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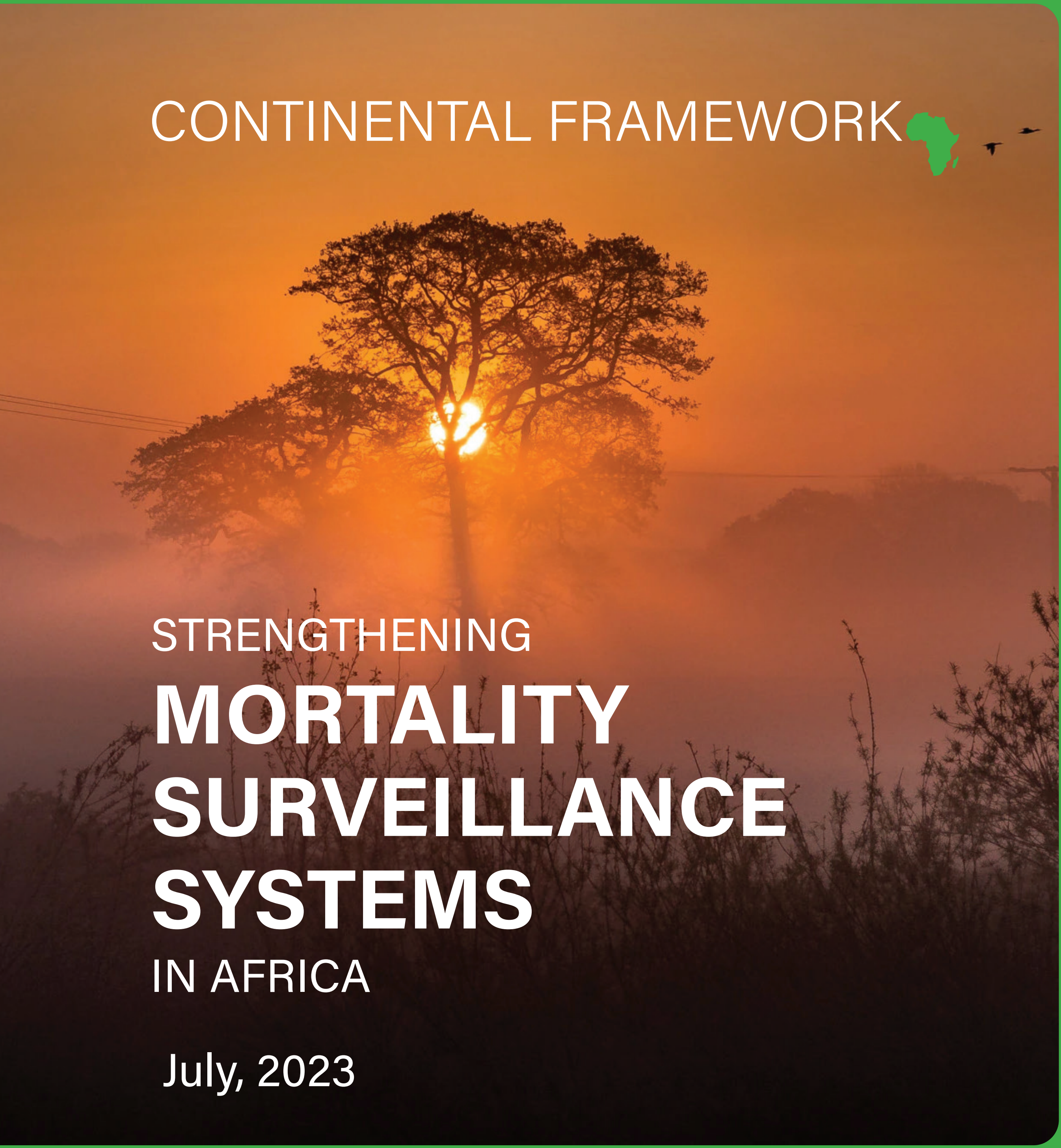

CONTINENTAL FRAMEWORK

# STRENGTHENING
# MORTALITY SURVEILLANCE SYSTEMS
# IN AFRICA

July, 2023

SURVEILLANCE AND DISEASE INTELLIGENCE

# PREFACE

The importance of robust mortality surveillance systems cannot be overstated in an era marked by increasing global health challenges where health threats loom large and population dynamics continue to evolve. Accurate and timely mortality data is essential for identifying trends and detecting emerging health threats, evaluating the impact of interventions, and guiding evidence-based policy decisions.

This framework outlines a holistic approach to strengthening routine mortality surveillance systems, considering the unique contextual factors and challenges faced by African countries. It emphasizes the importance of establishing efficient data collection mechanisms, enhancing data quality and completeness, and promoting data sharing and collaboration among stakeholders.

Moreover, the framework recognizes the pivotal role of technology in the integration of data from fragmented mortality data sources. It highlights the potential of innovative data capture methods, advanced analytics, and real-time reporting systems to enhance mortality data's accuracy, efficiency, and timeliness.

The continental framework for mortality surveillance aligns with Africa CDC's mission and strategic goal by serving as a fundamental component in strengthening public health systems, enhancing disease surveillance capacities and capabilities, informing evidence-based policies and interventions, and promoting collaboration and coordination among African countries to address health challenges and improve health outcomes on the continent.

The successful implementation of this framework requires collective commitment and concerted efforts from governments, health institutions, and the international community. We hope this document will serve as a catalyst for transformative change, enabling countries to build resilient mortality surveillance systems that protect public health, save lives, and contribute to evidence-based decision-making.

We extend our gratitude to all the experts, organizations, and individuals who have contributed their knowledge, insights, and experiences to the development of this framework. Together, we can pave the way for a future where mortality surveillance systems provide timely and reliable information, helping us better understand and respond to the ever-changing landscape of global health architecture.

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# EXECUTIVE SUMMARY

Information on deaths by sex, age and cause of death is essential for population health assessment, policy and program evaluation, and epidemiological research. Timely mortality data is a critical element of epidemic surveillance and response. The earliest practices for close monitoring of deaths were established during the seventeenth century to guide responses to those times' plague and cholera outbreaks. The need for such data has also been acutely recognized during the recent COVID-19 pandemic. While Civil Registration and Vital Statistics (CRVS) systems are the optimal sources for timely and reliable mortality data, such systems are yet under development in several regions, including Africa. To fulfil this data gap, the concepts of mortality surveillance have been developed as an adjunct strategy for generating the required reporting. The concept of mortality surveillance emphasizes the importance of timely information collected on deaths in a systematic manner using an active case search approach and linking this information to responsible authorities to enable timely interventions on a continuous basis. To address the acute need for mortality data, countries should institute mortality surveillance programs that are appropriately coordinated and relevant to the local context. Further, countries must develop strategies that help align mortality surveillance activities with ongoing CRVS strengthening operations that will enable a sustainable and long-term solution for generating timely mortality data on a routine basis.

This Continental Framework establishes the principles for designing and implementing mortality surveillance in all African Union Member States. The Continental Framework aims to guide Member States on adopting a strategic approach to establish their national mortality surveillance programs based on country contexts. This would eventually increase quality and timely mortality data availability for public health action across the African continent. The Continental Framework envisions a well-coordinated and integrated approach for mortality surveillance implementation and should be adapted by Member States to achieve the following objectives:

- Harmonization of all existing mortality data systems to increase effectiveness and efficiency with limited health resources
- Standardization of existing processes and systems for collection, analysis, and dissemination of mortality data
- Establishment of a standard, unified mechanism for death reporting in each member state aligned with national Civil Registration and Vital Statistics (CRVS) CRVS operations to improve efficiency and data quality, eventually leading to the national CRVS system being the optimal data source for mortality surveillance.

The key elements and sections of the Continental Framework are arranged and presented in a series of chapters and summarized below:

**Chapter 1: Background and rationale.** This chapter introduces the rationale for the design and implementation of mortality surveillance in both general and specific terms. Additionally, a brief overview of the range of mortality data systems that are usually operated at country level and various regional and global initiatives that could support activities under this Framework are also described.

**Chapter 2**: **Mortality recording systems**. This chapter provides a broad description of the range of mortality data systems commonly in place in African countries, along with a discussion of the potential utility of each of these systems for the national mortality surveillance program. These are categorized into programs that essentially compile data from events occurring in health facilities and at the community level.

**Chapter 3: Functions of mortality surveillance systems.** This chapter provides guidance for conducting detailed assessments of the structure and operational characteristics of all existing mortality data systems towards establishing a harmonized single-point death recording mechanism at the local level. In some instances, such harmonization could involve integration of electronic mortality databases across different sources at more centralised levels to generate the required data for surveillance.

Using a consultative approach, the coordination committee should use the findings of the assessment to facilitate discussion among stakeholders to develop a shared vision, goals and objectives for the mortality surveillance

**Chapter 4: Steps in establishing a mortality surveillance system.** This chapter provides a broad understanding of the essential steps involved in developing a strategic plan for implementation of mortality surveillance, with some suggestions regarding potential short, intermediate and longer-term objectives of the program. A range of supporting mechanisms and functions needed for surveillance operations and the relevant details of these functions are also discussed in this chapter. It further provides guidance on costing tools and methods, resource mobilisation options, and advocacy strategies and raising awareness about mortality surveillance programs.

**Chapter 5: Monitoring and Evaluation (M&E) of mortality surveillance programs.** Monitoring and evaluation (M&E) provides vital and timely information on the efficiency and functionality of a program. This Chapter includes information on procedures and activities that could form a comprehensive monitoring and evaluation of the mortality surveillance program, along with examples of targets and indicators that could be used to monitor progress.

**Chapter 6: Role of Africa CDC and National Public Health Institutes in strengthening coordination mechanisms for mortality surveillance.** This chapter describes the overall governance and coordination mechanisms for operationalizing the implementation of the Continental Framework.

**Chapter 7: Conclusions.** This document reiterates the critical importance of data from mortality surveillance to establish a robust evidence base for pandemic preparedness at national, regional and continental levels in Africa. It promotes three core concepts: establishment of mortality surveillance protocols integrated with local official death reporting practices; close monitoring of data recording and compilation for timeliness and quality; and routine data dissemination and utilization for surveillance purposes.

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# CONTENTS

PREFACE i
EXECUTIVE SUMMARY ii
ACKNOWLEDGEMENTS iv iv
LIST OF CONTRIBUTORS v
ACRONYMS AND ABBREVIATIONS x

**CHAPTER 1: BACKGROUND AND RATIONALE 1**

1.1 Definition, scope and types of mortality surveillance 2
1.2 Goal and objectives of mortality surveillance programs 2
1.3 Strengthening Civil Registration and Vital Statistics systems – a priority for the African Continent 3
1.4 Continental framework for implementing mortality surveillance 4
1.5 Anchoring African continental mortality surveillance in existing global and regional initiatives 5
1.6 Operationalizing national mortality surveillance 5

**CHAPTER 2: MORTALITY RECORDING AND SYSTEMS 6**

2.1 Health information systems that collect and report mortality data 9
2.1.1 Routine Heath Management Information System 9
2.1.2 Integrated disease surveillance and response system 10
2.1.3 Maternal and perinatal death surveillance and response (20) 10

2.2 Population-based mortality data systems 11
2.2.1 Civil Registration and Vital Statistics systems (CRVS) 11
2.2.2 Health and Demographic Surveillance Systems 11

2.3. Other mortality recording initiatives that can facilitate mortality surveillance 11
2.3.1 Sample vital registration systems 11
2.3.2 Countrywide mortality surveillance for action 12
2.3.3 Child Health and Mortality Prevention Surveillance 12
2.3.4 Population census and health surveys with follow up verbal autopsy 12

**CHAPTER 3: FUNCTIONS OF MORTALITY SURVEILLANCE SYSTEMS 13**

3.1 Core functions of a mortality surveillance system 14
3.1.1 Detection of events 14
3.1.2 Immediate notification of events to the next level 14
3.1.3 Ascertainment and reporting of causes of death 16
3.1.4 Coding cause of death 16
3.1.5 Compilation of data collected 16
3.1.6 Quality assessment, analysis and interpretation 17
3.1.7 Dissemination of evidence generated 17

3.2 Key strategic considerations in setting up a functional mortality surveillance system 17
3.2.1 Coverage of Mortality Surveillance 18
3.2.2 Death recording tools and processes 18
3.2.3 Process for data management 18
3.2.4 Institutional resources for data analysis and capacity building 19

3.3 Strategic approach to establish mortality surveillance 19

**CHAPTER 4: STEPS IN ESTABLISHING A MORTALITY SURVEILLANCE SYSTEM 20**

4.1 Stakeholder engagement (Step 1) 20
4.2 Establishment of governance mechanisms (Step 2) 20
4.3 Situational assessment of existing systems and sub-systems (Step 3) 21
4.4 Identify opportunities for strengthening mortality surveillance (Step 4) 22
4.5 Develop a harmonized strategic plan of action (Step 5) 22

4.6 Implementation stage (Step 6) 24
4.6.1 Recommendations for a phased approach to implementing integrated mortality surveillance at national level 25
4.6.2 Recommendations for Implementing a nationwide sample-based mortality surveillance 26

4.7 Evaluating resource needs (Step 7) 26

**CHAPTER 5: MONITORING AND EVALUATION OF MORTALITY SURVEILLANCE PROGRAMS 28**

5.1 Stakeholder engagement 28
5.2 Develop parameters for data quality assessment 28
5.3 Determine the key performance and outcome indicators to guide system performance improvement 30
5.4 Design the monitoring and evaluation process and data collection 30
5.5 Analysis and use of Monitoring and Evaluation results 31

**CHAPTER 6: ROLE OF AFRICA CDC AND NATIONAL PUBLIC HEALTH INSTITUTES IN STRENGTHENING COORDINATING MECHANISMS FOR MORTALITY SURVEILLANCE 33**

**CHAPTER 7: SUMMARY 36**

REFERENCES 37
ANNEXES 39

# ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| AFRICA CDC | Africa Centres for Disease Control and Prevention |
| APAI-CRVS | Africa Program on Accelerated Improvement of Civil Registration and Vital Statistics |
| AU | African Union |
| CHAMPS | Child Health and Mortality Prevention Surveillance |
| CHW | Community Health Worker |
| CoD | Cause of Death |
| COMSA | Countrywide Mortality Surveillance for Action |
| COVID-19 | Coronavirus Disease 2019 |
| CR | Civil Registration |
| CRVS | Civil Registration and Vital Statistics |
| DHIS2 | District Health Information System 2 |
| DHS | Demographic Health Surveys |
| DSA | Demographic Survey Area |
| FCDO | Foreign, Commonwealth and Development Office |
| HC | Healthcare Centre |
| HDSS | Health and Demographic Surveillance System |
| HIS | Health Information System |
| HMIS | Health Management Information System |
| HW | Health worker |
| ICD | International Classification of Diseases |
| ICT | Information, Communication, Technology |
| IDSR | Integrated Disease Surveillance and Response |
| KPIs | Key performance indicators |
| M&E | Monitoring and Evaluation |
| MCCoD | Medical certification of cause of death |
| MICS | Multiple indicator cluster surveys |
| MoH | Ministry of Health |
| MPDSR | Maternal and perinatal death surveillance and response |
| NCHS | National centre for health statistics |
| NGDS | National growth and development strategy |
| NPHI | National Public Health Institute |
| NSO | National Statistics office |
| PHC | Primary Health Care |
| RCC | Regional coordinating centre |
| RMS | Rapid mortality surveillance |
| SA | Social autopsy |
| SAVVY | Sample registration system methods with verbal autopsy |

| | |
|---|---|
| SDG | Sustainable Development Goals |
| SMART | Specific, Measurable, Achievable, Realistic and Timely |
| SOP | Standard operating procedures |
| SRS | Sample registration system |
| TWG | Technical working group |
| UHC | Universal health coverage |
| UN | United Nations |
| UNDP | United Nations Development Program |
| UNICEF | United Nations Children's Fund |
| UNSD | United Nations Statistics Division |
| VA | Verbal autopsy |
| VASA | Verbal autopsy and social autopsy |
| WHO | World Health Organization |

# CHAPTER 1: BACKGROUND AND RATIONALE

Africa is overburdened with communicable diseases and faces a growing burden of non-communicable diseases, coupled with death caused by injury, such as road traffic injuries, and other unnatural causes, such as suicide and homicide. Even though there are improvements in critical health services delivery, the health systems in Africa remain underfunded and overstretched to accommodate the existing burden of diseases (1). According to the 2016 Global Burden of Disease study, over two-thirds of disease burden in Africa is due to premature mortality, generally understood as death before a standard measure of life expectancy at each age (2).

The health and wellbeing of a country is measured to a large extent by mortality indicators. Accurate and timely data about the number and causes of deaths enables countries to determine its burden of diseases and measure the effectiveness of its health sector and disease control programs. Without reliable mortality data, Member States cannot adequately address their public health needs and make informed critical decisions on the distribution of available resources, to deliver effective and efficient health services.

Therefore, availability of mortality data has become fundamentally important for national population health assessment and health development agenda across the continent, and more so to adequately respond to the current and emerging epidemics and pandemics.

Despite the importance of mortality data, few African countries have high-quality data at national or sub-national levels about fact and cause of death (3). According to the 2016 GBD study, countries in Africa scored an average of 8.3% mortality data accuracy and completeness from 2010 to 2016, as compared to a global average of 46.9% for the same period. Out of 55 African countries, 38 (69%) did not produce reliable data on cause of death from 2010-2016 (4). In its 2020 publication, the World Health Organization (WHO) reports that only 10% of deaths in the African region are registered, compared to over 90% in the European and Americas regions (5).

Hence, there is an urgent need for African Member States to produce reliable and timely mortality data that can be used to plan effective health services, public health interventions and to measure the impact of events of public health concern such as pandemics and natural disasters. This Continental Framework for Mortality Surveillance will guide African Union Member States on actions needed to develop and enhance holistic mortality systems that capture all deaths, and cause of death where feasible, to address the chronic lack of accurate mortality data.

African countries need continuous, prospective, timely and reliable mortality data to monitor public health threats. Globally, the emergence of the novel coronavirus disease (COVID-19) pandemic since 2020 has highlighted, like never before, the urgent need for countries to have continuous, relevant, reliable and real-time data to address both emerging and urgent public health threats. During epidemics, mortality is the most extreme health outcome that must be prevented. It can be readily identified in the community instead of more challenging measurements such as disease incidence. Hence, it is important that emergency response authorities in countries know who is dying, when, where and why, to initiate appropriate response actions in a timely manner to avert premature deaths. Timeliness is of particular relevance for the data to serve the purpose of early detection of epidemics and monitor the impact of response measures.

Despite general consensus about the essential need for mortality data, the reality in most African countries is that many separate systems collect, process and analyze mortality data without necessarily sharing this information with the responsible national level authorities for effective mortality assessment. In the wake of the COVID-19 pandemic, South Africa was able to measure and monitor excess deaths using mortality data from their CRVS system and utilize this information to guide their response strategy(6). Several African countries implemented the WHO guidance on “Rapid Mortality Surveillance (RMS) and Response to Epidemics” as a means to track the full impact of the COVID-19 pandemic on the local population and generate quick data for designing national response strategies (7). However, due to the lack of historical population-based data, most countries were reliant on the use of the United Nations (UN) statistical projections for estimation of the excess mortality trends due to the pandemic (8)9)

The need for harmonized mortality data systems that produce timely data for decisions is critical during public health emergencies. Robust and comprehensive mortality surveillance systems that can detect public health threats effectively need to be prioritized by all countries. In the current context, the COVID-19 pandemic has highlighted the need for most countries to review national mortality data systems and identify opportunities to rebuild or reconfigure them to ensure that they are robust enough and able to produce timely data on deaths and their causes, through a comprehensive mortality surveillance system.

## 1.1 DEFINITION, SCOPE AND TYPES OF MORTALITY SURVEILLANCE

Surveillance in the context of public health refers to the systematic ongoing timely identification, reporting and investigation of specific health events, with subsequent analysis and dissemination of resulting data to drive public health actions. The concept of mortality surveillance emphasizes these principles in terms of timely compilation of data on deaths in a systematic manner, with subsequent transfer continuously to relevant authorities to analyse and interpret the magnitude, stage and transition of disease trends.

In terms of scope, mortality surveillance programs could be configured across a spectrum of options, ranging from various models that involve combinations of primary data recording integrated with data from other available secondary data sources. The scope of mortality surveillance could also vary in the program's coverage at local, regional and national level, varying across sentinel clusters to nationally representative population samples or total national coverage.

Regarding type of operations, there are various modes for death recording activities at the local level. The most common form of death recording is practised in routine CRVS systems, which records deaths as they occur continuously, through community driven 'passive' death reporting processes. However, where such systems are dysfunctional, there may be a need for an 'active search' approach, in which deaths are identified either through periodic household surveys across entire population clusters, or through local networks of key informants that monitor and notify deaths in local households to the designated mortality surveillance program. To address the need for mortality data, national governments should institute ongoing mortality surveillance programs (which could be of either operational mode, i.e., passive or active) that are properly coordinated and relevant to the local context. As such, countries should strategically identify their priority actions towards building and strengthening unified mortality surveillance systems that are capable of generating reliable and timely data for public health action to prevent future avoidable deaths (9). Within the health sector, mortality surveillance operations are also classified according to the locations from where deaths are reported, in terms of facility-based death reporting and community-based death reporting systems. National Health management information systems (HMIS) commonly incorporate mechanisms for both types of reporting, with community events being reported through the primary health care system, which are merged with events reported by health facilities to develop a comprehensive mortality data set for the reference population. However, the HMIS is subject to various forms of bias, which are considered in subsequent sections.

## 1.2 GOAL AND OBJECTIVES OF MORTALITY SURVEILLANCE PROGRAMS

Mortality surveillance aims to help countries improve timely and reliable information that enables early detection of public health threats, guide responses for epidemic control and ensure evidence-based policy and practice.

This goal can be addressed through several interlinked objectives focusing on specific processes and actions required to design and implement the mortality surveillance program.

**Objective 1:** To establish reliable procedures for recording and reporting all death events occurring in defined populations to designated mortality data recording programs in line with existing local and international standards.

**Objective 2:** To develop efficient processes for data compilation, processing and management into an integrated national database with a set of recommended variables.

**Objective 3:** To strengthen capacity for regular analysis, interpretation, and dissemination of mortality surveillance outputs (events/indicators) to different stakeholders for their action.

At the national level, a series of considerations and actions must be taken into account for accomplishing each of these objectives, on the pathway towards the overall goal of the mortality surveillance program. Table 1 provides examples of the critical considerations for each objective. Given the scope of the required activities and tasks, and the degree of variation in program design at national (and possibly sub-national) levels, it is not feasible to recommend a uniform approach that could be followed by all countries in establishing MS programs. Consequently, there is a need to follow a more rational approach at national level that closely examines the existing structures in place, identifies strengths and opportunities for developing potential solutions, and develops a comprehensive strategy to design and implement a robust national MS program.

**Table 1: Key considerations for accomplishing objectives of national mortality surveillance programs**

| | Objective | Key consideration | Action |
|---|---|---|---|
| 1. | Reliable death recording & reporting procedures | Existing multiple parallel death recording systems across various sectors | Harmonization with focus on strengthening CRVS as the main death recording system |
| 2. | Efficient data compilation and management | Independent discrete information systems with mutually exclusive data capture and flow processes | Development of integrated electronic data management programs compliant with international quality standards |
| 3. | National capacity for data analysis and dissemination | Institutional, technical and human resource gaps | Capacity building at all levels with appropriate data release mandates and tools |

The problems with mortality data recording through multiple systems (or even absence altogether) account for most of the challenges in establishing mortality surveillance in African Member States. These considerations are discussed below, along with several other issues and factors that should be considered when proposing solutions for national mortality surveillance programs. Such background information and understanding helps to create the context and need for the overall Continental Framework for establishing Mortality Surveillance Programs in Africa.

## 1.3 STRENGTHENING CIVIL REGISTRATION AND VITAL STATISTICS SYSTEMS – A PRIORITY FOR THE AFRICAN CONTINENT

The most widely accepted approach to obtaining fact and cause of death data is a well-functioning, complete Civil Registration and Vital Statistics (CRVS) systems. A well-functioning, comprehensive CRVS system includes full registration of births, deaths and causes of death occurring within health facilities and communities. The United Nations (UN) states that CRVS systems should be universal (capturing all civil events), continuous (capturing data all the time), compulsory (a requirement of government for all within its borders) and permanent (producing a permanent, legal record for the individual and state) (10). During the COVID-19 pandemic, most African countries could not leverage their national CRVS systems to generate timely surveillance information on total, all-cause mortality for pandemic monitoring and response.

The UN criteria for measuring functionality of CRVS systems categorizes systems into 'nascent', 'limited', 'moderate', 'well-developed' and 'sustainable' capacities; with 'nascent' referring to lack of capacity to generate the needed vital statistics from these systems (11). From a practical perspective, the UN Demographic Yearbook System annually compiles information on deaths reported from all Member States (primarily from national CRVS systems) and the World Health Organization similarly compiles information on cause-specific mortality (12). A review of these two sources indicated gaps in data availability and/or quality in most African countries.

Due to the lack of fully developed CRVS systems, most countries rely on various alternative sources for information on births and deaths (as described in detail in chapter 2) including:

- Censuses
- Household surveys such as Demographic Health Surveys (DHS) and Multiple Indicator Cluster Surveys (MICS)
- Health Demographic Surveillance Sites (HDSS)
- Health Management Information Systems (HMIS)
- Sample-based mortality surveillance systems also known as sample registration systems (SRS)

Over the past decade, countries in the African continent have made considerable investment towards strengthening availability of vital statistics from CRVS systems. However, there are key factors which have contributed to the slow progress in movement towards availability of mortality data including:

- *Fragmented information systems that record deaths*: In most countries, in addition to the CRVS system, there are routine HMIS programs, disease-specific surveillance programs, and various surveys that record mortality in the population. This exerts a lot of pressure on the limited resources due to the parallel processes and structures needed for death reporting, varying data requirements and standards by different users, and increased reporting burden on the health personnel.
- *Weak or non-existent legal and policy frameworks*: one of the expected characteristics of a functional CRVS system is that it must be compulsory and a requirement of government. Whereas there are policy directives in most countries which articulate that the registration of civil and vital events is mandatory and compulsory, in most countries there are limited legal provisions (sometimes absent altogether) and where these exist, there are no or limited enforcement mechanisms. Additionally, most CRVS systems have been structured in a passive manner whereby the system only captures vital events that are reported on the initiative of the concerned individuals or family. There are limited incentives for individuals to register vital events.
- *Limited technical expertise, especially for certifying cause of death:* To set up and manage a CRVS system requires a multi-disciplinary approach which should bring different skill sets together. In the Continent however, there is an acute shortage of technical expertise required for collection, processing, and analysis of data on cause of death which has contributed to the low coverage of death and cause of reporting.

For comprehensive mortality surveillance, mortality and cause of death data must be available on a continuous basis at both national and subnational levels, and this can only be met through universal CRVS systems. Strengthening CRVS systems will require a multipronged approach that aims to address the challenges identified above. Where relevant, sentinel/sample registration systems and facility-based/routine health information system data should mutually complement and reinforce CRVS systems in an integrated manner, to maximize the availability and quality of mortality statistics. At a minimum, detection of deaths through these sources should trigger their formal notification and registration, in parallel.

Ideally, mortality surveillance should therefore seek to detect all deaths, at all ages, all populations and regardless of cause, as part of the routine detection process. Such mortality surveillance efforts that utilise information from multiple available local data sources can help strengthen the CRVS system. While generating actionable information, timely mortality data can serve the purposes of epidemic surveillance through continuous data compilation & analysis and guide evidence-based health policy and action using periodic reports. In some instances, provisional counts from mortality surveillance data could be used for immediate public health purposes, and validated official statistics can later confirm them. Mortality data from other intermittent sources, such as household surveys or censuses, could be used for data triangulation for verification of records or mortality measures derived from continuous recording systems. This underscores the need to develop strategies that help align mortality surveillance activities with ongoing routine CRVS operations, and investments in such strategies to strengthen mortality reporting will be seen as integral to CRVS improvement.

## 1.4 CONTINENTAL FRAMEWORK FOR IMPLEMENTING MORTALITY SURVEILLANCE

In the background of fragmented, independent death recording systems in African Member States, coupled with dysfunctional national CRVS systems, there is a need for a comprehensive, planned approach towards improving mortality data availability across Africa. The African Continental Framework for implementing national Mortality Surveillance programs (hereby referred to as 'the Continental Framework') has been developed with the explicit purpose to guide Member States in developing a strategic approach to establish robust, nationally contextualised mortality surveillance programs, with a focus on supporting CRVS system development as a long-term solution. It is envisaged that national level interventions that are designed and implemented as per the guidance in this Framework would eventually increase availability of good quality and timely mortality data for surveillance and public health action across the African continent.

In essence, the Continental Framework is designed to provide theoretical and practical guidance on the three core components of mortality surveillance, i.e., death recording; data management; and analysis/dissemination of surveillance outputs.

## 1.5 ANCHORING AFRICAN CONTINENTAL MORTALITY SURVEILLANCE IN EXISTING GLOBAL AND REGIONAL INITIATIVES

A unified and standardized approach to mortality surveillance is critical for ensuring a healthy population that is foundational to achieving the Aspirations of "Agenda 2063: The Africa We Want"(13). A united mortality surveillance initiative will allow for integrated continent-wide data, which will be increasingly necessary as Africa moves toward a vision of free movement of people across the entire continent. In addition to meeting a critical need for the continent, a harmonized continental framework for mortality surveillance will strengthen health systems, collection and use of data, and inter-sectoral collaboration, which are directly called for in Strategic Approaches A, K, and I of African Union (AU) Health Strategy, 2016-2030 (14).

The implementation of this mortality surveillance framework is aligned with many other global & regional initiatives. These include the:

- Health-related United Nations Sustainable Development Goals (SDGs) (https://www.un.org/sustainabledevelopment/);
- African Union Agenda 2063, whose goal is to have healthy and nourished citizens (https://au.int/en/agenda2063) ;
- Africa Health Strategy (2016-2030) whose Strategic Objective 3 is to reduce morbidity and end mortality from communicable and non-communicable diseases by 2030 (https://au.int/sites/default/files/documents/24098-au_ahs_strategy_clean.pdf);
- African Program for Accelerated Improvement of Civil Registration and Vital Statistics framework, an initiative to implement CRVS in all AU Member States (https://apai-crvs.uneca.org).
- Africa Health Statistics and Campaign on Accelerated Reduction of Maternal and Child Mortality (CARMMA) which aggregates essential health indicators from all Member States (https://www.africanhealthstats.org/)
- Newly launched African Statistics Agency (in Tunisia) that will aggregate and analyze CRVS data from across the continent under the Strategy for the Harmonization of Statistics in Africa 2017-2026 (https://statafric.au.int/en/strategy-shasa-2-2017-2026).
- Mortality surveillance is also critical to allocating resources for Universal Health Care (UHC) services and ensuring health security (https://www.who.int/news-room/fact-sheets/detail/universal-health-coverage-(uhc)).
- International Health Regulations (2005) Third Edition (https://www.who.int/health-topics/international-health-regulations#tab=tab_1).

Therefore, this Continental Framework serves as a catalyst for countries to work towards achieving the regional and global development goals by advocating for availability of improved and timely mortality data among Member States with limited capacity for generating these data.

## 1.6 OPERATIONALIZING NATIONAL MORTALITY SURVEILLANCE

Given the limited availability of mortality data from CRVS systems among Member States, it is imperative to establish national-level mortality recording programs based on existing mechanisms for death reporting in each country, to generate basic information for surveillance purposes. However, the organization of the existing death reporting systems in most countries remains scattered among different stakeholders with different functions. There is a need to integrate data recording and compilation across these varied sources into a single, unified, comprehensive mortality surveillance repository for information on deaths at subnational and national levels.

Some activities that may enable the successful implementation of such an efficient surveillance program include: strengthening governance and operations of death reporting activities, establishing a clear definition of institutional roles and responsibilities, raising awareness and advocacy at all levels, building technical capacities, improving allocation of resources, and leveraging of shared interests by both implementing and development partners. Given the potential overlap across existing systems within each country, a comprehensive mapping of characteristics and reporting processes of all existing mortality data sources is an essential initial step of the Continental Framework that should be implemented in each country to develop a platform for their harmonization towards establishing the protocols for national mortality surveillance.

# CHAPTER 2: MORTALITY RECORDING AND SYSTEMS

In the absence of fully viable CRVS systems, countries have a range of data sources that serve as alternatives for compiling mortality data. Broadly, mortality data sources are those that record and report deaths continuously as they occur, or those that record deaths periodically, usually from household inquiry. Each data source has its unique characteristics, advantages and limitations, summarised in Table 2.

For mortality surveillance purposes, continuous data sources are preferred since they provide the potential to act as 'early warning' systems to detect onset of an epidemic. Hence, from this perspective, several alternative sources are not well-suited for mortality surveillance. For instance, censuses and surveys are conducted periodically (on average, every five to ten years) and therefore not adequate to make timely policy decisions if only based on such data. In addition, they are costly, and the data quality is limited due to recall bias, and in the case of household surveys, it is also limited by sampling error. On the other hand, while HDSS provide continuous data on death events and their causes, they do not usually produce valid national and sub-national estimates, given their limited sample size. Similarly, HMIS can provide continuous fact of death, and sometimes cause of death data, but may face challenges in reporting community-based data, or may only capture health facility data, therefore being biased in their representativeness. Sample-based mortality surveillance systems with verbal autopsy produce fact of death and cause of death data. They can be designed to generate a statistically valid estimate of national and sub-national mortality based on a sample population. Still, they are not universal or compulsory, and may rely on retrospective data compilation, rather than the continuous recording of events. These alternative sources have provided countries with vital information about births and deaths for decades; however, they have several critical limitations and should not replace the need to strengthen a sustainable CRVS system.

*Table 2: Key attributes of the different mortality data sources*

| **Source** | | **Description** | **Lead partner** | **Nationally representative** | **Sub-nationally Accurate** | **Frequency of data collection** | **Cause of death** | **Country-run** |
|---|---|---|---|---|---|---|---|---|
| Census | | Procedure of systematically counting and recording data on every member of a country. Done ~ every 5 to 10 years. Records fact of death but not cause of death (unless followed by post-census mortality survey). Data does not support timely decision making and the cost often requires external support. | UNSD | Y | Y | Periodic | Optional | Y |
| Surveys | Multiple Indicator Cluster Surveys | Only records summary birth histories from women of reproductive age, used for estimating child mortality. | UNICEF | Y | Y | Periodic | Often No | Varies |
| | Demographic and Health Surveys (DHS) | Records complete and summary birth histories from women of reproductive age to estimate child mortality. Some surveys also record sibling survival histories to estimate adult mortality using indirect demographic analytical methods. | USAID | Y | N | Periodic | N | N |
| | DHS - Cause of death | Same as Fact of Death DHS above but include follow-up verbal autopsies to determine causes of death. | USAID | N | N | Periodic | Y | N |
| | Non-routine limited surveys | Surveys conducted in one or a few countries but limited in scope and/ or not intended to be re-run to track change over time (e.g., one-off verbal autopsy surveys, post-census mortality surveys). | Varies | Varies | Varies | Periodic | Varies | Varies |

| Source | | Description | Lead partner | Nationally representative | Sub-nationally Accurate | Frequency of data collection | Cause of death | Country-run |
|---|---|---|---|---|---|---|---|---|
| Health and Demographic Surveillance System (HDSS) | | Sites conduct continuous monitoring within a demographic surveillance area (DSA), collecting data on all births, deaths, cause of death, fertility, and migration. Data are representative of the DSA but not the nation as a whole. | INDEPTH Network | N | Representative of DSA | Continuous | Y | Varies |
| Studies | | Limited research into specific population/cause of death (e.g., one hospital examining cause of death in the facility for one year, one country investigating all childhood deaths for just one year).  Data is often not shared widely. | Varies | N | N | Continuous / retrospective | Y | Varies |
| National Surveillance Systems | Health Management Information Systems | Provide continuous fact of death, and sometimes cause of death, data but may face challenges reporting community-based data or may only capture health facility data. | Country | N | N | Continuous | Y | Y |
| | Fully Developed National CRVS Systems | Continuously captures high quality data on births and deaths nationally, and allows for calculation of birth rates, mortality rates, and cause-specific mortality fractions at the national and sub-national levels. | Country | Y | Y | Continuous | Y | Y |
| | Sample Registration Systems | Captures all vital events, sometimes on a continuous basis (with or without civil registration of the births and deaths) and causes of death for deaths inside and outside of health facilities. Very few countries in Africa have such systems. | Measure Evaluation, BMGF | Y | N | Continuous | Y | Y |

In this chapter we broadly describe mortality recording systems based on the sources and methods used for data collection and depending on the location of occurrence of the death event. These are:

- **Health facility-based systems –** Mainly collect information on medically-attended and medically-certified deaths in healthcare settings. When a death event occurs, the healthcare provider completes the international medical certificate of death and cause of death (MCCoD), according to the World Health Organization's (WHO) International Classification of Diseases (ICD) standards. Health facilities are mandated to report information on fact and cause of death to the next health system level and, in some cases, notify or inform the civil registration authorities in country.
- **Community-based systems –** In most locations, there are community death notification systems where community health workers or other informants report death events that occur at community level. In certain locations, such community level death recording systems also report deaths that may have occurred in health facilities, for comprehensive records on local mortality. This aspect needs attention when merging information across facility-based and community-based notification systems, to eliminate duplication of records.

Community-based systems are sometimes operated by personnel directly integrated with local CRVS programs, while in other instances are operated by the health sector or civil society/volunteer institutions. Where such community notification systems function independently of CRVS, they should be integrated with the official death registration system for purpose of death certification. Deaths that occur at accident sites, from natural disasters or occupational hazards, or under other medicolegal circumstances are usually recorded by local police authorities, and such death recording must also be integrated with the CRVS system.

Health facilities compile and report information on local community deaths in several countries. In such cases, the data recording systems should specify the place of death (health facility or home) and whether it was medically attended in the event of a community death.

In some instances, health sector operated community notification systems may use verbal autopsy (VA) methods to determine probable causes of death. Verbal autopsy is a method of determining causes of death, in which a trained interviewer uses a questionnaire to collect information about the signs, symptoms, and demographic characteristics of a recently deceased person from an individual familiar with the deceased. Based on the information from the questionnaire, a probable cause(s) of death could be assigned either through physician review or by computer algorithms (15) .

It has been generally observed that about three fourths of all deaths in African countries occur at home or outside health facilities (16) with some countries (Ethiopia, Chad, South Sudan) experiencing even higher proportions (>90%) of such instances. Hence, a brief overview of the generic structure and functional processes of death reporting systems for both facility and community events can help place the overall mortality surveillance development activity into context and provide a basis for system strengthening activities.

## 2.1 HEALTH INFORMATION SYSTEMS THAT COLLECT AND REPORT MORTALITY DATA

### 2.1.1 Routine Heath Management Information System

Globally, mortality data is often used to measure the quality of health care services provided at national and subnational levels. Therefore, death counts are routinely collected by health care providers at points of service and reported to the next level through the national Health Management Information System (HMIS). In most countries, the HMIS platform also includes mortality data from community-based death recording systems that are operated by the health sector, particularly for rural areas. Examples of such health information systems with a community-based component on death reporting include Maternal and perinatal death surveillance and response (MPDSR) programs, disease specific surveillance programs (e.g. HIV/AIDS, Tuberculosis), among others.

More recently, the WHO has promoted the use of a standard electronic platform for HMIS operations at district level via District Health Information System Version 2 (DHIS2), which is routinely used to derive indicators, including mortality, for monitoring and evaluating health service performance regularly. In addition to providing health service-related data, the HMIS also provides data on mortality recorded by disease specific programs mentioned above.

These disease specific surveillance programs often collect information on cause specific mortality as one of the health outcomes of interest, but only record deaths among patients enrolled for health care under the program, and hence the data are not generalizable for public health purposes (17). However, integrating these death records with those from facility-based and community-based systems (with careful record matching to avoid duplications) can enhance the overall completeness of death records and the accuracy of recorded causes of death.

### 2.1.2 Integrated disease surveillance and response system

The integrated disease surveillance and response (IDSR) structure is a component of the routine HMIS which provides an integrated platform for sharing of epidemiological data on priority diseases and events of public health importance (18) Ministries of health use the IDSR strategy in most African countries to monitor priority events through early identification and reporting, to prevent and control potential public health emergencies of national and international concern (19). The IDSR framework incorporates event- and indicator-based surveillance as components for early warning and response and epidemic intelligence.

**WHO defines event based surveillance (EBS)** as the organized collection, monitoring, assessment and interpretation of mainly unstructured ad hoc information regarding health events or risks, which may represent an acute risk to health. EBS is an epidemic intelligence mechanism often used by emergency response authorities to identify abnormal or unusual occurrences as early as possible on an ad-hoc basis. Information is also collected based on predefined signals/alerts from both health facilities and community information and ad hoc non -traditional health information sources (such as media outlets) for further validation and investigation by responsible authorities to rule out potential public health threats. EBS compliments the IDSR functions in that it combines both health facility and community information with active media scanning to identify potential alerts that are further investigated in line with IDSR guidance. As an epidemic intelligence open source (EIOS) platform, the EBS mechanism for collecting information can be leveraged to detect vital events occurring in underserved communities and emergency settings where there are no proper structures for reporting health information.

**Indicator-based surveillance (IBS)** is the systematic identification, collection, monitoring, analysis and interpretation of structured data on a regular basis. Events occurring within the community and health facilities are systematically identified using standard case definitions and reported to the next level on a case-by-case basis or as aggregated counts to facilitate quick decision making for urgent interventions.

Some of the priority events defined under the IDSR guidance include cause specific deaths, such as, measles, malaria, HIV, maternal deaths, perinatal deaths and unusual death occurrences. The IDSR platform is widely established in most Member States and provides a favourable framework for conducting mortality surveillance in a timely manner especially at the health facility level where mandatory immediate and weekly reporting is done.

Where IDSR records health facility and community-based deaths, the recording system should specify the place of death (health facility or home) and whether it was medically attended in the event of a community death. Community health workers or community volunteers primarily serve as a link between the community and the health facility. These individuals usually have good knowledge of their communities, as they may be residents and even custodians of household-level information.

While data from IDSR can help monitor numbers of events over time, it may not be useful for comparative analysis of disease magnitude in terms of proportional mortality or comparative population mortality risk assessment through calculation of mortality rates. This is because the principal function of IDSR is the identification of priority diseases and events of public health importance and therefore does not compile information on all deaths.

### 2.1.3 Maternal and perinatal death surveillance and response (20)

The maternal and perinatal death surveillance and response system collects cause of death information on adverse pregnancy outcomes, including maternal death, loss of pregnancy, still birth and newborn deaths. Maternal and perinatal death surveillance and response is a form of continuous surveillance that links the health information system and quality improvement processes from local to national levels. This includes the routine identification, notification, quantification and determination of causes of maternal and perinatal deaths, as well as using this information to respond with actions that will prevent future avoidable deaths. In countries with established MPDSR systems, an existing technical and structural capacity presents an opportunity for establishing an all-cause mortality surveillance system (21).

## 2.2 POPULATION-BASED MORTALITY DATA SYSTEMS

### 2.2.1 Civil Registration and Vital Statistics systems (CRVS)

The Continental Framework recognizes the urgent need for countries to generate data for public health actions, including emergency preparedness and response, while aligning with the long-term CRVS agenda. In the CRVS system, vital events are primarily notified to the civil registration (CR) authorities by concerned individuals but may also be notified according to the law by authorized notifiers, such as physicians, who complete - medical certificate of cause of death and other informants including police, and community leaders or agents.

Mortality surveillance systems can and should, wherever possible, also be leveraged to support CRVS system development. When events in the mortality surveillance system are also being notified to CR authorities, the data collected should include the minimum set of data elements required for legal registration. Given the legal implications of civil registration, there may be requirements such as signatures/thumbprints or other data security measures, which may go beyond the requirements of a standard mortality surveillance system. In these cases, countries need to decide on how to harmonize the data collection and transfer across different levels, including data sharing agreements to meet the needs of all users.

### 2.2.2 Health and Demographic Surveillance Systems

Health and Demographic Surveillance Systems (HDSS) gather longitudinal health and demographic data on events such as pregnancies, births, deaths, and other health and social economic variables in a well-defined geographic area (22). Annex 3 summarizes the characteristics of HDSS programs, now operational in 18 countries across the continent of Africa. Baseline household level data is collected in a census, and regularly updated through household enumeration visits to enable monitoring of population dynamics. In addition to other health data, HDSS sites provide a good source of mortality data including all cause and cause specific fractions and enable generation of life tables for estimation of survival rates due to the longitudinal nature of the data collected. These sentinel surveillance sites provide a unique opportunity for monitoring public health risks and tracking effectiveness of interventions through the data produced. They also provide a useful platform for conducting cross-sectional household surveys whose data can be used to validate the surveillance data. Some countries such as Burkina Faso, Ethiopia, Kenya, Tanzania and Uganda among others, operate HDSS sites in several locations, effectively representing different geographic regions or socio-economic strata of their national populations.

However, the major limitation with HDSS is that they cover relatively small geographical areas that are not representative of the entire population. Also, the study population sizes are insufficient to generate data to reliably measure commonly required total and cause-specific mortality indicators (23). Hence, although the actual data from HDSS is of limited value for surveillance purposes, the implementation experiences from the HDSS program should be leveraged by countries to strengthen mortality surveillance through broader coverage and expansion across the country. Additionally, HDSS sites could be used as pilot areas to test revisions to CRVS laws and procedures for reporting/recording deaths and their causes, and apply lessons learnt to improve CRVS efficiency across the country. HDSS programs should also aim to share data with national governments to integrate and utilise other data sources (24).

## 2.3. OTHER MORTALITY RECORDING INITIATIVES THAT CAN FACILITATE MORTALITY SURVEILLANCE

### 2.3.1 Sample vital registration systems

Sample vital registration systems (SRS) are sample based mortality surveillance systems that employ innovative approaches to enumerate essential events with or without verbal autopsy methods to determine cause of death in sampled areas. These innovations are used to enumerate birth and death events in the community through active case finding methods. However, despite using the term "registration" within the name, it is important to note that most SRS approaches do not always link the vital events data collected to the civil registration authorities, nor do they strictly contribute to generating nationally representative mortality data. It should be noted that where these do exist, efforts should be made to gradually link or integrate these systems with the CR authorities to enable registration of these vital events. When implemented in a representative sample, sample vital registration with verbal autopsy (SAVVY) have been used to generate a statistically valid estimate of the national and subnational mortality data including cause of death (25).

Countries implementing sample mortality surveillance systems must align such activities with country-specific needs and priorities to ensure improvement and use of mortality data. It is also necessary to ensure adequate sample size to generate sufficient data for reliable mortality measurement (26). These country-led efforts should be tailored to fit existing capacity and infrastructure; improve CRVS systems; assist in documenting community deaths; and provide a platform for integrating other public health surveillance systems. Furthermore, when linked with existing CRVS systems, these systems can help to increase completeness of legal birth and death registrations.

### 2.3.2 Countrywide mortality surveillance for action

Countrywide mortality surveillance for action (COMSA) is a robust SRS that captures high quality data on births and deaths nationally, and allows for calculation of birth rates, mortality rates, and cause-specific mortality fractions at the national and sub-national levels. It is designed to align with national CRVS strengthening plans and priorities and is led from the outset by country teams including national statistics institutes, ministries of health, national public health institutes, and civil registration authorities. In Mozambique for example, the COMSA approach has been used to generate mortality data for public health programming initially, and the country is moving towards using the same platform to strengthen legal registration of births and deaths nationwide (27).

With COMSA, government personnel conduct surveillance on 3-8% of the national population, a sample that has been carefully selected to be nationally and sub-nationally representative, and based on population clusters that align with the local CRVS administrative areas. Personnel prospectively identify, record, and report pregnancies, births, and deaths within the sample areas and populations and conduct verbal autopsy (VA) for deaths outside of health facilities. Data are collected by community health workers/volunteers supported by program staff, using automated tools on mobile tablets and entered into an online database for onward transmission to the national level for cause of determination, coding and eventual processing. VA data are transformed into cause-of-death data and used to calculate timely and accurate national and subnational estimates of birth and death rates. Countrywide mortality surveillance for action also provides a platform for improving local capacity to code cause of death and certify deaths using the WHO international medical certificate of cause of death, while also linking with existing CRVS systems to increase completeness of birth and death registration.

### 2.3.3 Child Health and Mortality Prevention Surveillance

Child Health and Mortality Prevention Surveillance (CHAMPS) is a surveillance program that collects data on causes of death among children under five, using a combination of verbal autopsies, medical records from stillbirths and deaths in children under five years that occur within selected sites, and other available pathological evidence. A panel of specialists reviews this information for each CHAMPS case and determines the most likely cause of death. Data from CHAMPS can supplement information for the national mortality surveillance program.

### 2.3.4 Population census and health surveys with follow up verbal autopsy

A population census is the total process of collecting, compiling, evaluating, analysing, and disseminating demographic, economic and social data related to a specified time, to all persons in a country. Usually, population and housing censuses and demographic and health surveys are conducted every five or ten years, respectively. In the absence of complete civil registration systems in Africa, population censuses provide one of the major sources of mortality data. However, as mentioned previously, mortality data from censuses have limited utility for both surveillance and population health assessment because of poor timeliness and high potential for recall bias. For these reasons, even the verbal autopsy data has limited reliability since recall periods greater than one year could adversely impact the quality of responses regarding the symptoms and terminal events related to the possible cause of death.

The critical utility of census data for mortality surveillance lies in the provision of high-quality data on current population by age, sex and location, which could be used as a denominator for estimating mortality risk, as a sampling frame for selecting sentinel/sample sites for surveillance activities, and (in conjunction with data from previous censuses) as a basis to forecast future population characteristics in terms of size or composition.

# CHAPTER 3: FUNCTIONS OF MORTALITY SURVEILLANCE SYSTEMS

When designing a mortality surveillance system, the key principles should include system flexibility and potential to adapt and build upon existing resources. Several essential activities and supporting mechanisms are integral to the design and operation of a mortality surveillance program, as depicted in Figure 1. The core functions of the mortality surveillance system are grouped into six categories including: detection of events, immediate reporting of fact of death to the next health system level, determining probable cause of death using verbal autopsy and social autopsy (VA and SA) methods for community deaths (usually a predetermined sample of community deaths), certifying cause of death, timely reporting of cause of death, coding, compilation, analysis and interpretation of data and dissemination of evidence generated for actions (**Table 3**).

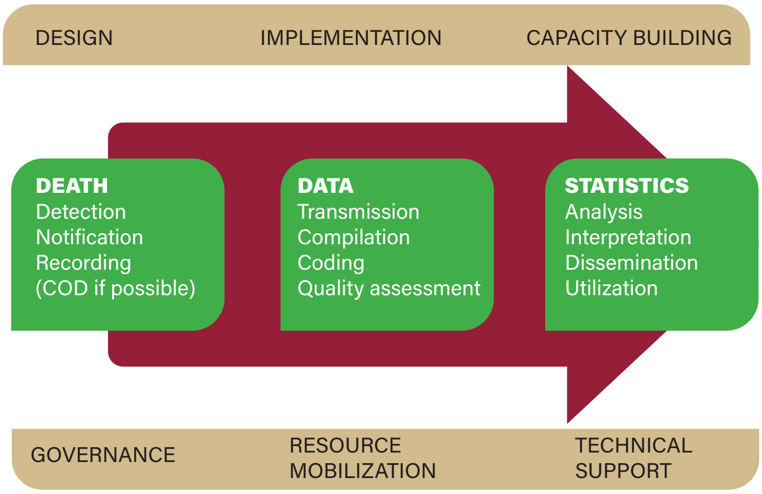


*Figure 1: Framework of essential activities and supporting functions for operating a mortality surveillance program*

Comprehensive mortality surveillance should be implemented at all levels, including the community where most deaths occur, health facility level, district/local level, subnational and national levels. At each of these levels, a cycle of actions and processes will be implemented according to the existing capacities, roles and responsibilities.

**Table 3: Core functions of the mortality surveillance system at different levels of implementation (may vary by country)**

| **Core function** | **Level of implementation** | | | |
|---|---|---|---|---|
| | **Community** | **Health facility** | **Sub-national** | **National** |
| a) Detection of events | X | X | | |
| b) Immediate reporting to the next level (notify to CR system) | X | X | X | |
| c) Ascertain cause of death. | VA | MCCD | | |
| d) Applying ICD mortality coding | | X | X | X |
| e) Compilation of data collected | | | X | X |
| f) Quality assessment, analysis and interpretation | X | X | X | X |
| g) Disseminating evidence generated for actions | X | X | X | X |

## 3.1 CORE FUNCTIONS OF A MORTALITY SURVEILLANCE SYSTEM

### 3.1.1 Detection of events

Death events either occur within the health facility or in other areas within the community. The system should be able to capture and record all these deaths by utilizing different sources of information such as the health facility records, community health service providers, disease surveillance programs, village registers and administrative records such as police, other service records such as insurance policy providers, funeral homes and coroners.

- *Recording deaths within health facilities*

When a death event occurs in the health facility, the hospital authority must comply with CRVS procedures for recording details of the death to be submitted to the local registration authority, along with the international medical certificate of death completed by the physician who attended the death. The mortality surveillance program should utilise information as recorded by the standard health facility death reporting practices, but with necessary modifications in case there is a need to make compliant with international recommendations.

- *Recording deaths outside health facilities*

When a death event occurs in the community (at home, road traffic accidents, drownings, or elsewhere), the community health worker or representative should immediately record relevant details on a standard form which includes a minimum set of variables such as Date of death, Age, Gender, Place of residence and cause of death if known. The format should preferably be aligned with the national protocol for death reporting as mandated by the CRVS system. In some instances, the CRVS system also operates a network of local key informants who identify and record death events among the community, including religious leaders, village headmen, funeral attendants / organizations, and local police and community health staff. The mortality surveillance program could also harness such local death recording practices.

### 3.1.2 Immediate notification of events to the next level

Notification in public health surveillance terms is used to refer to the immediate reporting of case-based priority events for purposes of timely investigation to rule out or confirm an outbreak. However, in CRVS, notification refers to the legal process that occurs after an event is identified and verified and refers to the official process followed by the informant (notifier) to notify authorities of the event, for subsequent entry as a record in the civil register (i.e. registration).

Once identified, the responsible notifier in the community or health facility should immediately report the death event to the next level as per prescribed mechanisms of the mortality surveillance program. The notification can be daily, weekly or monthly depending on three requirements namely: the urgency of the information required (e.g., in an epidemic setting or any other public health emergency), the existing guidelines and standards for routine reporting of surveillance data, and if events are to be legally registered, existing guidelines and standards for routine reporting of civil registration data.

For notification purposes, the input of a minimum set of data required by the CRVS system should be determined and availed to the reporting cadres to ensure uniformity and alignment with a pre-existing set of CRVS data variables. For mortality surveillance programs, **Table 4** lists essential and optional variables that could be collected.

To ensure comparability of the data extracted from the different sub systems, country teams need to adopt standardized protocols, procedures and tools for collection and reporting of data from the different sub systems. In an epidemic situation, there is an urgent need for information on certain essential characteristics of deaths which could be provided using a simple format.

For example, a notification report may provide summary information on age, sex, date and location on a case-by-case basis. When more than one case is identified, the information should then be tabulated into a line list (see example in **Table 5**) which is then reported to the next level as a trigger for further surveillance actions including collection of information on why the death occurred.

For purposes of timely reporting, countries are encouraged to promote automated data capture and transfer mechanisms to facilitate timely collection, transmission, compiling, analysis and dissemination of information for action. Applications such as the open data kit (ODK), mobile phone short messaging service (SMS) and similar others should be carefully considered when setting up mortality surveillance systems as they help reduce the time lag experienced with transferring paper-based data into electronic form. Adequate data security provisions should be made to ensure the privacy and confidentiality of data that is electronically transmitted through public information platforms.

**Table 4: Essential and additional variables required for mortality surveillance programs**

| | **Category** | **Variable** | **Remarks** |
|---|---|---|---|
| ESSENTIAL VARIABLES | Identity / demographic data | ▪ Name(s)*<br>▪ Date of birth / Age<br>▪ Sex<br>▪ Address of usual residence<br>▪ National ID number (if available) | Full names<br>Age in completed years<br>Complete address |
| | Event data | ▪ Date of death occurrence<br>▪ Address of occurrence<br>▪ Place of death (home/ hospital)<br>▪ Name of hospital<br>▪ Date of registration in civil registry | Verify date/month of death & of death registration<br>Complete address<br>Name of institution |
| OPTIONAL VARIABLES | Causes of death | ▪ Medically certified death (yes / no)<br>▪ If yes, data from MCCD (multiple causes with duration for each cause)<br>▪ Verbal autopsy COD<br>▪ Family lay reported COD | Data entry of complete MCCD forms<br>Specify source of VA diagnosis (physician / computer) |
| | Other health-related data | ▪ Variables to facilitate in-depth epidemic mortality surveillance such as diagnostic confirmation, vaccination status, and access to health care during terminal illness, among others | This would require additional data collection from health information systems, where available |

** Names are collected only for verification purposes, especially when collating death records for the reference population from parallel data sources*

**Table 5: Sample line list for immediate notification of all cause of death events**

| SN | Name of deceased | Date of death | Sex | Age at death | Usual place of residence | Place where death occurred | Cause of death (if known) | Remarks |
|---|---|---|---|---|---|---|---|---|
| 1. | | | | | | | | |
| 2. | | | | | | | | |
| 3. | | | | | | | | |

### 3.1.3 Ascertainment and reporting of causes of death

As mentioned previously, attending physicians complete an MCCD for facility deaths, which is submitted as part of the death notification procedures. The MCCD section allows recording of multiple causes of death, including immediate, antecedent, and underlying causes in a pathophysiological sequence, along with any contributory causes. In some instances, the health facility death report might comprise a complete single form with both death notification as well as cause of death sections, or a single form with separate sections for these two components, or with two separate forms.

Whatever is the local practice, the recorded causes for facility deaths should be reported to the CRVS or mortality surveillance program. In all African Union Member States, community deaths are notified with the cause of death as reported by the household. In real terms, most of these deaths are attributed to non-specific causes with no utility for public health purposes. Hence, it is recommended that such community deaths (depending on requirement and feasibility) should be followed up by a household visit to conduct a Verbal Autopsy interview to elicit further information surrounding the death event from family or caretakers of the deceased in the community. IF REQUIRED, such VA interviews could be implemented on only a sample of community deaths in an area. Following the VA interview, data should be reported to relevant health sector agencies for cause of death analysis.

### 3.1.4 Coding cause of death

For all facility deaths that have been notified with MCCD forms, the recorded multiple causes of death on MCCD forms should be subjected to mortality coding based on ICD standards. A team of trained coders should do coding. Identifying the underlying cause of death, and corresponding ICD code, involves complex processes requiring highly technical expertise that calls for thorough training to assure generation of quality data; coding should be done by designated and trained ICD coders. In some instances, mortality coding could be undertaken at the health facility prior to submission of the records to CRVS / mortality surveillance. VA based causes for community deaths should also be assigned relevant ICD codes, to facilitate statistical analysis.

### 3.1.5 Compilation of data collected

To facilitate data compilation, all mortality records should be computerised from the point of event capture. Such computerised records could be submitted as per defined time periods to nominated sub-district/district/provincial nodes of the mortality surveillance program, where they could be collated and reconciled across different sources/compiled across different locations, into a comprehensive dataset for the relevant level. When collating facility and community sourced records, particular care should be taken to identify and eliminate record duplications (e.g., a facility death that the family member also reports to the local community recording source).

Depending on the nature of death recording programs, the collation/reconciliation/integration across different sources could be conducted either at the local level itself (e.g., within a village/urban unit); or more centrally at the sub-district/district level; or at the central data warehouse level. Since the data reconciliation process will likely generate the need for some additional field verification for some events, it is recommended that such integration should be implemented at the most peripheral level, to improve feasibility and timeliness of availability of integrated data. Eventually, all integrated data from different sources should be available in the form of a comprehensive central mortality data base. At every level, specific personnel should be identified to manage the database, oversee other data quality assessment functions, and ensure timely reporting to the national level.

### 3.1.6 Quality assessment, analysis and interpretation

The surveillance program must establish a protocol to evaluate the completeness and accuracy of data variables for each death record and the overall completeness of reported deaths for the population under surveillance. Care should be taken to adopt relevant data standards for quality of recorded variables (age, address including place of residence/occurrence, date of death/reporting, etc. ), as well as to establish appropriate population denominators for evaluation of completeness and for analysis of mortality outcomes for the population under surveillance periodically. A detailed list of mortality indicators can be found in the Operational Guide that is being developed for use alongside this document. Selections of such indicators that represent both total and cause-specific mortality are as follows:

- Numbers of deaths by age and sex; (periodically updated with current and cumulative totals, by geographical location)
- Mortality trend analysis over time as well as comparisons across sub populations
- Any specific epidemiological parameters of relevance for pandemic surveillance (e.g. vaccination status, place of death (hospital/community), etc.
- On an annual basis, certain standard mortality indicators could be measured from the surveillance data, such as
    - Risks of mortality at different ages – such as infant mortality, under-five mortality, adult mortality and elderly .
    - Maternal mortality ratios
    - Annual life expectancy at birth
    - Leading causes of death for different age groups
    - Age-standardized death rates by cause

At the continental level, the data analysis protocol could also include monitoring of these indicators to interpret levels and trends in mortality across countries and over time. Comparative analysis and interpretation could also be conducted between sub regions and international comparisons with other regions of the world, with appropriate interpretations of mortality levels and trends for epidemic surveillance and measuring progress towards the United Nations Sustainable Development Goals.

### 3.1.7 Dissemination of evidence generated

The resulting information should be packaged appropriately for various audiences and disseminated in a timely manner to enable evidence-based decision making at all levels. Implementing countries should develop a dissemination plan to cater to regular and periodic information sharing with stakeholders. Some of the users that should be targeted for information dissemination are: health workers, political leaders, government officials, opinion leaders, academia, civil society organizations, researchers, business community, media, and the general public, among others. Mortality surveillance data should also be reported according to international health regulations and mandates to the international agencies such as the WHO and Africa CDC. Information products from surveillance data could include electronic dashboards, periodic fact sheets with summary variables and/or indicators, and annual statistical reports. These data should be used as input to address various needs, including monitoring and early warning surveillance and response, as well as for planning, prioritising resources, program improvement, program impact assessment, advocacy and resource mobilization and policy generation.

## 3.2 KEY STRATEGIC CONSIDERATIONS IN SETTING UP A FUNCTIONAL MORTALITY SURVEILLANCE SYSTEM

When planning their mortality surveillance programs, countries should strategically consider and prioritise their options to enable strengthened and sustainable programs in the long term. In an ideal scenario, we should leverage CRVS and other existing mortality surveillance systems for real-time mortality surveillance. Although CRVS systems are not fully established in most African Union Member States, several of the mortality reporting systems described in the previous section would likely be operational in each country, alongside the CRVS system. However, these have patchy coverage, and are limited on account of low levels of completeness as well as other aspects of data quality. Nevertheless, these existing mortality data systems offer a basic platform of national death recording practices and experience.

It is necessary to take advantage of the implementation experiences and the human, technical and financial resources available from these multiple death reporting systems. Therefore, several considerations should be considered when designing a mortality surveillance program that builds on available resources towards achieving the stated goals of the activity. Figure 2 summarises these considerations, some discussed below and in subsequent sections of this document.

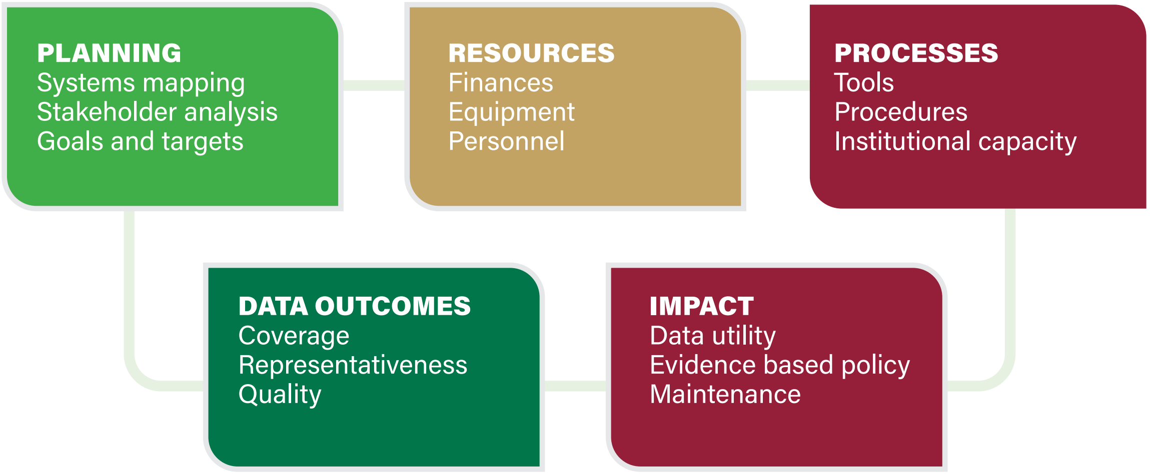


*Figure 2: Key elements requiring consideration when designing a mortality surveillance program*

### 3.2.1 Coverage of Mortality Surveillance

The value of monitoring trends and calculating mortality rates depends on the coverage and scope of mortality surveillance activities implemented to generate data representative of the population under surveillance. A greater attention can be given to universal coverage but where this is not feasible, the next best option is to establish a sampling strategy that is representative at the national or sub-national level. Optimal coverage can be achieved by mapping existing sources of mortality to identify and complement gaps in coverage and promote data sharing where possible. Given the mandate of CRVS systems to provide universal coverage as per UNSD guidance, these systems should be prioritized since they could form the institutionalized and long-term basis for the mortality surveillance system.

### 3.2.2 Death recording tools and processes

Death recording using standard data collection tools is the backbone of mortality surveillance systems and can be standardized and digitized to ensure data is captured once for multiple usage and in a timely manner. The CRVS system data collection tools can be used to standardize collection of mortality data for surveillance purposes. Where the CRVS system is not fully functional, consultation within key stakeholders will be useful to define the standard data variables that meet the local needs of the surveillance population. Further considerations can be made to align tools with global standards to ensure data collected is comparable with other mortality data sources. Such tools may include the WHO ICD medical death certificate and the VA instruments (26, (29).

### 3.2.3 Process for data management

The standard operating procedures (SOPs) for handling mortality surveillance data should be defined from the point of collection to transmission, storage, and analysis. There should be measures in place for quality assurance and improvement at every stage of data management to ensure accuracy of the analysis. Data processing can be ongoing with a feedback mechanism to address quality issues and training for improvement. The choice and design of the data base should be interoperable to allow for linkage or sharing of information with stakeholders such as the CR authorities. Stakeholder engagement is important at every stage to promote data use for policy translation and ownership.

### 3.2.4 Institutional resources for data analysis and capacity building

National institutions and resources must be mobilised to provide relevant analytical support and data collection and management training. Training and mentorship plans should be in place for data validation, analysis, and dissemination depending on the existing data collection and analysis capacity. Considerations can be made to institutionalize such training within statistical training institutions.

Considering the above practical considerations, the following principles could guide national governments in designing and establishing an optimal mortality surveillance program.

- Obtain buy-in and commitment from across the government and critical stakeholders;
- Identify a local champion or leader who will serve as the lead advocate or chief mobilizer for the program, to ensure high-level engagement with and commitment to design and implement the program;
- Build consensus with the various stakeholders, including the national CRVS steering committee, by involving them in the decision-making processes from inception.
- Work towards a harmonized national mortality surveillance strategy, based upon national and regional priorities;
- Align the mortality surveillance system with existing initiatives and goals and the users of the data at local, national, and international levels, such as the CRVS agenda, the global sustainable development goals, universal health coverage, the International Health Regulations and many more.
- Consider a phased approach whereby activities start small and gradually scale up, considering short-, medium-, and long-term objectives; and
- Design country programs to fit within their local environment.

## 3.3 STRATEGIC APPROACH TO ESTABLISH MORTALITY SURVEILLANCE

A harmonized strategic approach should be developed from a clear understanding of the different processes, targets, capacities and resources needed. For this, countries should start by assessing their existing capacities, infrastructure and resources available for mortality surveillance to inform their initial planning processes. The action plan should incorporate cross cutting themes such as systems integration, process-oriented actions, advocacy, funding and institutional roles.

In most countries, the key elements for implementation of the mortality surveillance system are currently scattered in different sectors of governments. Countries should therefore aim at integrating efforts from all these various sources of mortality data for the functionalization of the system through a clear coordination mechanism. Multilevel advocacy at this stage will be critical to ensure final approval of the plan of action at various levels as well as mobilization of resources. The steps and activities involved in setting up strategic plan for a national mortality surveillance program are discussed in chapter 4.

# CHAPTER 4: STEPS IN ESTABLISHING A MORTALITY SURVEILLANCE SYSTEM

Countries should adapt the steps outlined below to design and implement nationwide mortality surveillance programs. However, it is essential to note that countries are at different stages of mortality surveillance implementation and thus may not need to follow all the steps outlined. They include:

- Stakeholder Engagement
- Establishment of Governance Mechanisms
- Assessment of existing systems and subsystems, as well as their processes
- Identify opportunities for improvement
- Develop a plan of action
- Phased approach to implementation
- Evaluating resource needs

## 4.1 STAKEHOLDER ENGAGEMENT (STEP 1)

High level of commitment and leadership is crucial to establishing a sustainable mortality surveillance system. System-wide governance and coordination structures can create enabling environment to implement an efficient mortality surveillance system by synergistically collaborating across stakeholders. A coordination framework of taskforce and regional Technical Working Group (TWG) for mortality surveillance has been established at the continental level. Within Member States, a national coordination committee for mortality surveillance must also convene a national-level TWG, preferably hosted by the National Public Health Institutes or similar responsible departments within the Ministry of Health. This will also allow for the mobilization of stakeholders and the necessary resources, laws and regulations that support comprehensive mortality surveillance that meets the country's local needs.

There is a need to map stakeholders across various sectors involved in death identification and reporting (e.g. CRVS, health, local government, police, and funeral homes). There are often several departments within the health sector too, with specific roles in mortality reporting. Hence, following the mapping exercise, the governance and coordination structure can be aligned to existing government mechanisms and, where possible, adapted to meet country-specific needs for mortality surveillance.

Effective coordination with CRVS stakeholders is essential to ensure mortality surveillance complements the national death registration system. Hence, there is a need to develop consensus and agreement among stakeholders regarding governance roles, leadership, and responsibilities for coordination and implementation. Eventually, the institutionalization of mortality surveillance within the national CRVS system will require both activities (i.e. death registration and mortality surveillance) to be interoperable at every level of implementation.

## 4.2 ESTABLISHMENT OF GOVERNANCE MECHANISMS (STEP 2)

Countries planning to implement nationwide mortality surveillance should put governance mechanisms in place according to the country's specifications. This could involve a national Steering Committee and a national Technical Committee focused on mortality surveillance. The Steering Committee would provide general leadership and guidance, and play a major role in advocacy and resource mobilization. The Technical Committee should have technical experts from the stakeholder agencies to oversee the overall program design and implementation.

This committee should constitute representatives from the relevant government ministries such as Health, Home/Internal Affairs, Local Government, Civil registration, Statistics agencies, and other producers and users of mortality data (such as research institutions, technical support agencies, donors and development partners). The department within the Ministry of Health responsible for surveillance/ health information or the National Public Health Institute could coordinate for the national technical committee.

This technical committee should serve the role of:

- Providing technical advice
- Overseeing the baseline assessment of the existing systems and capacities
- Establishing a national mortality surveillance strategy, along with goals and objectives,
- Estimating resource requirements & potential funding sources and ensuring investments are aligned with the strategy
- Obtaining stakeholder consensus during program planning and implementation
- Monitoring the implementation of the mortality surveillance strategy
- Convening regularly to deliberate on key issues

During the design and planning phase, the committee's main focus should be to ensure the involvement and support of all the key stakeholders in country. The committee should also report to the national CRVS steering committee, and/or national surveillance committee, and/or others (as relevant); and have a mandate from these committees to support mortality surveillance in the country.

## 4.3 SITUATIONAL ASSESSMENT OF EXISTING SYSTEMS AND SUB-SYSTEMS (STEP 3)

The aim of conducting this situational assessment could be broadly considered as an exercise to harmonize existing mortality data recording systems towards a standard, unified mechanism for death reporting in each member state that is aligned with national CRVS operations. This would eventually lead to an overall strengthening of the national CRVS system to a level where it would serve as the primary data source for mortality surveillance. This system strengthening approach should also ensure adoption of global standards for data quality and dissemination to enhance international compliance and comparability of surveillance outputs.

The national technical committee should assess the existing systems, sub systems and processes, to take stock of where mortality data is collected across the health sector and even beyond, to inform and prioritize future investments for collecting and reporting nationally or sub-nationally representative mortality data. In particular, the committee should:

- Develop the terms of reference for the assessment(s)
- Identify the assessment team(s)
- Mobilize the needed resources for conducting the baseline assessment(s)

Several levels of assessments could be helpful:

a) One place to start is to consider all the monitoring frameworks in place at a national level, and to identify all the mortality indicators that are reported through these frameworks. This could include, National Health Indicators, National Growth and Development Frameworks, National Statistical Strategies and others. For each indicator, it is helpful to identify the data sources, frequency of measurement, variables and levels of disaggregation. (see **Annex 1a**). These indicators represent national monitoring priorities and are important to consider while developing a national mortality surveillance strategy.

b) The subsequent step could involve an assessment to identify all systems and sub-systems within the health sector that collect mortality data (see **Annex 1b**). This would expand the first list to include indicators and data elements that are not represented in a national monitoring framework. Similarly, it is helpful to outline where mortality data is collected, for which populations, and with which variables. And to also determine who collects this data, how data are reported and used.

**c)** **Annex 2** shows an example of a data quality assessment tool recommended by the Health Metrics Network that one might consider for more in-depth quality analysis (30). The tool includes data-collection method, timeliness, periodicity, consistency, representativeness, disaggregation, and adjustment methods. Similar matrices could be developed for other prioritized mortality indictors.

d) Still, a broader assessment could review systems for mortality data collection outside the health sector. This could involve police records, mortuaries and cemeteries, funeral establishments, fire/rescue teams, etc. Similar to the health sector-specific assessment (**Annex 1b**), this could capture information on the tools and systems used, geographic scope, variables collected, actors that collect the data and where data is reported to. Other parameters include the indicators generated and how the information is used. Business process mapping is also valuable to examine the various processes involved in collecting death and cause of death information and processes related to analysis and dissemination (31).

Actions and processes implemented at different administrative levels of the health system should be considered at this stage, such as community, health facility, district, regional and national level. Other streams of data collection in different sectors, such as the administrative, police, insurance providers, civil and vital registration processes, and statistical agencies should also be considered in the mapping exercise. The findings should inform the development of a national action plan for implementing mortality surveillance with targeted interventions.

## 4.4 IDENTIFY OPPORTUNITIES FOR STRENGTHENING MORTALITY SURVEILLANCE (STEP 4)

The findings from the assessment should be used to understand the full landscape of processes used in detection, reporting, compilation and analysis of mortality data across data sources. The information collected also help in evaluating the resources to be invested in mortality data, the availability and utility of mortality data, and the performance of the various systems involved. It is an opportunity to understand information priorities and gaps, to avoid duplicated efforts and improve coordination and efficiency. The comparative study of system characteristics would identify best performing tools, processes and practices for mortality reporting at the local level. The assessment results also help identify the most appropriate design for the mortality surveillance program's data compilation and management system.

## 4.5 DEVELOP A HARMONIZED STRATEGIC PLAN OF ACTION (STEP 5)

Using a consultative approach, the coordination committee should use the assessment findings to facilitate stakeholder discussion to develop a shared vision, goals and objectives for the mortality surveillance program. Preliminary assessment results should be used to identify harmonized, government-wide priorities (short, medium and long-term) for mortality measurement and to further identify those appropriate for a comprehensive five-year mortality strategy, as noted in **Table 6**.

**Table 6: Overview of the aspects to be considered when planning to set up a mortality data system**

| Action Area | Strategic actions for consideration | Short-term (1-2 years) | Medium-term (3-4 years) | Long term (≥5 years) |
|---|---|---|---|---|
| Planning | Situation analysis | | | |
| | Stakeholder engagement | | | |
| | Develop policy & legal frameworks. | | | |
| | Resource mobilization | | | |
| | Coordination plans | | | |
| | Development of tools and processes for data collection, processing, reporting, analysis, interpretation, and dissemination | | | |
| | Capacity building | | | |
| | Implementation schedule or roadmap | | | |

| | | | | |
|---|---|---|---|---|
| Inputs | Resources needed | | | |
| | Personnel | | | |
| | Finances | | | |
| | Equipment | | | |
| | Materials e.g. Data collection tools and standard operating procedures (SOPs) | | | |
| | Information, communication and technology (ICT) needs for data capture, transmission, analysis & storage | | | |
| | Institutional capacity | | | |
| Output | Data on Fact of death available | | | |
| | Data on cause of death available | | | |
| | Target population coverage achieved | | | |
| Impact | Improved mortality data completeness and accuracy | | | |
| | Informed decisions for public health programming | | | |

These planning efforts should be closely coordinated with the national CRVS Steering Committee.

There are several principles to consider:

- As noted above, civil registration and vital statistics (CRVS) systems are the "ideal source from which to derive accurate, complete, timely and continuous information on vital events…including annual flow statistics from the smallest civil divisions, which no other data-collection systems can provide…and with universal coverage" (10). CRVS systems also have ramifications for individual rights, identity systems, legal processes, and more. Therefore, CRVS strengthening is expected to be part of a national mortality surveillance strategy, focused on achieving universal registration of death events, even if reliable vital statistics are not yet expected in the short-term.
- When assessing mortality trends, it is preferred to have nationally representative data, including data that reflects demographic, social, economic, both urban and rural environments.
- In the absence of a high-coverage universal CRVS system, countries may focus on early-stage CRVS improvements or alternate mortality surveillance approaches, across a nationally representative sample of locations.
- As mortality systems are built at sample sites, a scalable model for national civil registration can be developed in collaboration with the national civil registration authority.
- Countries must also determine locations where it would be better to focus on recording fact-of-death mortality data, and other locations where cause-of-death information can feasibly be ascertained. While it is ideal to have details about cause of death for every death in a country, until sustainable, fact-of-death data (date of birth, date of death, sex, site of death, location of death, location of usual residence) still yields invaluable information for public health decision-making.
- Countries may also prioritize mortality surveillance among epidemic-prone diseases, diseases targeted for eradication and/or elimination, and other conditions of substantial public health importance.
- Timeliness is another important factor. While in some instances mortality surveillance data is acceptable to have on an annual basis, countries should also develop real-time mortality surveillance processes, so that mortality data can be monitored quarterly, weekly, or even daily, to support outbreak investigation and other potential public health threats. Countries may differentiate between "provisional" (early release) data and "official" (fully validated) data, in

order to meet the needs of timely mortality surveillance.

Ideally, this process results in a reduction of overall activities. It allows to streamline and focus resources into a few priority areas that can more efficiently and effectively meet the country's national mortality surveillance needs. This may take intergovernmental negotiations and where outside donor funding supports activities, negotiations with funding agencies to help align resources with national priorities.

Once harmonized, national mortality surveillance priorities are identified, teams can work to identify gaps that need to be filled. Using SWOT (strengths, weaknesses, opportunities, threats) analyses, root-cause analyses, or other tools, teams can identify required inputs, intermediate processes, and desired outputs and outcomes, and expected impacts.

## 4.6 IMPLEMENTATION STAGE (STEP 6)

The continent-wide mortality surveillance shall feed on country-specific mortality surveillance data. An Operational Guide will be provided to assist countries in planning and implementation. Country level Implementation shall heavily rely on local leadership as well as involvement of the various stakeholders. Active participation by stakeholders and partners in aligning and harmonizing data collection and reporting should be emphasized to avoid duplication of efforts. For quality implementation, the system shall have clear in country coordinating mechanisms among the various stakeholders and build on existing infrastructures.

At the country level, mortality surveillance systems shall be implemented within the context of existing public health information systems and linked to the national civil registration and vital statistics system, for registration of births, deaths and causes of death in health facilities and communities. This will involve considerable effort to integrate mortality capture and reporting functions across the range of data sources within the country. In the initial design and planning stages, external technical assistance may be required. It would be critical for knowledge sharing and skills transfer to build capacity for subsequent activities.

Countries should set up and maintain an integrated database/s to ensure proper storage and management of the data. Ideally, a single, comprehensive mortality registry is developed, with individual level, fact-of-death information, and cause-of-death information when available. When setting up the national database, countries should leverage existing health information platforms and the national digital health infrastructure to avoid duplication of efforts. However, in the unique event where setting up a new database is required, consideration should be given to the needs of the users and stakeholders in the country. These should guide the decision on where, who, when and how the database will be managed.

### 4.6.1 Recommendations for a phased approach to implementing integrated mortality surveillance at national level

The approach for establishing national and sub-national representative mortality surveillance depends on the type (MCCoD or VA) and the collected data's coverage (at population level). A five-phased approach for building nationally representative mortality data collection is proposed (**Table 7**). It is important to note that countries are at different levels of implementation with different capacities, and thus there is no uniform approach for all. We categorize the steps towards nationally representative mortality surveillance as follows:

- ***Phase 0:*** *Compilation and analysis of existing mortality data from different sources:* As an initial step, data from existing sources could be compiled, triangulated and analysed, to develop a baseline mortality measurement potentially. The findings could be used as primary evidence to guide the phased approach.
- ***Phase 1:*** *Not nationally represented mortality surveillance – Sentinel sites:* The sites are purposively selected and are not nationally representative sentinel sites. The sentinel sites include both healthcare facilities & communities in a specific geographic or administrative area. All death events occurring in health care facilities and communities are reported with or without their causes.
- ***Phase 2:*** *Nationally representative Sentinel Sites for mortality surveillance:* The selection of nationally representative sentinel sites is at random. The selection of the sentinel sites includes

both health care facilities & communities in a specific geographic or administrative area. All death events occurring in health care facilities and communities are reported together with their causes. MCCD and ICD coding should be done for all deaths in health care facilities with a medical doctor. Verbal autopsy is done for deaths in the community and health facilities where no medical doctor exists.

- ***Phase 3:*** *All hospitals and a nationally representative sample of primary healthcare facilities and communities*
- ***Phase 4:*** *All hospitals and primary health care facilities and a nationally representative sample of communities*
- ***Phase 5:*** *All healthcare facilities and all communities covered*

**Table 7: Summary of the five phases for establishing nationally & sub-nationally representative mortality surveillance**

| Phase | Coverage* | Goals |
|---|---|---|
| Phase 0 | Compilation and analysis of existing data | Baseline measurements<br>Guide the next steps |
| Phase 1 | Non-nationally representative sentinel sites: health facilities and communities | Demonstrate the pattern of causes of deaths to inform policy |
| Phase 2 | Nationally representative sentinel site: both health facilities and communities | Demonstrate both the pattern of causes of deaths, & a weighted number of deaths & causes of deaths |
| Phase 3 | All hospitals, & a nationally representative sample of primary health care facilities & communities | Demonstrate both the pattern of causes of deaths, and a weighted number of deaths and causes of deaths |
| Phase 4 | All hospitals & primary health care facilities and nationally representative sample of communities | Demonstrate both the pattern of causes of deaths, and a weighted number of deaths and causes of deaths |
| Phase 5 | All health care facilities and all communities | The goal is to count all deaths and their causes |

**For all phases, the catchment population under surveillance must be clearly defined to enable derivation of appropriate mortality indicators.*

### 4.6.2 Recommendations for Implementing a nationwide sample-based mortality surveillance

Based on existing capacities and resources, a stepwise approach for implementing nationwide sample-based mortality surveillance, with long-term goal of strengthening Civil Registration, is recommended:

- Sample population areas should align with existing local administrative boundaries to cater for the needs of the users at local level but also to enhance linkages with the CR authorities;
- Attention should be paid to optimizing the sample size of population under surveillance to facilitate reliable measurement of all-cause and cause-specific mortality;
- Countries should start by capturing fact-of-death information in a cost-effective/sustainable manner designed to meet local needs and gradually integrate cause of death based on existing resources and capacity;
- The tools and processes for data collection and reporting should align with the national priorities, legal requirements and business processes for CR even if this may not be feasible from the onset to avoid duplication of efforts;
- Once fact of death reporting is established, countries can introduce methods to ascertain cause of death as they work to improve event capture and reporting in the representative sample population including universal CR where possible. However, depending on the local context,

both fact and cause of death data may be collected from the start of the program;

- Implementation should be done stepwise, incremental to allow sustainable scale-up based on resource availability. One approach could be to expand the activity in contiguous areas, which can be enabled through sharing of local knowledge, experience and technical resources;
- An interim goal for sample-based mortality surveillance would be to ensure that fact-of-death information is being captured nationwide, while medical certification of cause of death is done for all facility deaths and Verbal Autopsy is done on a representative sample of deaths in communities;
- A broader goal for sample-based mortality surveillance would be to integrate local death reporting and data compilation functions with the national CRVS protocols or even serve as a framework for establishing national CRVS protocols, where such are not yet established; and
- Information technology innovations such as automated data capture and reporting are critical to facilitate timely collection, transmission and compilation at all system levels, as well as supporting linkage of records across databases.

In addition, to providing timely evidence for reliable data for epidemic surveillance and population health assessment, sample mortality surveillance programs can serve an urgent, interim source to meet the data needs for monitoring progress towards the UN SDGs. However, achieving adequate representativeness is a challenge, particularly in countries with larger populations (>20 million), and with diversity in geographic and/or socio economic terms, where design and implementation of such programs can sometimes take several years (32). However, the broader benefits and the potential for incremental expansion in coverage from a sound basis of national representation could serve as incentives for national planners to consider the design of sample mortality surveillance systems.

## 4.7 EVALUATING RESOURCE NEEDS (STEP 7)

Once the national mortality surveillance program has been designed with all details of core functions and processes, along with roles and responsibilities of different stakeholders for implementation, monitoring, and evaluation, the TWG would need to plan for resource mobilization and advocacy. Understanding resource implications of having a functioning mortality surveillance system is essential information in decision-making processes. Countries would need to establish the primary cost centres of their mortality surveillance programs (e.g., personnel, equipment, capacity building, field operations, maintenance), along with a landscape analysis of potential funding sources for the program (e.g. government ministries and agencies, international development partners, philanthropic institutions).

The cost analysis would also need to consider potential use of existing resources and processes that could be harnessed for mortality surveillance operations, and such 'in kind' resources could serve as a cost-saving mechanism. To some extent, the cost analysis might be a part of the design process for the mortality surveillance program, when considering various options with varying costs and efficiency in delivering surveillance outcomes. A key factor that could determine the decisions when weighing cost options would be the overall sustainability of each approach, particularly in terms of the strategy being closely aligned with the long-term goals for strengthening CRVS systems.

Data on the cost of mortality surveillance systems is scarce and probably unsuitable for extrapolating different settings. Rather than an academic exercise, estimating the cost of mortality surveillance systems must answer relevant questions to inform the design or the improvement process. In this endeavour, the national TWGs could utilize available CRVS costing and budgeting tool (33). The CRVS Costing Tool enables cost estimation for the following generic groups of activities that are common to the design of most mortality surveillance operations:

1. Start-up/capital costs: Includes all activities that are needed to initiate a mortality surveillance system, but are only spent once (such as initial training and equipment)
2. Governance activities: Covers all governance-related activities, including organising meetings, workshops, and other related activities.
3. Program implementation and management: Includes costs related to running the program such as salaries of staff, administrative costs, operations and communication.
4. Supervision: Covers the costs related to the supervision of the surveillance system at different levels.

5. Recurrent training and workshop: include the costs of recurrent training and capacity building. Initial costs are not included in this section.

The user must record the resources used to implement each activity for each activity group. Once all the information has been entered in the Tool, it automatically produces several outputs with costing estimates. The Tool provides the total financial and economic cost per major activity and itemized costs for specific components such as personnel, supplies or equipment.

Once cost estimates have been established, the TWG would need to undertake resource mobilization activities, through a comprehensive advocacy program. The Continental Taskforce at Africa CDC, as well as regional TWGs could guide national counterparts with regards to identifying international development agencies with declared mandates to support CRVS strengthening, pandemic preparedness, or even disease-specific surveillance; as well as facilitating communication links with agency-specific focal points for such funding opportunities.

Even at the national level, TWGs could undertake advocacy activities with policy makers among partner stakeholders, who could identify or have access to national budget resources that could be allocated (or diverted) to support mortality surveillance. As mentioned earlier, an efficient system design that clearly demonstrates a pathway from the mortality surveillance program to sustainable strengthening of the national CRVS system would enhance the potential success in advocacy and resource mobilization. For this, a thorough communication strategy should be established, with guidance on advocacy approaches that could be adopted variously for international development agencies, disease-specific control programs, bilateral aid agencies, and national government funding opportunities.

# CHAPTER 5: MONITORING AND EVALUATION OF MORTALITY SURVEILLANCE PROGRAMS

Countries should implement a well-established monitoring and evaluation (M&E) plan to help guide the implementation of their mortality surveillance programs. Routine and periodic assessments should be conducted to track progress towards achieving the program goals. The M&E framework should be designed to cover two broad domains: the first referring to the data quality and the second addressing system performance. Although the two are related, some distinctions necessitate their separate attention. Overall, the results from these M&E processes will help timely identify problems that affect implementation, thus providing an opportunity to address them.

Countries should consider the steps outlined below to develop (and implement) a robust M&E plan for implementing a mortality surveillance programs. They include:

- Stakeholder engagement
- Develop parameters for data quality assessment
- Define key performance indicators (KPIs) and outcome indicators to guide the M&E process
- Design the monitoring and evaluation process and data collection for M&E
- Analyses of M&E results and corrective action

## 5.1 STAKEHOLDER ENGAGEMENT

Stakeholders with interest in mortality surveillance program should be engaged or involved in the planning and execution of the M&E activities. This is to ensure the results and recommendations from the M&E activities are acted upon, to improve the mortality surveillance program further. The national coordination committee that oversees the overall program design and implementation of the country's mortality surveillance program (described in the implementation section above) should have a subcommittee to lead the development and execution of all the M&E activities. The M&E component should maintain some degree of autonomy in operations, and preferably involve academic institutions to ensure independent, critical assessment of the functioning of the surveillance program, with appropriate insight into data interpretation and implications of findings.

Since the country's mortality surveillance program may involve several government ministries/institutions and other international partners, stakeholder mapping is critical to know who these stakeholders are and their needs in the mortality surveillance process. This is also important in focusing the M&E activities to ensure that the right stakeholders are involved in the all the planning and implementation of the M&E activities to ensure that the M&E results are used. The typical stakeholders in a country's mortality surveillance program may fall into two major groups:

- Those involved in the mortality surveillance system operations: Key government ministries/ institutions such as Health (NPHIs or similar departments in the MoH responsible for surveillance) and Home/Internal affairs (agencies responsible for civil registration).
- Those who are intended *users* of the mortality surveillance program results: Ministry of Health, vital statistics agencies, and other users of mortality data such as research institutions, technical support agencies, donors and development partners.

## 5.2 DEVELOP PARAMETERS FOR DATA QUALITY ASSESSMENT

In general, four broad categories of factors can influence data quality (Figure 3). From a basic perspective, adequate **quality assurance** development will ensure that the mortality surveillance program is appropriately designed and implemented. Quality assurance refers to adequate preparation of the system design with clear roles and responsibilities for institutions/personnel that are documented in government regulations/ SOPs.  It also refers to ensuring adequate infrastructure (physical, human, technical and financial resources) for program implementation and the use of appropriate tools for data recording and processes for data management.

Across various stakeholders, there should be a thorough capacity building program for all staff, with scope for refresher training and induction training in case of staff turnover. Also, training manuals and instructional material that can guide field staff in their daily functions should be available. All these quality assurance parameters should be periodically assessed in mortality surveillance programs regarding the availability and readiness of the above quality assurance elements, particularly when moving through the incremental phases of development, as discussed in the previous chapter. The M&E framework should develop and incorporate various assessment attributes and related indicators to evaluate quality assurance parameters and guide necessary modifications.

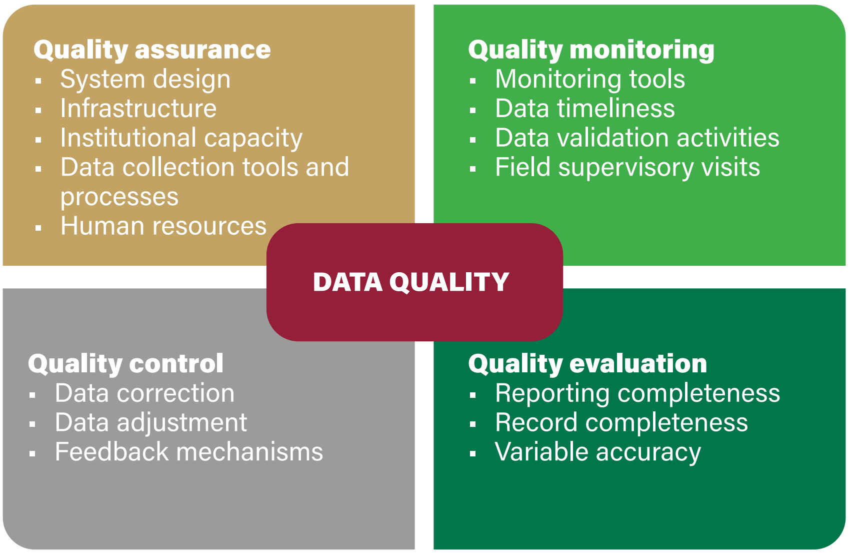


*Figure 3: Framework for quality assessment of mortality surveillance programs*

The second element of quality assessment covers the actual implementation of **quality monitoring** activities. This would involve the use of specific tools used to develop to monitor data reporting timeliness across different reporting units, as well as tools to check and validate entries for specific variables (dates, address etc.) that may be incomplete or missing from individual records. Although, there could also be modalities to include such reported events with missing variables in case it is not possible to obtain the data, since an incomplete record would still be of value, at least for some aspect of the surveillance activity. Quality monitoring could also involve field inspections of local death reporting units such as health facilities, CRVS registration offices, or community health centres, etc., to review performance and provide any onsite technical support, as required. The M&E framework should include a list of quality monitoring tools and schedule of monitoring activities for effective implementation.

The third element involves data **quality evaluation**, for which appropriate parameters and thresholds should be defined for specific variables compiled from mortality surveillance using a standard framework (34). The parameters could include the following:

- the completeness of death reporting (i.e., the proportion of reported deaths out of expected deaths in the study population during a defined reference period);
- proportions of deaths with missing age/sex/address/date of death/place of death; and
- plausibility and reliability of data in regard to age-sex mortality patterns (and age patterns for specific causes, if data available)
- The proportion of deaths assigned ill-defined causes from VA and MCCD, respectively.

The fourth aspect of quality assessment covers the functions related to data **quality control.** Since the mortality surveillance program data should be utilised to derive certain mortality indicators, correcting some of the data errors or gaps identified through the M & E exercise is necessary. For individual records, data errors or gaps may be corrected through inference e.g., missing village name could be inferred from the Village location code; or age at death in neonatal period could be inferred from the cause listed as neonatal sepsis or birth asphyxia, or a missing day of death could be ignored if the month of death has been recorded. At another level, quality control could involve data adjustment methods at an aggregated level prior to further analysis, such as using an adjustment factor from a specific completeness analysis to correct for potentially unrecorded deaths or correcting for ill-defined causes using evidence from validation studies. In general, although these adjustment techniques may not directly be considered as data quality control methods, they should be applied at the stage of data analysis, to maximise the potential reliability and utility of mortality surveillance program data.

In summary, the M&E framework should develop a broad set of parameters and indicators across all the above four aspects of data quality. These parameters should be periodically evaluated at subnational and national levels, to guide surveillance data utilization, as well as design of interventions to strengthen identified data weaknesses, and guide expansion of the surveillance program.

## 5.3 DETERMINE THE KEY PERFORMANCE AND OUTCOME INDICATORS TO GUIDE SYSTEM PERFORMANCE IMPROVEMENT

Monitoring and evaluation of the performance of the country's mortality surveillance system is a continuous and ongoing process throughout the implementation of the system. At a broader level, the M&E system should also include key performance indicators (KPIs) to measure the performance of the system and the processes within it. The KPIs measure processes and their outputs and outcomes in mortality surveillance systems against a set of performance targets.

Such performance metrics should preferably be applied at the subnational, district and local levels, and be subjected to periodic comparative analysis, to derive evidence that could be used to enhance system performance. A logic model shows the process of the implementation of the mortality surveillance system with expected results (outcomes), from which to get these KPIs and their resulting indicators (**Table 8**).

As described in the previous section, certain data quality parameters could also be used as thresholds to define KPIs, such as a targeted level of data completeness or data accuracy for specific variables. The selection of the appropriate KPIs and their target results indicators helps identify the performance gaps systematically and robustly, leading to a set of recommendations for improved mortality surveillance system. A study in Kenya shows a useful example of performance assessment of health information systems to drive improvements in data availability and utilization (35).

The approach used in the Kenyan HIS study could be adapted to be applied with focus on mortality surveillance programs. A core M&E team of the national coordination committee should develop a set of these KPIs, with input from key stakeholders, to benchmark the current performance of the mortality surveillance program and measure further improvements. These KPIs developed should be SMART, meaning that they should be: Specific, Measurable, Attainable, Relevant, and Time bound. For each of the KPIs, baseline information should be collected for which to measure the improvements, including the outcomes and goals.

While the number of KPIs developed may vary by country, depending on their mortality surveillance targets and implementation, countries may utilize the following categories to identify their performance indicators for monitoring progress towards their target goals.

## 5.4 DESIGN THE MONITORING AND EVALUATION PROCESS AND DATA COLLECTION

Before designing an M&E activity (and data collection process), a fully understanding of the mortality surveillance system's process (such as inputs and processes) and intended results (such as outputs, outcomes and impact where possible) is needed in order to help focus on what is to be monitored and/or evaluated. The national coordination committee, with input from stakeholders, should determine what should be monitored and/or evaluated; the most important M&E questions and the appropriate design for the assessments. In particular, the committee should (1) identify the M&E questions; (2) determine the appropriate M&E design; (3) gather credible evidence (data collection); and (4) mobilize the needed resources for conducting the assessment.

**Table 8: Sample indicators for monitoring performance of a mortality surveillance system**

| Core surveillance functions | Activity Description | Sample indicator |
|---|---|---|
| Detection | Identify all death events occurring both in the health facility and community | Proportion of deaths line listed in a month |
| Recording | Record all deaths identified in a health facility or community register | Proportion notified to the next level |
| Notification | Immediate case based reporting to the next level to flag the event and trigger follow up actions.<br>Notification of event to the CR authorities | Proportion of deaths notified to the next health system level; Proportion registered with the civil registrar |
| Assign COD | Review facility deaths to certify COD<br>Conduct VA interviews for community deaths to determine probable CoD | Proportion of deaths certified with MCCoD<br>Proportion of community deaths with VA interviews conducted |
| Reporting | Forward the cause of death data collected to the next level | Proportion of deaths captured in the CoD data base |
| Analysis | Perform epidemiological analyses of the reported data and interpret them to inform interventions | Documentation showing evidence of analysis by person place and time |
| Feedback | Sending messages back to the lower levels basing on resulting information from the reported data | Evidence of dissemination of information generated. |

Selecting appropriate M&E questions to assess assumes that the entire mortality surveillance system does not need to be evaluated at one time. Instead, depending on the needs and what questions are being asked (by stakeholders) certain aspects or processes of the system can be monitored, and certain intended outcomes can be evaluated.

Besides determining what should be monitored and/or evaluated, there is also a need to determine the appropriate M&E design (36). Of critical importance in choosing the M&E design is whether the need is to monitor progress in implementation or measure outcomes—the progress on outcomes that is related to the program implementation efforts.

After developing an appropriate M&E design, information (data) should be gathered based on the indicators to be measured. Data collection methods and sources should be selected for the appropriate data to be collected; depending on the M&E question to be answered and indicators to be measured. A key decision to consider is whether there are existing data sources—*secondary* data collection—to measure the selected indicators or whether to collect new data—*primary* data collection.

## 5.5 ANALYSIS AND USE OF MONITORING AND EVALUATION RESULTS

After the M&E data are gathered, they should be analysed to show evidence about the system's performance or improvements in its results. Whether the M&E is conducted to show the system's effectiveness, help improve its implementation or demonstrate improved outcomes, it is important to correctly analyse and interpret the evidence gathered to come up with the correct conclusions. Thus, the M&E core team of the national coordination committee should have members with competent data analysis skills to conduct these analyses or be able to seek outside assistance from other agencies, such as the statistics offices or research institutions.

The ultimate purpose of an M&E process is to use the information obtained to improve implementation of the national's mortality surveillance system (37). Thus the key stakeholders must be involved in all planning and processes of the M&E to ensure that the results are used to improve the implementation of the system, and not just shelved after the completion of the M&E activity.

# CHAPTER 6: ROLE OF AFRICA CDC AND NATIONAL PUBLIC HEALTH INSTITUTES IN STRENGTHENING COORDINATING MECHANISMS FOR MORTALITY SURVEILLANCE

The Africa CDC's mission is to strengthen Africa's public health institutions' capacities, capabilities, and partnerships to detect and respond quickly and effectively to health threats and disease outbreaks based on scientific evidence and data-driven interventions and programs.

Africa CDC works through five regional Coordinating Centres (RCCs), including the Northern Africa region, Central Africa region, Eastern Africa region, Western Africa region and the Southern Africa region. Africa CDC RCCs support Member States in ensuring improved infrastructure and enhanced capacity for integrated regional networks for disease surveillance, including laboratories and emergency preparedness and response. The RCCs work directly with national public health institutes (NPHIs) and Ministries of health (MOHs) in the Member States. The NPHIs are national-level institutions that lead and coordinate public health functions, including disease surveillance, laboratory systems and networks, emergency preparedness, response and public health research. They are science-based governmental organizations that serve as focal point for a country's public health efforts and services to support MoH mandates. Functional NPHIs currently exist in some African countries, with many more countries developing and strengthening their respective NPHIs.

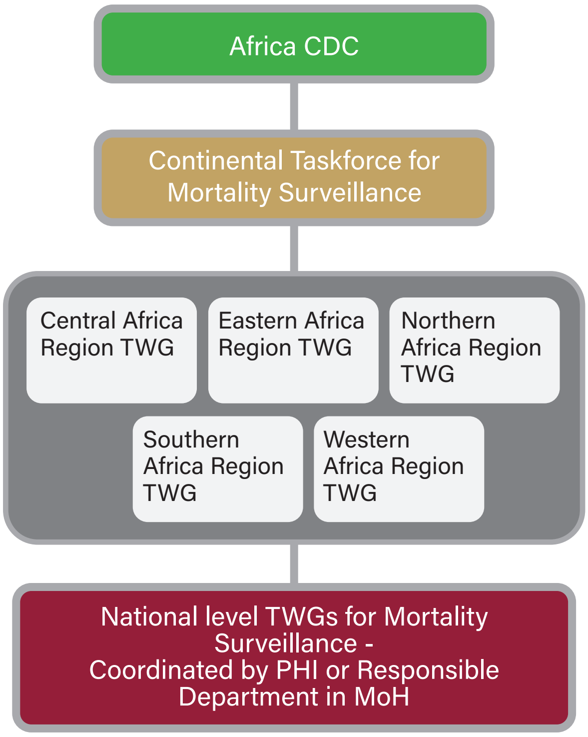
In line with the mandate and operational framework of the Africa CDC, a multi-stakeholder and multi-layered coordination structure has been launched to strengthen the governance, coordination and collaboration towards building accountability systems for all deaths occurring on the continent. The coordination structure, mechanisms and institutional network for continental mortality surveillance in Africa is depicted in **Figure 4.** The governance and coordination will be accomplished across three levels – continental, regional and national levels, with membership from development partners, government bodies, academic and research institutions, and civil society organizations, as relevant. This coordination structure has established procedures at each level and across the levels for business and communications through periodic consultations and documentation of proceedings for follow up action and/or feedback, as required. A critical aspect of coordination at all levels is to promote and/or ensure that mortality surveillance activities are harmonized with other planned or ongoing CRVS development activities, which will enhance overall sustainability of both programs.

**The continental task force secretariat is hosted within the Africa CDC's Division of Surveillance and Disease Intelligence; co-chaired by two representatives from Member States and representatives from the WHO regional Offices for African and Eastern Mediterranean regions, respectively.** The regional TWGs activities are coordinated through the Africa CDC RCCs and the secretariat at the Africa CDC headquarters. At national level, a multi-sectoral and multi-disciplinary technical committee (see chapter 4) focussed on mortality data should be formed and linked with the respective regional TWG, in collaboration with the secretariat at the Africa CDC RCC. The national level technical committees should be integral to similar efforts, particularly within the CRVS sector, to holistically address the local needs.

The five regional TWGs have a critical role in coordinating surveillance design, implementation and maintenance in Member States located across the continent's geography. The key roles and responsibilities of the Regional TWGs are listed below:

- Provide technical assistance in the development, implementation, and sustainability of MS
- Support Member States in the development and implementation of Standard Operating Procedures and other technical guidelines
- Support Member States to establish or strengthen their national multi-sectoral technical working group
- Promote multi-sectoral engagement across agencies and partners
- Facilitate dissemination and sharing of information, knowledge, and best practices on mortality surveillance to Member States, policymakers, and other stakeholders through the CRVS Strategic Partnership
- Promote and support the mobilization of political will and funds for Member States to achieve and sustain the goals of the continental initiative to strengthen mortality data

- Develop and track progress toward clear, measurable, and time-bound objectives
- Track progress of Member States in achieving the mortality data targets
- Should the need arise, develop sub-groups to be tasked with different areas of expertise, including technical, advocacy and advisory.



*Secretariat at Africa CDC HQTRs*
Mortality Surveillance Programme Unit, Division of Surveillance and Epidemic Intelligence

Composition of Continental Taskforce
Membership: Member States (Regional TWG chairs), Health Organisations, CRVS Partners, Donors
Secretariat: Africa CDC HQ. Co-chairs - Member States (Morocco & Cameroon), WHO AFRO & WHO, EMRO

Composition of Regional TWG
Membership: Member State Representatives (atleast 3 including PHI / MOH, CR, NSOs)
Roles: Coordination, Advocacy, Advisory
Secretariat: Africa CDC Regional Collaborating Centre (RCC)

Composition of national Level TWG
PHI/MOH, CR, NSO, Home Affairs, Centres of Excellence, Academia, Professional Bodies, Partners, CSOs, etc
Roles: Coordination, Advocacy & Advisory for mortality surveillance in country
Secretariat: NPHI/ MOH Department

*Figure 4: Coordination structure for continental mortality surveillance in Africa*

At national level, the mortality surveillance committee will work closely with the national steering committee, which may include several institutions/representatives with overlapping membership. The involvement of statistical authorities from the time of inception is important, to ensure that appropriate standards are built into the system design, for both surveillance as well as registration purposes. Similarly, the national TWG could also provide inputs regarding the legal requirements of specific variables as well as data confidentiality and security that would need to be accounted for in the surveillance system, aligned with such CRVS requirements. From a data management perspective, the national TWG could explore the use and harmonization of electronic systems used for compilation of CRVS data as well as health sector mortality reporting (through DHIS2 or MCCD) into one common platform that could facilitate both purposes.

Technical support would also be required for the critical capacity building function at all levels. **Annex 4** describes the various forms of skill development that will be required for different personnel and functions in the mortality data systems, and this will be common for both surveillance and CRVS operations. These levels and functions mirror those represented in the core functions of mortality surveillance in Chapter 3. The wide range of knowledge requirements across all these activities necessitates a careful and planned approach to the overall domain of capacity building for mortality surveillance operations. Hence, national TWGs must include government university public health department representatives to design and conduct training programs for field personnel with an emphasis on practical aspects. Local academic institutions could also be assigned responsibilities for monitoring, evaluation and data analysis, to have long term impact on sustainability of national, regional and continent-wide mortality data systems.

For implementing the Continental Framework for mortality surveillance, the secretariat conducted a series of three-day consultations with Member States in the five geographical regions of Africa. Overall, about 130 participants from 33 Member States and 11 regional and global partner institutions were represented in these consultations, at which the overall design and proposed activities comprising this Continental Framework were discussed. These consultations generated considerable interest in the initiative and provided various shared experiences and learnings that contributed to the development of this Framework.

Terms of Reference for the regional TWGs were developed and refined, along with the nomination of office bearers (member state representatives) who would lead the initial rounds of activities. Also, a general consensus was developed regarding the timelines for implementing the various broad components of the Framework. Detailed annual timelines for specific activities under each component are available in the Roadmap for strengthening continental mortality surveillance 2022-2026 (**Annex 5**).

# CHAPTER 7: SUMMARY

A comprehensive approach towards the design and implementation of mortality surveillance is urgently required to establish a robust evidence base for pandemic preparedness at national, regional and continental levels in Africa. This Continental Framework elaborates the rationale for and concepts of mortality surveillance operations that can be integrated with existing death reporting practices in African countries. The Framework is based on an underlying principle that surveillance programs must be oriented towards strengthening national CRVS systems, which are the optimal source of mortality data for health monitoring and research. The current patterns of mortality data availability from CRVS systems in member states indicate that there are widespread gaps in system performance across the continent. These gaps are likely to be due to weaknesses in national system design and/or availability of necessary administrative, technical, and human resources. Hence, this Framework has been developed to support member states in establishing national mortality surveillance programs that could address the immediate short-term need for reliable mortality data, through well-designed death reporting and data compilation functions and processes that are aligned with national CRVS operations. Since CRVS systems are also under development in many member states, the newly designed surveillance operations could be harmonized with CRVS strengthening activities right from inception.

The Continental Framework promotes three core concepts which include 1) establishment of mortality surveillance protocols that are integrated with local official death reporting practices; 2) close monitoring of data recording and compilation for timeliness and quality; and 3) routine data dissemination and utilization for surveillance purposes. Implementation of the framework is to be facilitated by a continental task force, supported by the five regional TWGs.

In each Member State, activities will be implemented through a national coordination committee, supported by a technical working group. An essential initial step is the conduct of a thorough national review of current death reporting and mortality statistics programs, the findings from which could be used to build consensus among national stakeholders regarding the optimal approach to conduct mortality surveillance through harmonization of multiple local mortality data systems.

The Framework also discusses practical considerations for standardization of functions and processes of various components and steps involved in mortality surveillance, from data reporting and recording through data management, analysis and dissemination. In addition to these aspects related to design and implementation, this Framework also covers policy matters related to governance, coordination, and technical support, capacity building needs, resource mobilization and advocacy to generate support for the surveillance program at national and international levels.

Taken together, the Framework provides comprehensive guidance towards establishing reliable mortality data systems in African countries by 2026, the outputs from which could be used for AU MS to effectively plan and implement interventions to address the leading causes of preventable and premature deaths in their populations.

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# ANNEXES

## Annex 1a: Assessment of mortality data reflected in national Monitoring Frameworks

| Monitoring Framework | Agency Responsible | Indicator | Data System | Reporting frequency | Data dissemination/use |
|---|---|---|---|---|---|
| Example: National Growth and Development Strategy (NGDS) | Ministry of Economic Planning and Development | Under-five Mortality Rate | Civil Registration and Vital Statistics System | Annual | Reported annually to NGDS, reported in Annual Health Sector Report, others. |
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## Annex 1a: Assessment of mortality data reflected in national Monitoring Frameworks

| Monitoring Framework | Agency Responsible | Indicator | Data System | Reporting frequency | Data dissemination/ use |
|---|---|---|---|---|---|
| Example: National Growth and Development Strategy (NGDS) | Ministry of Economic Planning and Development | Under-five Mortality Rate | Civil Registration and Vital Statistics System | Annual | Reported annually to NGDS, reported in Annual Health Sector Report, others. |
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## Annex 1b: Assessment of other mortality data in health sector (and beyond, e.g. police)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Data Source/ System** | ***Example: Child Health, Health Management Information System (HMIS)*** | | | | | | |
| **Custodian of the Indicator/ Data** | *Department of Child Health* | | | | | | |
| **Data collection tools (forms)** | *Pediatrics Register* | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Data collection systems (including electronic systems)** | *HMIS/DHIS2* | | | | | | |
| **Geographic scope** | *Nationwide* | | | | | | |
| **Community and/or Facility based** | *Facility-based* | | | | | | |
| **Variables collected** | *Child date of birth (DOB), date of death (DOD), etc.* | | | | | | |
| **Cause of Death included? Y/N**<br>**If yes, method** | *Healthcare staff*<br>*Yes, selected from short list* | | | | | | |
| **Data collection agent** | *Healthcare staff* | | | | | | |
| **Data Reported in Patient-level or Aggregate?** | *Aggregate* | | | | | | |
| **Reporting rates or completeness** | *98%* | | | | | | |
| **Data outcomes; disaggregation** | *Deaths to children >5, by short cause list, by facility* | | | | | | |
| **Measurement frequency/ Recommended timeliness** | *Routine, events reported within 14 days* | | | | | | |
| **Data dissemination/ use** | *Facility-based monitoring, annual reports* | | | | | | |

## Annex 2: Recommended HIS Data Quality Criteria for Under-5 Mortality and Maternal Mortality

**Table V.A- Assessing National HIS Data Quality: Under-5 mortality (all causes)**

| **Indicator** | **Quality assessment criteria** | **Items** | **Highly adequate**<br>**3** | **Adequate**<br>**2** | **Present but not adequate**<br>**1** | **Not adequate at all**<br>**0** | **Score** |
|---|---|---|---|---|---|---|---|
| A. Under-5 mortality (all causes) | **V.A.1**<br>Data-collection method | Data-collection method used for estimate published most recently or to be published | Vital registration of at least 90% of under-5 deaths | Birth history from household survey or Sample Registration System | Other methods (such as indirect methods based on household surveys or censuses) | No data | |
| | **V.A.2**<br>Timeliness | For the most recently published estimate, number of years since the data were collected | 0-2 years | 3-5 years | 6-9 years | 10 years or more | |
| | **V.A.3**<br>Periodicity | Number of times measured in the past 10 years | 3 or more | 2 | 1 | None | |
| | **V.A.4**<br>Consistency | Data sets from major data sources consistent during past 10 years | No major discrepancies | Several discrepancies | Multiple Discrepancies | Not applicable | |
| | **V.A.5**<br>Representativeness | Coverage of data upon which the most recently reported estimate is based | All deaths (>90%) | Sample of deaths | Local studies | Not applicable | |
| | **V.A.6**<br>Disaggregation | Most recent estimate disaggregated by (1) demographic characteristics (e.g., sex, age); (2) socioeconomic status (e.g., income, occupation, education of parent); (3) locality (e.g., urban/rural, major geographical or administrative region) | All 3 | 2 | 1 | None | |
| | **V.A.7**<br>Adjustment methods | In-country adjustments use transparent, well-established methods | Yes | | | No | |

**Table V.A- Assessing National HIS Data Quality: Maternal mortality**

| Indicator | Quality assessment criteria | Items | Highly adequate<br>3 | Adequate<br>2 | Present but not adequate<br>1 | Not adequate at all<br>0 | Score |
|---|---|---|---|---|---|---|---|
| B. Maternal mortality | **V.B.1**<br>Data-collection method | Data-collection method used for estimate published most recently or to be published | Vital registration of at least 90% of deaths with good medical certification of cause of death | Sample Vital Registration with Verbal Autopsy | Other methods from household survey or censuses (such as sibling history, recent deaths with verbal autopsy) | No data | |
| | **V.B.2**<br>Timeliness | For the most recently published estimate, number of years since the data were collected | 0-2 years | 3-5 years | 6-9 years | 10 or more years | |
| | **V.B.3**<br>Periodicity | Number of times measured in the past 10 years | 3 or more | 2 | 1 | None | |
| | **V.B.4**<br>Consistency | Data sets from major data sources consistent during past 10 years | No major discrepancies | Several discrepancies | Multiple Discrepancies | Not applicable | |
| | **V.B.5**<br>Representativeness | Coverage of data upon which the most recently reported estimate is based | All deaths | Sample of deaths | Local studies | Not applicable | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | **V.B.6**<br>Disaggregation | Estimate that was published most recently (or will be published) is disaggregated by (1) demographic characteristics (e.g., sex, age); (2) socioeconomic status (e.g., income, occupation, education); (3) locality (e.g., urban/rural, major geographical or administrative region) | Disaggregation available for all 3 elements | Disaggregation available for 2 elements | Disaggregation available for 1 element | Disaggregation not possible |
| | **V.B.7**<br>Adjustment methods | In-country adjustments use transparent, well-established methods | Yes | | | No |

**Annex 3: HDSS programs currently operating in African Union Member States**

| Country | HDSS program | Current study population | Start year | Verbal autopsy |
|---|---|---|---|---|
| Angola | Dande | 59,635 | 2010 | Yes |
| Burkina Faso | Kaya | 64,480 | 2007 | Yes |
| | Nanoro | 54,780 | 2009 | Yes |
| | Nouna | 93,000 | 1992 | Yes |
| | Ouagadougou | 82,387 | 2008 | Yes |
| | Sapone | 86,069 | NA | NA |
| Cote d'Ivoire | Taabo | 42,480 | 2009 | Yes |
| DR Congo | Kimpese | 60,000 | 2016 | NA |
| Ethiopia | Arba Minch | 68,802 | 2009 | NA |
| | Butajira | 78,000 | 1986 | Yes |
| | Dabat | 69,468 | 1996 | No |
| | Gilgel Gibe | 62,235 | 2005 | Yes |
| | Harar | 60,444 | 2012 | NA |
| | Kilite Awlaelo | 65,848 | NA | NA |
| Gabon | Lambarene | 30,000 | 2016 | Yes |
| Gambia | Farafenni | 47,331 | 1981 | Yes |
| | West Kiang | 14,374 | NA | NA |
| Ghana | Dodowa | 132,690 | 2005 | Yes |
| | Kintampo | 142,977 | 1994 | No |
| | Navrongo | 156,735 | 2006 | Yes |
| Guinea Bissau | Bandim | 105,000 | 1978 | No |
| Kenya | Kilifi | 260,000 | 2000 | Yes |
| | Kisumu | 230,000 | 2001 | Yes |
| | Kombewa | 123,456 | 2007 | Yes |
| | Mbita | 54,014 | 2006 | Yes |
| | Nairobi | 61,695 | 2002 | Yes |
| Malawi | Karonga | 35,730 | 2004 | Yes |
| Mali | Bamako | 227, 219 | 2006 | NA |
| Mozambique | Manhica | 89,617 | 1996 | Yes |
| | Chokwe | 99,834 | 2010 | Yes |
| Nigeria | Cross River | 31,124 | 2010 | Yes |
| | Nahuche | 136,106 | 2009 | Yes |

| | | | | |
|---|---|---|---|---|
| Senegal | Bandafassi | 13,373 | 1975 | Yes |
| | Mlomp | 8,200 | 1985 | Yes |
| | Niakhar | 43,000 | 1962 | Yes |
| South Africa | Agincourt | 115,000 | 1992 | Yes |
| | AHRI | 168,000 | 2000 | Yes |
| | Dikgale | 35,000 | NA | Yes |
| Tanzania | Ifakara | 124,000 | 2001 | Yes |
| | Magu | 35,000 | 1994 | Yes |
| | Runji | 97,000 | 1998 | Yes |
| Uganda | Iganga/Mayuge | 79,794 | 2004 | Yes |
| | Kyamulibwa | 22,000 | 1989 | No |
| | Rakal | 50,000 | NA | NA |

INDEPTH Network: Member Health and Demographic Surveillance Sites (HDSSs). Available from: http://www.indepth-network.org/member-centres

*This list of HDSS programs in African Union Member States may be incomplete, owing to lack of information on operational status of several previously known programs

### Annex 4: Capacity building requirements for establishing national mortality statistics programs

| Node | Personnel | Functions | Capacity building elements |
|---|---|---|---|
| **Community** | 1. Community leaders<br>2. Local notifier network* | 1. Identification of deaths<br>2. Reporting/ notification of deaths | 1. Laws and rules<br>2. Responsibilities, forms and procedures |
| **Civil registration office** | 1. Civil registrars<br>2. Local police | 1. Death registration<br>2. Data sharing with local government health centre | 1. Laws and rules<br>2. Responsibilities, forms and procedures<br>3. Role of health sector/ mechanisms for data sharing<br>4. Importance of data completeness and quality |
| **Community health centres** | 1. Paramedical staff<br>2. Physicians<br>3. Data managers | 1. Verbal autopsy (VA) interview<br>2. Assigning causes of death<br>3. Data compilation & submission | 1. Technical, administrative and societal aspects of VA<br>2. Data completeness and quality<br>3. Cause of death diagnostic guidelines and processes<br>4. Data management |
| **Hospitals** | 1. Physicians<br>2. Coding experts<br>3. Medical records staff | 1. Medical certification of cause of death<br>2. Coding multiple/ underlying causes<br>3. Data verification & submission | 1. Principles of medical death certification<br>2. Rules for coding/ selection of the underlying cause<br>3. Quality control and data management |
| **District/City health offices** | 1. Statistical staff<br>2. Coding experts<br>3. Public health physicians | 1. Coding and data compilation<br>2. Monitoring reporting timeliness/quality<br>3. Statistical reports and interpretation of performance/ mortality measures<br>4. Logistic/technical assistance to field units | 1. Rules for coding/ selection of the underlying cause<br>2. Principles of field supervision<br>3. Monitoring timeliness/follow up of reports<br>4. Understanding and interpretation of measures of system performance and mortality outcomes<br>5. Compilation/archival/ submission of records |
| **Province/ state health departments** | 1. Statistical staff<br>2. Data analysts<br>3. Health program managers<br>4. Regional health director | 1. Data compilation and quality control<br>2. Data analysis and interpretation<br>3. Mortality statistics program governance/ resource allocation/capacity building | 1. Principles/methods/tools for data quality evaluation<br>2. Analysis and interpretation of demographic and epidemiological mortality measures<br>3. Training materials and methods for peripheral functions<br>4. Resource needs for efficient mortality statistics programs |

| | | | |
|---|---|---|---|
| **National health planning /**<br>**Statistics Office** | 1. Epidemiologists<br>2. Health economists<br>3. Health policy bureaucrats<br>4. International health staff | 1. Use of mortality data / measures for<br> Health situation & trend assessment<br> Health program evaluation<br>2. Liaison with academia & research bodies<br>3. Representation on international forums | 1. Interpretation of trend and differential analysis of mortality measures<br>2. Translating information into evidence<br>3. National / international reporting requirements |

*Local notifier network usually includes village health workers, religious leaders, police, and local social service agencies

**Annex 5: Roadmap for strengthening continental mortality surveillance (2022-2026)**

| **Action Area 1** | Leadership and Governance | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Strategic Objective 1** | Strategic Objective 1: Align Member States, Regional Economic Communities and partners to establish, strengthen and coordinate multi-sectoral actions on mortality surveillance | | | | | | | | |
| | **Priority Interventions** | **Baseline** | **2022** | **2023** | **2024** | **2025** | **2026** | **Overall Target** | **Responsible Authority** |
| | Determine primary Agency responsible for MS (likely MOH/ NPHI) as well as responsible Department | | | | | | | | Country, Africa CDC |
| | Define institutional roles and responsibilities | | | | | | | | Country |
| | Establish collaboration frameworks with other key agencies and stakeholders (including Development and implementing Partners) | | | | | | | | Africa CDC, Country, Partners |
| | Designation of country-level MS focal point persons | | | | | | | | Country |
| | Establish multiagency coordination structure at continental, regional level (regional TWG) | | | | | | | | Africa CDC, Country, Partners |
| | Establish/strengthen country-level governance structure (e.g. MS TWG) | | | | | | | | Country |
| | Align with Africa Union Health, Population & CRVS Specialized Technical Committees | | | | | | | | Africa CDC |
| | Flagship Project: Establish and strengthen multi sectoral technical working groups on mortality surveillance to lead and coordinate action across sectors | | | | | | | | Africa CDC, Country, Partners |

| Action Area 2 | Advocacy/Awareness raising | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Strategic objective 2: | Advocate for political commitment and prioritisation of mortality surveillance | | | | | | | | |
| | **Priority Interventions** | **Baseline** | **2022** | **2023** | **2024** | **2025** | **2026** | **Overall Target** | **Responsible Authority** |
| | | | | | | | | | |
| | Development of an advocacy strategy at the regional and national levels, to promote mortality surveillance | | | | | | | | Africa CDC, Country, Partners |
| | Implementation of an advocacy strategy at regional and national level to promote mortality surveillance | | | | | | | | Africa CDC, Country, Partners |
| | Collaborate with stakeholders such as CSOs, Professional bodies, NGOs, etc to advocate for mortality surveillance | | | | | | | | Africa CDC, Country, Partners |
| | Advocating for funding support | | | | | | | | Africa CDC, Country, Partners |
| | Identifying and mapping of key stakeholders | | | | | | | | Africa CDC, Country |
| | Development and implementation of a communication strategy at the regional and national level, to promote mortality surveillance | | | | | | | | Africa CDC, Country, Partners |
| | Flagship project: Support adoption of a continental declaration by Member States for the implementation of mortality surveillance | | | | | | | | Africa CDC, Country, Partners |

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|---|---|---|---|---|---|---|---|---|---|
| Action Area 3: | Policy/Legal Framework | | | | | | | | |
| Strategic Objective 3 | Enhance the capacity of MoH/NPHI to develop, integrate and implement national, continental and global frameworks and policies for the implementation of mortality surveillance | | | | | | | | |
| | Support MoH/NPHIs to develop and implement national guidelines and policies for mortality surveillance | | | | | | | | |
| | Develop harmonised tools and SOPs for collection of mortality data | | | | | | | | |
| | Establish collaborative agreements or MOUs including on mortality data sharing | | | | | | | | |
| | Harmonization of the regulatory framework for mortality surveillance in the five African regions | | | | | | | | |
| | Conduct a KAP study | | | | | | | | |
| | Flagship Project: Support Member States on the integration of the continental framework for mortality surveillance | | | | | | | | |
| Action Area 4 | Technical Implementation | | | | | | | | |
| Strategic Objective 4: | Support MOH/NPHI to integrate mortality data into a national repository and align with existing national, continental and global initiatives and stakeholders. | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|
| | Establish/strengthen comprehensive mortality surveillance system | | | | | | | | |
| | Adoption of standards, SOPs and standardized tools on mortality surveillance for the five regions | | | | | | | | |
| | Support development and implementation of country action plans | | | | | | | | |
| | Support countries to implement periodic inventory of their national programs | | | | | | | | |
| | Strengthening of capacity for data analysis and reporting | | | | | | | | |
| | Establish central repository for all mortality data | | | | | | | | |
| | Development of tools, adapted to the epidemiological and geographical context for the five regions | | | | | | | | |
| | Digitalization of mortality surveillance systems | | | | | | | | |
| | Promote initiatives for systems interoperability | | | | | | | | |
| | Adopt data collection tools | | | | | | | | |
| | Development of a technical implementation action plan in each region and each Country | | | | | | | | |
| | Flagship project: Development of roadmap for implementation at regional level and Country level | | | | | | | | |
| Action Area 5 | Workforce & Capacity Strengthening | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|
| Strategic objective 5: | Strengthen workforce capacities and capabilities for effective implementation and build communities of practice for mortality surveillance | | | | | | | | |
| | Identify capacity building needs of different key actors (regional/ national) | | | | | | | | |
| | Build capacity for mortality data collection, analysis, and interpretation in line with international standards (regional/ national) | | | | | | | | |
| | Development of training course to guide implementation of implementation | | | | | | | | |
| | Promote public health research for evidence generation leveraging on existing African Union/Africa CDC and other stakeholders' initiatives. | | | | | | | | |
| | Flagship Project: Launch the Africa Union/Africa CDC mortality surveillance training course for key actors | | | | | | | | |
| Action Area 6 | Sustainability/Resource Mobilisation | | | | | | | | |
| Strategic Objective 6: | Develop and support sustainable continental and regional funding mechanisms for the implementation of Africa CDC strategic plan for supporting Member States on mortality surveillance | | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Integrate Mortality Surveillance to the country Health Surveillance System | | | | | | | | |
| | Develop a costed mortality surveillance plan | | | | | | | | |
| | Mobilize funding for setting up continental centers of excellence on mortality surveillance | | | | | | | | |
| | Mobilize domestic funding for Mortality Surveillance | | | | | | | | |
| | Set up continental and regional funding mechanisms for Africa CDC flagship initiatives | | | | | | | | |
| | Conduct advocacy with funding partners & National Leaders to increase resource mobilization and innovative financing through domestic and international sources | | | | | | | | |
| | Collection and use of mortality data and reports for national and regional decision-making | | | | | | | | |
| | Flagship project: Develop a continental investment case for implementing mortality surveillance in alignment with existing initiatives | | | | | | | | |
| Action Area 7 | Monitoring & Evaluation | | | | | | | | |
| Strategic Objective 7: | Support MOH/NPHI to develop and support an M&E framework for measuring performance and functionality of mortality surveillance systems | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|
| | Develop a baseline assessment tool for assessing the existing capacities for mortality surveillance implementation | | | | | | | | |
| | Conduct a baseline assessment on the status of mortality surveillance at country level using the developed assessment tool | | | | | | | | |
| | Develop an M&E plan for mortality surveillance in Africa | | | | | | | | |
| | Implementation of M&E plan for mortality surveillance at the national and regional levels | | | | | | | | |
| | Flagship Project: Conduct a readiness assessment to collect information on the status of mortality surveillance in Africa Union Member States | | | | | | | | |

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