The role of health sector in building a Civil Registration and Vital Statistics system: from hospital mortality register to CRVS national reform in Mozambique

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Abstract

Civil registration and vital statistics (CRVS) provides essential information for public health, however death and cause-of-death registration is critically low in resource-limited settings. In 2007, Mozambique revised the death certification process, in compliance with its legal CRVS framework, providing tools underpinning the CR processes and enabling recording and analysis of data, including new national regulations, death certificate forms, adoption of the International Classification of Diseases (ICD-10), and development of software for data management (SIS-ROH), leveraging local resources. A phased implementation approach was chosen, prioritising hospital mortality and progressively expanding to extra-hospital deaths, certified by Forensic Medicine and health centers. International guidelines were tailored towards specific country needs, such as decentralization of coding of cause-of-death at hospital level and development of a targeted list of causes to increase access to ICD-10. To date, SIS-ROH is implemented in 53% of the 30 hospitals nationwide and 11 health centers. By 2013, 93,910 deaths were recorded (89,858 were hospital deaths), with only 5.1% ill-defined causes-of-death. Although the national coverage of SIS-ROH data is still low, it is much higher in highly urban areas and trends could be monitored in target population. Monthly reports are used by hospital managers; annual national statistics are used for decision making for public health. Availability of mortality statistics based on routinely collected data was a powerful tool to trigger institutional engagement and coordination of all CRVS stakeholders, showing how the health sector can fulfil its need for high-quality data on cause-of-death, while contributing to strengthening the overall CRVS system.

Background

Civil registration (CR) and Vital Statistics (VS) (CRVS) is an irreplaceable source of information for decision making, impact assessment and detection of emerging threats in the health sector. However, almost two-thirds of African countries have non-existent or extremely weak CRVS systems; death registration including information on cause-of-death is critically low[1,2,3,4]. Methods to compensate for the lack of VS often diverts resources and delays CRVS strengthening[5,6]. Our experience in Mozambique is a successful example of how the health sector can obtain high-quality data on cause-of-death through

routine systems that conform to CR requirements, and simultaneously contribute to building VS in a resource-limited setting, and providing institutional support for overall CRVS reform[7].

As a resource-limited country, Mozambique relies heavily on donor funds and faces the challenge of accountability and impact assessment of subsidized interventions. The health sector has weak infrastructure, poor human resources, and fragmented information systems. Coverage of CR is unknown but estimated to be below 50%[1,2,8]. Statistics on cause-of-death rely on disease-specific surveillance systems, the 2007 survey (INCAM)[9], DHSS site data[10], a few research studies[8,11,12], and estimates based on South Africa statistics[13].

Approach

The Mozambique national CRVS legal framework requires medical certification of death to enable death registration into the Civil Registry. The Ministry of Health (MOH) is responsible for developing and implementing the processes and tools for medical certification, which also feeds VS on cause-of-death. In 2007, the MOH, in collaboration with MOASIS (project of University Eduardo Mondlane) and Jembi Health Systems, revised the death certification process to generate cause-of-death statistics complying with its mandate towards national CRVS.

A new Death Certificate (DC) form aligned with the International Classification of Diseases (ICD) was prepared. National standards were introduced for health facilities lists and hospital wards. After analysis of exiting lists across hospitals, consensus was reached to adopt ICD, 10th revision (ICD-10) as a standard for diagnostics. National regulations for death certification, including cause-of-death registration and coding, were established. Using local resources, MOASIS developed software for data management (SIS-ROH), dedicated hardware (SIS-Compact Station), a sealed-unit computer restricted to MOH information applications) and user manuals to ensure correct and standardised system implementation. Training on death certification and ICD-10 was conducted for clinical staff and coders.

Considering limited resources for training, dedicated staff, infrastructure to deploy the software and capacity for maintenance, a phased implementation approach was chosen. In the first phase, the scope was limited to cover all deaths occurring among inpatients of all 57 public hospitals. Prioritisation of hospital mortality was justified by keen interest of hospitals to use mortality data to improve internal management, and the availability of basic IT infrastructure when compared to health centres and CR offices. Full hospital coverage was a realistic target, achievable within a few years; to rapidly obtain tangible results at national scale. Implementation began in the highest referral level hospitals in provincial capital cities where infrastructure, personnel turnover (affecting training and data quality) and minimum IT literacy were less of a challenge.

The next step was to gradually capture extra-hospital deaths certified by Forensic Medicine services and physicians at health centres, which are mainly deaths occurring for external causes requiring ascertainment of cause-of-death and natural deaths whose DC is requested for legal purposes.

Registration of deaths occurring in the community, including information on cause-of-death for all or a representative sample, is a longer term objective.

Local setting

International guidelines were tailored towards specific needs of Mozambique to avoid common pitfalls[4,14,15].

The revised DC was aligned with ICD, but only a sequence of three causes is reported; a unique identifier will enable linkage to future CRVS-related systems (currently none exists). Even though centralized coding of cause-of-death is recommended by WHO, Mozambique chose decentralisation. Coding is done at each hospital by trained certifying doctors or SIS-ROH managers; the latter also check data quality and contact certifiers, if amendment of the certificate is required. Data from the certificate are directly entered into hospital's SIS-ROH dataset. All certifiers and coders are government employees, none is exclusively dedicated to SIS-ROH, and all receive on-the-job training, whenever SIS-ROH is implemented in a new site, as well as periodic refresher training.

To improve access to ICD-10 in the Portuguese language, an application was developed for mobile phones. A national targeted list of causes-of-death was elaborated based on frequency, public health relevance and possibility to ascertain the diagnosis; it includes about 200 3- or 4-digit codes, covering over 80% of causes-of-death recorded in SIS-ROH. The remaining 20% can be tabulated by ICD-10 chapters, and includes the terminology used in the clinical context. This list was made available to certifiers and coders where access to ICD-10 is difficult (i.e. insufficient budget to purchase ICD-10 volumes, inadequate internet access) and high personnel turnover affects training.

The SIS-ROH software includes a minimum dataset including demographic data, circumstances and causes of death, as recommended by the UN Statistical Division and WHO. Most variables are standardised and built-in validations enhance data quality; the software produces standard reports. The installation in SIS-Compact Station significantly reduced frequent sources of data loss caused by misuse of equipment, viruses, or theft.

Results

SIS-ROH implementation began in 2008 at the Maputo Central Hospital (MCH) and it was gradually scaled up. To date, it is implemented in 41 health facilities: 30 hospitals nationwide (53%) and 11 health centres. By 2013, 93,910 deaths were recorded in SIS-ROH (89,858 hospital and 4,052 extra-hospital deaths) (Figure 1). Monthly standard reports are produced at hospital level and used by clinicians and hospital managers. Annual data are available at national level within the first semester of the following year. Data tabulation by date of death, place of residence (up to district), age, sex, underlying and direct cause-of-death (up to ICD-10 sub-category) are used to describe the epidemiological profile of hospital and extra-hospital deaths; tabulation by admission ward, type of admission and interval between admission and death are used to evaluate quality of care and hospital referral system.

At MCH, where hospital census data were available, the number of deaths registered in SIS-ROH was shown to be complete. In 2013 the coverage of SIS-ROH was 9% of estimated national annual deaths; however in highly urbanised provinces, such as Maputo City and Maputo Province, where 5-year data is already available, the coverage is consistently around 50% and 30%, respectively[9].

The proportion of deaths with ill-defined underlying cause-of-death[4], was 2.6% in 2011 and 5.1% in 2013: data quality is high, despite slight deterioration following the geographical extension of SIS-ROH. Assessment of reliability of cause-of-death information through comparison with other sources of mortality data is limited, because of differences in target populations, methods to ascertain cause-of-death and time periods. However, the cause-of-death specific fractions among hospital deaths registered in SIS-ROH are compatible with the Mozambique epidemiological profile (Table 1), except for deaths for perinatal conditions that are more likely to happen in hospitals due to increased institutional births and for malaria, the burden of which decreased in the last decade[8,12].

SIS-ROH results catalysed political commitment to expand death registration. In 2012 an Inter-Institutional VS Working Group was created, aiming to strengthen CRVS with its main focus on births, deaths and cause-of-death. In 2013, an in-depth CRVS assessment was concluded[15], followed by the elaboration of a plan for CRVS Reform.

Lessons learnt

In just a few years, Mozambique has established a national, individual-based hospital mortality registry implementing ICD-10. Although the system primarily addresses health sector needs in terms of statistics, it is built in compliance with a legal CRVS framework, providing tools that are part of the CR processes and that enable recording and management of data as per VS requirements. Implemented tools and trained staff feed directly into a better CRVS system, avoiding the creation of interim or parallel systems that divert resources from the ultimate goal of efficient CRVS systems.

To ensure sustainability, system requirements (human resources and infrastructures) were limited and local resources were leveraged for development and maintenance of customised IT solutions; external funding mainly supported initial implementation in each site and domestic resources cover running costs. The ICD-10 implementation approach involved a certain level of simplification, although quality was pursued through training, standardisation of targeted lists and enabling use of data at local level.

Despite low coverage, SIS-ROH is a valuable source of high quality information on cause specific death fractions and their trends in the target population. Given high coverage in urban areas, SIS-ROH data can be used as a proxy to calculate mortality rates for the overall urban population. Data have already been used at central level to set new public health priorities, such as reducing deaths caused by traffic accidents.

Limiting the initial scope of the system to hospital deaths reduced the risk of failure and enabled progressive capacity building and production of results in a short timeframe. The first mortality analysis based on routinely collected data was a powerful tool to trigger institutional engagement of all stakeholders towards CRVS strengthening and activate the inter-institutional coordination needed to achieve the demanding goal of registering all deaths occurring outside the national health system.

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Figure 1 - Distribution of deaths recorded in SIS-ROH database by type of facility and type of death (hospital or extrahospital)
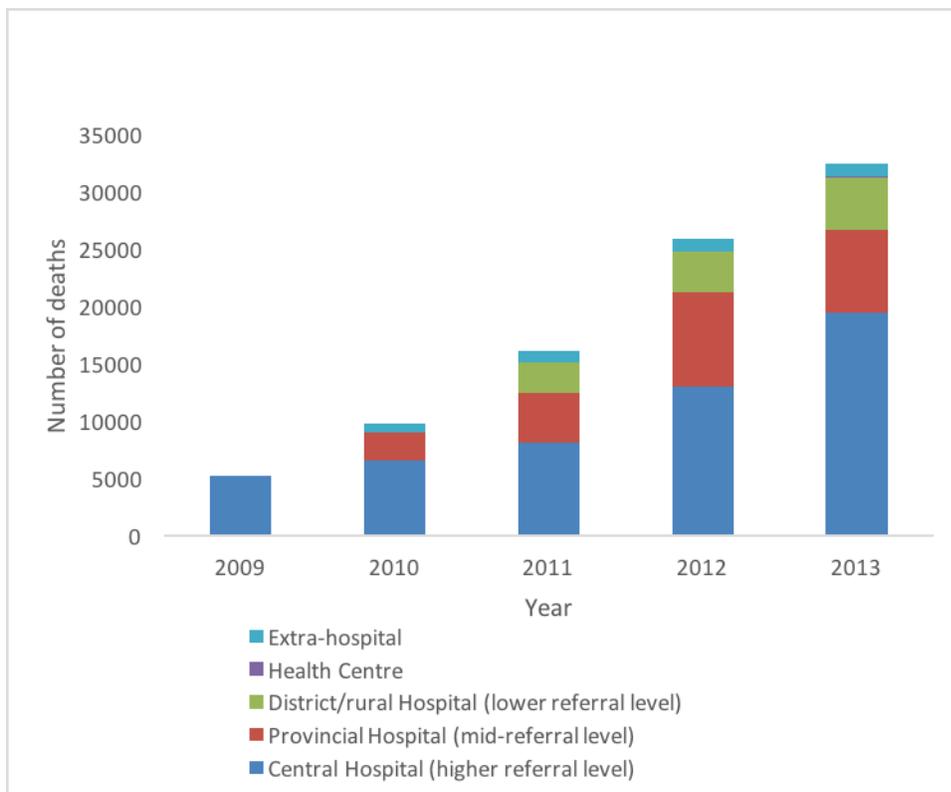
Table 1 - Death fractions for causes grouped by ICD-10 chapters for deaths registered in SIS-ROH 2013 database, excluding ill-defined causes (in *italics* death fractions for intervals of ICD-10 categories included in above mentioned chapter)

Cause of death	Number	Death fraction (%)
Certain infectious and parasitic diseases	12801	42.8
Human immunodeficiency virus [HIV] disease (B20-B24)	*8411*	*28.1*
Malaria (B50-B54)	*1722*	*5.8*
Tuberculosis (A15-A19)	*732*	*2.4*
Certain conditions originating in the perinatal period	5789	19.4
Disorders related to length of gestation and fetal growth (P05-P08)	*1989*	*6.7*
Diseases of the respiratory system	1950	6.5
Influenza and pneumonia (J09-J18)	*1579*	*5.3*
Diseases of the circulatory system	1822	6.1
External causes	1329	4.4
Transport accidents (V01-V99)	*330*	*1.1*
Neoplasms	1123	3.8
Endocrine, nutritional and metabolic diseases	1091	3.6
Malnutrition	*672*	*2.2*
Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	975	3.3
Diseases of the nervous system	771	2.6
Pregnancy, childbirth and the puerperium	630	2.1
Diseases of the digestive system	569	1.9
Congenital malformations, deformations and chromosomal abnormalities	469	1.6
Diseases of the genitourinary system	344	1.2
Other causes	228	0.8
Total	**29891**	**100**

Box 1 – Summary of Lessons Learned

Summary of Lessons Learned:

- While fulfilling its own needs in terms of VS, the health sector can strengthen the CRVS component of death and cause-of-death registration by complying to the legal CRVS framework and providing tools to enable registration of vital events and management of data for elaboration of VS.
- Simple, localised solutions, implemented in a phased manner, enabled registration of medically certified deaths and production of high quality statistics on cause-of-death for the target population and offer a platform for gradually increasing coverage of the CRVS system.
- By addressing registration of vital events occurring in the health system and providing rapid results, the health sector can play a key role in trigging the inter-sectorial and cross-governmental coordination required to achieve comprehensive coverage of CRVS.