil registration legal framework enforces the registration of vital events, and it also clearly designates the functions, duties, and responsibilities of the different entities involved. All health facilities are required, by law, to register births and deaths. The law requires that all births are registered within 15 days of birth. Similarly, deaths must be registered within 1 day. Cause of death is assigned using ICD-10 coding principles.

The department of civil status falls under the Ministry of Interior and is responsible for civil registration in the country. The civil registration system in Egypt is decentralized. Civil registration information collected at the local registration office is sent to the Department of Civil Status, through the provincial-level civil registration offices and centers (27 in total).

Registration of marriages and divorces is the responsibility of Family Affairs Courts (a total of 231) and the Real Estate Publicity Department. The marriage registration requires ID cards for both parties, witness(es), and payment of fees. For the registration of divorce, a marriage certificate needs to be provided in addition to a payment of fees once the divorce is granted by the court.

Digitalization of CRVS Business Processes

In 2009, the Ministries of Interior and Health and Population developed an integrated digitalized CRVS web-based application and hosted it on a government network. This system was upgraded in 2019 to facilitate the issuance of certificates at lower administrative units. This system facilitates the collection,

storage, and production of data on vital events from all civil registration offices countrywide and connects health facilities to the sectors through user interfaces, thus birth and death registration occurs in real-time allowing for notification and verification. Additionally, the system has user authentication, security protocols and generates vital statistics. Users can also request for services using the online portal. In accordance with legislation, business processes for births, deaths, fetal deaths, marriages, divorces, annulment of marriages, judicial separation of marriage, adoption, legitimation, and recognition have been digitalized. The CRVS system has interoperability with the other governmental systems including the national identity management system. The national identification number is a unique number that is issued at birth and is used for linking user information across several databases.

The notification and registration of marriages, divorces, and marriage annulments are managed through the Ministry of Justice's electronic records management system. These records are made available to civil registration agency when the court process is concluded through the integrated CRVS system.

Governmental Ministries and Entities Involved in CRVS digitalization.

1. Ministry of Health and Population (All health offices in Egypt)
2. Ministry of Planning.
3. Ministry of Justice.
4. Ministry of Interior.
5. Center Agency for Public Mobilization and Statistics.
6. Ministry of Social Solidarity.
7. The National Council for Population.

CRVS Coordination and Integration with the Governmental Systems

The Ministry of Interior is responsible for coordination of all CRVS-related activities in country. However, all government agencies listed above play specific roles to ensure that CRVS implementation and maintenance is seamless. System improvements must be done in consultation with key stakeholders (Ministries of Justice, Health and population, and Planning).

Data Compilation and Dissemination

The Central Agency for Public Mobilization and Statistics (CAPMAS) is responsible for generation and publication of official statistics. CAPMAS disseminates vital statistics that are collected from the CRVS system annually.

Birth registration and Disease Vaccination Card

A child must be registered within 15 deaths of birth at a local registration centre. The child also receives a vaccination card in addition to the birth certificate.

Registration of deaths at hospitals or home

When a death occurs at the health facility, a medical doctor completes the medical certificate of the cause of death and the death notification form. If the death occurs at home, the doctor from the nearest health office will examine and complete the report stating the cause of death.

Challenges in the digitalization of CRVS System

- Lack of awareness of the importance of the civil registration system by the citizens as well as by the staff working at the local health offices.
- Information collected from the vital events' statistical forms is sometimes incomplete.
- Inadequate and inefficient equipment for the CRVS system
- Unable to conduct regular training for local health office staff.
- Inadequate monitoring and evaluation system
- Resistance to change by most of the public servants, most of whom preferred the old paper-based system.

Key Lessons from Egypt's CRVS digitalization efforts

The following are the main lessons from the digitalization process in Egypt.

Effective engagement with all stakeholders

Effective and efficient coordination of all stakeholders from the highest level to the lowest level of the administrative structure is critical for success.

Create interoperability between existing systems

Create linkages between the civil registration system and the national identity systems. In Egypt, the Ministries of Interior and Health and Population developed an integrated digitalized CRVS web-based application and hosted it on a government network. This system facilitates the collection, storage, and production of data on vital events from all civil registration offices countrywide and connects health facilities and is also connected to CAPMAS to produce vital statistics.

Establish online services as an integral part of the process

The government has put in place a scalable identity verification service, which it makes available to the various parties that go through the required information security certification. Online identity services are also a fraud-combating tool in any identity ecosystem. If the Egyptian ID card is falsified, the falsification would be detected during the online identity verification, since no unauthorized alteration can be made to the database. These services are also essential for facilitating the electronic integration of different registers.

Invest in appropriate IT infrastructure.

The government has invested in IT infrastructure for eGovernment with sustainable fast speeds internet connectivity. Egypt has developed its own servers for hosting solutions and included scalable options for the future. Identify the Infrastructure requirements including network and communication equipment.

Legal reform

Establish the necessary legal framework to enforce the registration of vital events, and designation of roles and responsibilities to different arms of government.

Phased implementation of digitalization of CRVS

Establish a short-term and long-term strategy for digitization transformation plans.

Publicize the new system

Create awareness of the importance of CVRS systems.

Appendix 3

Assessment Questionnaire

CRVS Digitization in African Member States / Numérisation de l'enregistrement des actes d'état civil et des statistiques d'état civil (CRVS) dans les États membres africains/ Digitalização Registo Civil/Estatísticas Vitais (CRVS) Para Os Estados-Membro De Africanos

Assessment Tool / Outil d'évaluation / Instrumento de avaliação

Name of Country / Nom du pays / Nome de país:

A. Legal framework for civil registration and vital statistics / Cadre juridique pour l'enregistrement des actes d'état civil et les statistiques de l'état civil / Quadro Legal para o registo civil e estatísticas vitais

1. **Does your country have provisions for the registration of vital events (births, deaths, marriages, divorce) / Votre pays dispose-t-il des systèmes d'enregistrement des actes d'état civil (naissances, décès, mariages, divorces) / O seu país possui provisões legais para o registo de eventos vitais (nascimentos, mortes, casamentos, divorcio)?**

Yes/Oui/Sim

No/Non/ Não

2. **Does the country have legislation that has provisions for linking or interfacing with the other databases e.g., the Health Information System, National statistical system, National Identity systems, passport issuing, civil status, population register, or similar systems / Le pays dispose-t-il d'une législation prévoyant le couplage ou l'interfaçage avec d'autres bases de données, par exemple le Système d'information sur la santé, le Système statistique national, les systèmes d'enregistrement d'identité nationale, de délivrance de passeports, de l'état civil, le registre de la population ou des systèmes similaires / O seu país possui legislação com provisões que liguem ou interajam (interface) com outras bases de dados, por exemplo: o Sistema de Informação da Saúde, o Sistema Estatístico Nacional, o Sistema de Identificação Nacional, emissão de passaportes, estado civil, registo da população ou sistemas similares?**

Yes/Oui/Sim

No / Non/Não **[Skip to Q4]**

3. **Could you please mention the law that states the provisions for linking or interfacing with the other databases e.g., the Health Information System, National statistical system, National Identity systems, passport issuing, civil status, population register, or similar systems / Pourriez-vous mentionner la loi qui énonce les dispositions relatives au couplage ou à l'interfaçage avec d'autres bases de données, par exemple le Système d'information sur la santé, le Système statistique national, les systèmes d'enregistrement d'identité nationale, de délivrance de passeports, de l'état civil, le registre de la population ou des systèmes similaires / Poderia mencionar a lei com provisões que liguem ou interajam (interface) com outras bases de dados, por exemplo: o Sistema de Informação da Saúde, o Sistema Estatístico Nacional, o sistema de Identificação Nacional, emissão de passaportes, estado covil, registo da população ou sistemas similares?**

……..

B. Digitization of CRVS Systems / Numérisation des systèmes d'enregistrement des actes d'état civil et des statistiques d'état civil / Digitalização Do Sistema CRVS

4. **At what administrative levels are registrations of vital events done / À quels niveaux administratifs les enregistrements des faits d'état civil sont-ils effectués / A que nível administrativo o registo dos eventos vitais é feito?:**

District / Distrito

Sub-District / Sous-District / Sub Distrito

Provincial / Régional / Regional

National / Nacional

5. **Does the country have computerized databases where civil registration records are maintained / Le pays dispose-t-il de bases de données informatisées où sont**

conservés les registres d'état civil / O país possui bases de dados computorizados onde são gravados os registos civis?

The country has a national database / Le pays dispose d'une base de données nationale / O Pais possui base de dados nacionais

Yes – all civil registration offices countrywide have electronic databases / Oui - tous les bureaux d'enregistrements des actes d'état civil du pays disposent de bases de données électroniques / Sim – todos os departamentos de registo civil de todo o país possuem base de dados eletrónica

Yes, only towns in the urban areas have electronic databases / Oui, seules les villes des zones urbaines disposent de bases de données électroniques / Sim – somente cidades nas áreas urbanas têm bases de dados eletrónicas

No – only the few offices in major cities have electronic databases / Non - seuls quelques bureaux dans les grandes villes disposent de bases de données électroniques / Não – somente alguns departamentos nas cidades principais têm bases de dados eletrónicas

No electronic CRVS database in the country **[Skip to Q8]** / Pas de base de données CRVS électronique dans le pays / Não – Não existem bases de dados CRVS no Pais

6. **Which steps of the registration processes are digitized / Quelles étapes des processus d'inscription sont numérisées / Que etapas do processo do registo é digitalizado?**

6a. Complete the declaration form / Remplissage du formulaire de déclaration / deve-se completar o formulário de declaração

Yes/Oui/Sim

No/ Non/Não

6b. Consolidation of data nationally / Regroupement des données à l'échelle nationale / Consolidação dos dados a nível nacional

Yes/Oui/Sim

No/ Non/ Não

6c. Issuance of certificates / Délivrance de certificats / Emissão de certificados

Yes/Oui/Sim

No/ Non/Não

6d. Validate a registration / Validation d'inscription / Validação do registo

Yes/Oui/Sim

No/ Non/Não

6e. Edit/change a record / Correction/modification d'un enregistrement / Editar/mudar o registro

Yes/Oui/Sim

No/ Non/Não

6f. Search and data recovery of electronic database / Recherche et récupération de données de base de données électronique / Pesquisa e recuperação de base de dados eletrónicos

Yes/Oui/Sim

No/ Non/Não

6g. Share data with National Statistics Office / Partage de données avec l'Office national de la statistique / Partilha de dados com a Direção Nacional de Estatística

Yes/Oui/Sim

No/ Non/Não

6h. Share data with other institutions (identification, social protection etc.) / Partage de données avec d'autres institutions (identification, protection sociale, etc.)/ Partilha de dados com outras instituições (identificação, proteção social, etc)?

Yes/Oui/Sim

No/ Non/Não

7. Does the CRVS software have functionality for searching and data recovery of the old registration records / Le logiciel CRVS a-t-il une fonctionnalité de recherche et de récupération de données des anciens enregistrements d'enregistrement / O software CRVS possui funcionalidade para busca e recuperação de dados dos antigos registros cadastrais?

Yes/Oui/Sim

C. No/ Non/Não**Information Technology and Data Management / Technologie de l'information et gestion des données / Tecnologia De Informacao E Gestao De Dados**

8. **How are birth and death records transmitted from local and regional offices to a central storage in the capital city / Comment les actes de naissance et de décès sont-ils transmis des bureaux locaux et régionaux à un stockage central dans la capitale / Como é que os registos dos nascimentos e mortes são transmitidos do nível local e regional para o armazenamento central na capital do país**

All information is exchanged electronically from local to regional offices, then to a central office / Toutes les informations sont échangées électroniquement des bureaux locaux aux bureaux régionaux, puis à un bureau central / Toda a informação é trocada electronicamente dos departamentos locais para os regionais, e depois para nível central

Paper copies are sent from local offices to the regional office and processed there for electronic transmission to the central office / Les copies imprimées sont envoyées depuis les bureaux locaux au bureau régional et y sont traitées pour transmission électronique au bureau central / Copias físicas são enviadas dos departamentos de nível local para o regional e processados aqui para envio eletrónico para o nível central

The system is still mainly paper based, with copies sent from local offices to the regional office,

where they are scanned, then sent to the central office for processing / Le système est encore principalement basé sur les copies imprimées ; les copies sont envoyées depuis les bureaux locaux au bureau régional, où elles sont scannées, puis envoyés au bureau central pour traitement/ O sistema é ainda de base manual, com copias enviadas dos departamentos locais para os regionais onde eles são escaneados (scanned) e depois enviados para o nível central para processamento

Paper copies are used throughout the system to transfer birth and death records to a central storage facility / Les copies imprimées sont utilisées pour l'ensemble du système pour transférer les actes de naissance et de décès vers une installation de stockage central / Copias de papel são usadas por todo sistema para transferir registos de nascimentos e mortes para o nível central para armazéns

9. **Does the civil registration office in the country host its own data or outsources / Le bureau de l'état civil du pays héberge-t-il ses propres données ou a-t-il recours à la sous-traitance / O cartório de registo civil do país guarda os seus próprios dados ou terciariza?**

Outsourced system / Système externalisé / Sistema terceirizado

Self-hosted system / Système autonome / Sistema auto-hospedado

10. **What type of CRVS IT systems does the civil registration office in the country use / Quel type de systèmes informatiques de CRVS le bureau d'enregistrement des actes d'état civil du pays utilise-t-il / Que tipo de sistemas de TI de CRVS o cartório/departamento de registo civil é utilizado no seu país?**

Custom developed software / Logiciel conçu sur mesure / Desenvolvido a medida

Commercial off-the shelf software / Logiciel commercial prêt à l'emploi / Software comercial de prateleira

Community-supported open-source software / Logiciels libres communautaires / Software de código aberto suportado pela comunidade

11. **Does the CRVS software that the civil registration office in the country is using have the following capabilities / Le logiciel de CRVS utilisé par le bureau d'enregistrement des actes d'état civil du pays possède-t-il les capacités suivantes / O software de CRVS que o departamento de registo civil utiliza tem as seguintes capacidades?**

10a. Does the software have the capability to work in offline mode / Le logiciel peut-il fonctionner en mode hors ligne / O software tem a capacidade de funcionar em modo offline?

Yes/Oui/Sim

No/ Non/Não

10b. Does the software work on mobile phones and tablets in offline mode / Le logiciel fonctionne-t-il sur les téléphones mobiles et les tablettes en mode hors ligne / O Software funciona em telefones moveis e tablets em modo offline

Yes/Oui/Sim

No/ non/Não

10c. Does the software have mechanisms for fraud detection / Le logiciel comporte-t-il des mécanismes de détection de la fraude / O software possui um mecanismo de detenção de fraude?

Yes/Oui/Sim

No/ Non/Não

10d. Does the software have the capability to send user alerts sent to clients / Le logiciel peut-il envoyer des alertes utilisateur aux clients / O software tem capacidade de enviar alertas de utilizador enviadas aos clientes

Yes/Oui/Sim

No/ Non/Não

10e. Does the software have the capability to transfer and store encrypted data / Le logiciel peut-il transférer et stocker des données chiffrées / O software tem capacidade de transferir e armazenar dados encriptados

Yes/Oui/Sim

No/ Non/Não

10f. Does the IT system have the capability to deactivate a user log-in after a specified number of unsuccessful login attempts / Le système informatique peut-il désactiver la connexion d'un utilisateur après un nombre spécifié de tentatives de connexion infructueuses / O sistema de IT tem capacidade de desactivar o acesso ao utilizador após um numero especifico de tentativa de login sem sucesso?

Yes/Oui/Sim

No/ Non/Não

10g. Does the IT system have user password expiration / Le système informatique a-t-il une expiration du mot de passe utilisateur / O sistema de TI tem expiração da palavra-chave do utilizador?

Yes/Oui/Sim

No/ Non/Não

12. **Does the CRVS software have modern data analysis and reporting methods (e.g., dashboards and visualizations) / Le logiciel CRVS dispose-t-il de méthodes modernes d'analyse de données et de production de rapports (par exemple, des tableaux de bord et des visualisations) / O software CRVS tem métodos de analise de dados e de relato modernos (exemplo, painéis e visualizações)?**

Yes/Oui/Sim

No/ Non/Não

13. **Does the civil registration office in the country use CRVS software that requires an annual license subscription or other recurring costs / Le bureau d'enregistrement d'actes d'état civil du pays utilise-t-il un logiciel CRVS nécessitant une licence avec un abonnement annuel ou autres frais récurrents / O Departamento de registo civil utiliza um software que necessita de subscrição da licença annual ou outros custos recorrentes?**

Yes/Oui/Sim

No/ Non/Não [Skip to Q14]

14. **How does the civil registration office pay for the annual license subscriptions / Comment le bureau d'enregistrement des actes d'état paie-t-il les abonnements annuels des licences /** O **Departamento de registo civil paga pela subscrição anual da licença?**

Government grant / Subvention gouvernementale / Orçamento do Estado

Donor assistance / Aide des donateurs / Apoio de doador

15. **Does the civil registration office have dedicated staff members responsible for the management of the IT system / Le bureau d'enregistrement des actes d'état civil dispose-t-il de personnel dédié à la gestion du système informatique / O departamento de registo civil tem pessoal dedicadas responsáveis pela gestão do sistema de TI?**

Yes/Oui/Sim

No/ Non/Não

16. **Does the Government provide adequate funding meant for any maintenance and upgrades required over the expected lifetime of the CRVS IT system / Le gouvernement offre-il un financement adéquat pour la maintenance et les mises à niveau nécessaires au cours de la durée de vie prévue du système informatique de CVRS / O Governo prove financiamento adequado para qualquer necessária manutenção e atualização ao longo do período esperado de vida do sistema de TI de CRVS?**

Yes/Oui/Sim

No/ Non/Não

17. **Is the civil registration office in the country planning for an evolution of the IT system / Le bureau d'enregistrement des actes d'état civil du pays envisage-t-il une évolution du système informatique / O departamento de registo civil no país planifica uma avaliação do sistema de TI?**

Yes/Oui/Sim

No/ Non/Não

D. Existing initiatives that might inform the design of the digitized CRVS system / Initiatives existantes qui pourraient éclairer la conception du système CRVS numérisé / Iniciativas Existentes Que Possam Informar O Desenho De Um Sistema Digitalizado De CRVS

18. **Does the country have an electronic national identification database / Le pays dispose-t-il d'une base de données électronique nationale d'identification / O Pais possui uma base de dados nacional eletrónica de identificação?**

Yes/Oui/Sim

No/ Non/Não [Skip to Q19]

19. **Is the national identification database linked to the civil registration system / La base de données nationale d'identification est-elle liée au système d'enregistrement des actes d'état civil / A base de dados nacional de identificação está ligada ao sistema de registo civil**

Yes/Oui/Sim

No/ Non/Não

20. **What e-Government technical infrastructure exists in your country / Quelle infrastructure technique de gouvernement électronique existe dans votre pays / Que infraestrutura técnica e-Governo existe no seu país?**

19a. Data centres / Centres de données / Centros de dados

Yes/Oui/Sim

No/ non/Não

19b. Cloud computing / Cloud computing (Nuage informatique) / Computação em nuvem

Yes/Oui/Sim

No/ Non/Não

19c. System integration platforms / Plateformes d'intégration de systèmes / Plataformas de integração de sistemas

Yes/Oui/Sim

No/ Non/Não

E. System Integration Opportunities / Possibilités d'intégration des systèmes / Oportunidades de Integração do Sistemas

21. **Does the civil registration office in the country have a collaborative arrangement with the Ministry of Health in facilitating the transfer of birth and death notification records / Existe-il un accord de collaboration entre le bureau d'enregistrement d'actes d'états civils du pays et le Ministère de la Santé pour faciliter le transfert des actes de notification des naissances et des décès / O Departamento de registo civil no país tem arranjos de colaboração com o Ministério da saúde para facilitar a transferência registos de nascimentos e mortes?**

Yes/Oui/Sim

No/ Non/Não

22. **Does the Ministry of Health have a patient-level electronic health record system / Le Ministère de la Santé dispose-t-il d'un système de dossier de santé électronique pour les patients / O Ministério da Saúde tem um sistema de registo de saúde eletrónico a nível do paciente?**

Yes/Oui/Sim

No/ Non/Não[Skip to Q23]

23. **Is there any interoperability between the civil registration office database and the Ministry of Health electronic health record system / Existe-t-il une interopérabilité entre la base de données des bureaux d'enregistrement des actes d'état civil et le système de dossiers de santé électroniques du Ministère de la Santé / Existe uma interoperabilidade entre a base de dados do departamento de registo civil e o sistema de registo de saúde do Ministério da saúde?**

Yes/Oui/Sim

No/ Non/Não

24. **Are there any other systems that may have the potential to be a source of vital event information e.g., school enrolment systems / Existe-t-il d'autres systèmes susceptibles d'être une source d'informations sur les faits d'état civil, par exemple les systèmes d'inscription scolaire / Existem outros sistemas que possam ter o potencial de constituírem a fonte de informação sobre eventos vitais, eg: sistemas de registos escolares?**

Yes/Oui/Sim

No/ Non/Não

25. **Are there any other data that are already being captured (manually or digitally) for purposes other than civil registration that closely resembles vital events data e.g. vaccination records of infants / Existe-t-il d'autres données qui sont déjà saisies (manuellement ou numériquement) à des fins autres que l'enregistrement civil qui sont similaires aux données sur les faits d'état civil, par ex. les carnets de vaccination des nourrissons / Existem outros dados que já estão a ser capturados (manualmente ou digitalmente) para propósitos que não sejam o registo civil que se pareçam com os dados sobre eventos vitais como registos de vacinações as crianças?**

Yes/Oui/Sim

No/ Non/Não

F. Gaps and Challenges / Lacunes et défis / Lacunas e Desafios

26. What are the gaps and challenges that you have encountered in quest to ditigitize the CRVS system in your country? Quelles sont les lacunes et les défis que vous avez rencontrés dans votre quête pour numériser le système CRVS dans votre pays? Quais são as lacunas e desafios que você encontrou na busca de digitalizar o sistema CRVS em seu país?

26a. Inadequate legal framework / Cadre juridique inadéquat / Marco legal inadequado

Yes/Oui/Sim

No/ Non/Não

26b. Skilled personnel dedicated to maintaining the IT infrastructure / Personnel qualifié dédié à la maintenance de l'infrastructure informatique / Pessoal qualificado dedicado à manutenção da infraestrutura de TI

Yes/Oui/Sim

No/ Non/Não

26c. Inadequate relevant equipment e.g., computers, tablets / Équipement pertinent inadéquat, par exemple ordinateurs, tablettes / Equipamento relevante inadequado, por exemplo, computadores, tablets

Yes/Oui/Sim

No/ Non/Não

26d. Limited or no access to internet / Accès limité ou inexistant à Internet / Acesso limitado ou inexistente à internet

Yes/Oui/Sim

No/ Non/Não

26e. Inadequate physical infrastructure e.g., computers, servers and IT staff / Infrastructure physique inadéquate, par exemple, ordinateurs, serveurs et personnel informatique / Infraestrutura física inadequada, por exemplo, computadores, servidores e equipe de TI

Yes/Oui/Sim

No/ Non/Não

26f. Unreliable power supply / Alimentation électrique peu fiable / Fonte de alimentação não confiável

Yes/Oui/Sim

No/ Non/Não

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