MEASURE EVALUATION KENYA ASSOCIATE AWARD

NATIONAL CIVIL REGISTRATION AND VITAL STATISTICS SYSTEM

BASELINE SYSTEMS ASSESSMENT REPORT

APRIL 18, 2013

This publication has been supported by the United States Agency for International Development (USAID) under the terms of MEASURE Evaluation PIMA associate award AID-623-LA-12-00001. Views expressed are not necessarily those of PMI, USAID, or the United States government.

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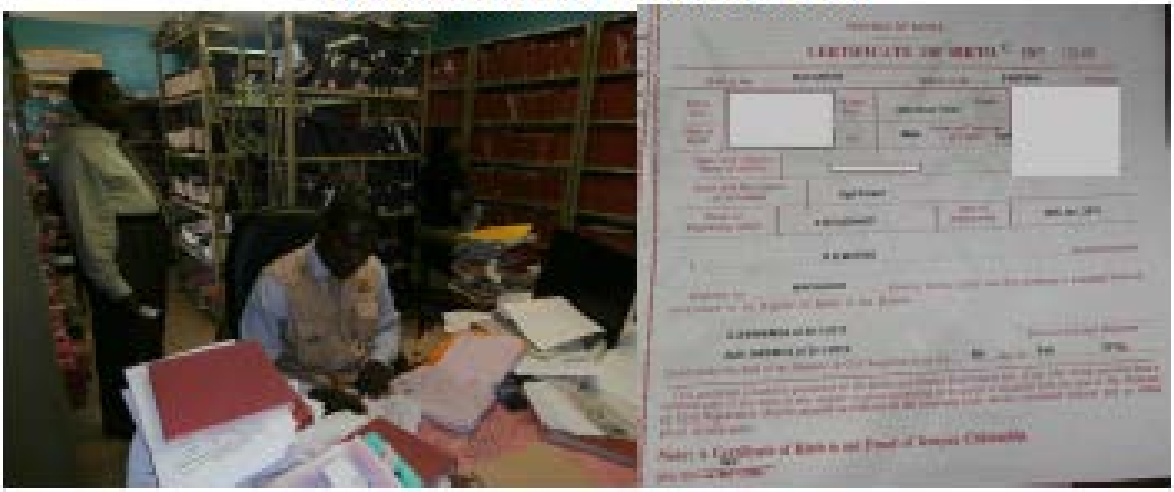
Kenya's Civil Registration System

1. Community-based notification of births and deaths is carried out by 7825 assistant chiefs, and 3412 health institutions

2. 106 local registration offices manually register births and deaths, and issue birth and death certificates



3. Department of Civil Registration archives the bound volumes of (duplicate) registration forms

4. New electronic registration software platform, linked with the IPRS, is ready to be rolled out.

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1. Introduction

The MEASURE Evaluation Kenya Associate Award was awarded to ICF International in partnership with the University of North Carolina, Tulane University, Futures Group, and Management Sciences in Health. The goal of the project is to assist the Government of Kenya to strengthen monitoring and evaluation (M&E) systems, including the civil registration system because it is the basis of the vital statistics system.

> *Civil registration is defined as the continuous, permanent, compulsory and universal recording of the occurrence and characteristics of vital events pertaining to the population as provided through decree or regulation in accordance with the legal requirements of a country. It therefore provides the ideal source from which to derive data for vital statistics on a regular basis.*
> UNESA (2001) *para.26*

Vital statistics including cause of death statistics are of high interest to the international community because they are the best source of data to measure global trends in fertility and mortality burden. The international community supports governments and national stakeholders who are seriously invested in assuring production of high quality vital statistics. While this investment requires strengthening technical capacity to process, analyze and interpret vital statistics-- these in themselves are insufficient for a successfully functioning system. A civil registration system, from which vital statistics are derived, requires that the nation's leaders embrace the notion of human rights[1] and successfully translate this into long-term political will to legally acknowledge and document every single birth and death. Anything short of this commitment, and the necessary leadership to see it through, will fail to produce meaningful vital statistics.

In conducting this baseline assessment, we recognize the broader legal and administrative challenges inherent in ensuring a functioning system. The assessment activities, however, will focus mainly on technical questions, and the results are aimed at informing decision-makers and identifying priority areas for improving the availability, quality and use of vital statistics in Kenya.

1.1 International context

Since the 1950s the **United Nations (UN)** has produced and updated international standards and guidelines for national governments to maintain a reliable system for the legal documentation of vital events, as well as technical guidance to promote common standards, concepts, definitions, and classifications for producing internationally comparable vital statistics (UN 1953, UNESA 1973, UNESA 2001).

To reinforce these international standards, the UN has also taken the lead on developing and implementing numerous training materials. In 1991, the UN Statistical Division, in the Department of Economic and Social Affairs, together with the UNFPA, World Health Organization (WHO) and the International Institute for Vital Registration (IIVRS), designed an International Program for Accelerating the Improvement of the Civil Registration and Vital Statistics Systems, emphasizing national efforts and commitment. Training workshops were conducted in five regions of the world from 1991 to 1995[2]. To

[1] The key human rights instruments include but are not limited to: Universal Declaration of Human Rights (1948) states that every person has the right to a nationality and this depends on having each birth legally recorded. This was reinforced in the Declaration of the Rights of the Child (1959) that states that every child is entitled from birth to a name and nationality; and in the International Covenant on Civil and Political Rights (1996) that also states that every child shall be registered immediately after birth and shall have a name.

[2] Workshops on strategies for accelerating the improvement of civil registration and vital statistics systems were held at Buenos Aires (1991), Damascus (1993), Beijing (1993), Addis Ababa (1994) and Rabat (1995).

complement the training workshops, a series of Handbooks on Civil Registration and Vital Statistics Systems was developed[3]. In 2002, the UN Statistics Division published a new Handbook on Training in Civil Registration and Vital Statistics Systems (UNESA 2002).

The impact of these trainings and publications in Africa, however, has not resulted in better availability of useable national vital statistics at the international level. The latest global review of the WHO Mortality Database website shows that in the WHO Africa Region national authorities in only three countries have submitted recent annual vital statistics and cause of death data (Mauritius, Seychelles, and South Africa) (Table 1).

Table 1.Number and percentage of countries reporting vital statistics and cause of death to WHO, by WHO regions 2012

WHO region	Number of countries	Data reported for at least one of the years 2004-2008	Percentage of countries reporting (%)
Africa	**46**	**3**[a]	**7**
Americas	35	32	91
Eastern Mediterranean	21	6	29
Europe	53	46	87
South-East Asia	11	3	27
Western Pacific	27	8	30
Global	**193**	**99**	**51**

[a] Mauritius, Seychelles, South Africa

Source: WHO presentation at Civil registration and vital statistics analytical workshop, Central Asian Republics, Bishkek, Kyrgyzstan, 11-12 October 2012.

In the meantime, until the civil registration and vital statistics system is functioning, interim measures must be used to produce basic fertility and mortality indicators. These interim measures include the national census every ten years and national surveys about every five years. While the importance of the approaches cannot be overstated, the fact is that they do not provide optimal information for monitoring basic indicators such as the crude death rate, adult mortality and life expectancy, as well as trends in causes of death. As long as complete vital statistics from civil registration are missing then the basic measures must be derived indirectly from applying the observed level of infant and child mortality (based on data on children ever born and surviving from the Kenya DHS of 1989, 1993, 1998, 2003 and 2008-09, and the 1999 and 2009 census) to the Coale-Demeny Model Life Tables, assuming that the age pattern of mortality conforms to the North model. There are two significant drawbacks to these approaches, 1) the assumptions for indirect measures do not apply indefinitely as a country progresses through the epidemiological transition, and the level of uncertainty is thus too high for monitoring real changes, and 2) cause of death is rarely obtained through national surveys due its added complexity and cost, and furthermore this approach is not adequate for accurately monitoring trends of cause of death.

[3] (a) Handbook on the Management, Operation and Maintenance of Civil Registration and Vital Statistics Systems (UNESA 1998a);
(b) Handbook on the Preparation of a Legal Framework for Civil Registration and Vital Statistics Systems (UNESA 1998b);
(c) Handbook on Developing Information, Education and Communication for Effective Civil Registration and Vital Statistics Systems (UNESA 1998c);
(d) Handbook on the Computerization of Civil Registration and Vital Statistics Systems (UNESA 1998d);
(e) Handbook on Civil Registration and Vital Statistics Systems Policies and Protocols for the Release and Archiving of Individual Records (UNESA 1998e).

In addition to the UN who traditionally has the mandate to set international standards for civil registration, the **World Health Organization (WHO)** is the primary interested international party for establishing norms to monitor levels and causes of death. Since 1948, the WHO has endorsed an international classification of diseases and injuries (ICD) as well as a standard medical certificate of cause of death with rules for classifying the causes of death. The underlying cause of death, derived from uniform rules for statistical classification, is widely used for monitoring mortality burden. The most recent version, ICD-10, was endorsed by the World Health Assembly in 1990 and is used in most countries reporting cause of death data to WHO. (The 11th revision of the classification has already started and will continue until 2015.)

Acknowledging the stagnation in the availability of national mortality data, WHO has stepped up efforts in the 2000s to promote strengthening of civil registration and vital statistics systems. It produced several publications highlighting the current situation of available data including a Lancet series of four articles describing the challenges to obtaining high quality national vital statistics: Mathers *et al.* 2005, AbouZahr *et al.* 2007, Hill *et al.* 2007, Mahapatra *et al.* 2007, Setel *et al.* 2007.

In 2005 the WHO conducted an assessment of national systems among all Member States, in which Kenya participated (WHO 2005). Also since 2005 WHO houses the global partnership, **Health Metrics Network (HMN)**. The HMN developed an assessment tool to assess the national health information system including the civil registration system (WHO/HMN 2005), followed by a framework and minimal standards for vital registration data collection followed by a (WHO/HMN 2008). In 2006 HMN launched a multi-partner research initiative, **Monitoring of Vital Events (MoVE)** to promote vital registration systems. The sister project of MoVE, MoVE-IT, adds an information technology component to the initiative. As part of this initiative, HMN provided financial support for several UN agencies and national African institutions to hold the **First Conference of African Ministers Responsible for Civil Registration, in Addis Ababa, August 2010** (the 1964 conference in Addis Ababa also was also called the 'first'!). The 10 declarations resulting from the Conference express renewed efforts to take measures to improve vital events registration (Conference of African Ministers 2010). Most recently, WHO has produced a standard CRVS assessment tool (2010) and resource kit to support countries in planning and implementing improvements to their CRVS (WHO 2013); it has launched an initiative, Accountability for Women's and Children's Health that has a Framework assessment and planning tool including a module for civil registration and vital statistics systems.[4]

The regional UNSD headquarters in Addis is also coordinating efforts to strengthen civil registration systems in Africa. It established the **African Symposium for Statistical Development (ASSD)–** originally to ensure that the round of national Censuses were conducted in compliance with international standards– but now with the new focus, from 2010 to 2015, to strengthen vital statistics systems to meet international standards. Representatives from statistical agencies and international development partners meet annually to define priorities and how to address them. In the last annual meeting, in Cote d'Ivoire in 2012, members discussed conducting comprehensive assessments of the CRVS system. The next ASSD meeting will be held in Guinea Bissau in 2013.

In 2012, South Africa hosted on behalf of the African Union and United Nations Economic Commission for Africa the **Civil Registration and Vital Statistics Ministerial Conference, in Durban 3-7 September 2012**. Invited to the conference were 54 African Ministers responsible for civil registration and statistics and 500 delegates from African countries including senior civil registration technical experts, development partners, statisticians, and professional associations. The objectives of the conference were: to review progress and address institutional and human infrastructural challenges; to integrate

[4] For more information on WHO Accountability for Women's and Children's Health, http://www.who.int/woman_child_accountability/countries/ken/en/index2.html

civil registration operations and services with health information management systems and national identification systems; and to develop mechanisms for monitoring of progress[5].

* * *

Summary Section 1.1
Despite decades of efforts by the international community to improve national civil registration and vital statistics systems, there is not yet useable information in most African countries to monitor births, deaths and causes of death.

Meanwhile, alternative approaches to produce indirect measures of fertility and mortality are filling the data gaps for some vital statistics. While their importance cannot be overstated, the fact is that they do not provide indicator measures precise enough, or frequently enough, for monitoring at national and subnational levels, and they do not provide information on causes of death.

1.2 Kenya Civil Registration System

After the turn of the century, birth and death registration became compulsory for Westerners (1904) and Asians (1928). In 1963, following independence, registration was made compulsory for all residents in Nyeri and Nairobi districts, followed by Bungoma and Nakuru districts in 1965-1966. By September 1971 it was extended to cover everyone in all districts across the country.

The civil registration has operated since 1928 under the Births and Deaths Registration Act, Chapter 149 of the laws of Kenya. While this old law is being repealed, a new law is being drafted to meet the requirements of the new Constitution adopted in August 2010. The new Constitution contains two articles specific to registration: requirement for citizenship to be conferred at birth (Article 14); requirement for citizens to have access to registration services (Article 12). The CRD is also in consultation with stakeholders to finalize the draft 5-year strategic plan and a Civil Registration Policy. These legislative documents are work-in-progress and solicited by the Constitution Implementation Commission (CIC).

1.2.1 Institutions producing vital statistics

The national institution responsible for the registration of births and deaths in Kenya is **the Civil Registration Department (CRD)** within the Ministry of Immigration and Registration of Persons (MIRP). The CRD central office core functions are the processing, analysis, and dissemination of vital statistics from birth and death records. The CRD central office has five main divisions: Field services, Financial, ICT, Statistics and Training. The Statistics division is responsible for the receiving, compilation, analysis, dissemination and use of the information to facilitate policy formulation, management and planning, and monitoring and evaluation of registration services. There are currently 107 local civil registration offices (CRO) providing services across the country. CRO submit aggregated vital statistics on a monthly basis to CRD.

The **Kenya National Bureau of Statistics (KNBS)** is responsible for disseminating official vital statistics on births and deaths and for computing annual vital events indicators by province (WHO 2005)[6]. The KNBS has officers in about 200 of 285 districts and could conceivably collect vital statistics from CRO at the local level (as is done in some countries). However, currently iinformation on vital events is exchanged only at central level: the KNBS Population Division, Vital Statistics Unit requests and receives aggregated

[5] http://www.info.gov.za/speech/DynamicAction?pageid=461&sid=30230&tid=81713
[6] http://www.knbs.or.ke/vital%20statistics.php

information upon request from CRD. KNBS provides this information to the annual Kenya Economics Survey to estimate GDP and national budget, and to the United Nations Statistics Division (UNSD) for publication in the UN Demographic Yearbook. (UNSD requests vital statistics broken-down by urban and rural but this is problematic in Kenya and in other countries where (1) the designation for urban rural residence may not be readily known, and (2) this information is not captured on the form.) Official vital statistics are published for public consumption in three tables on the KNBS website.

The **Ministry of Health (MOH)**, and in particular the Health Information System unit for vital statistics, is responsible for compiling and analysing medically certified CoD statistics with the ICD-10 coded underlying CoD. MOH has good internet connectivity in 170 districts and could conceivably transmit birth and death notifications electronically to CRD.

Since 2005/2005 the CRD produces an annual statistical report which is mainly for internal use inside of the Department. This report was initially conceived by CRD and KNBS (by two former classmates at IPRS who now head vital statistics divisions in CRD and KNBS) and is envisioned to be a more collaborative joint-undertaking in the future. Close collaboration would improve the quality in terms of harmonizing information provided to the government, to international bodies, and to the public via the web; it would also improve dissemination because KNBS has a well-developed website including for vital statistics. The content would also be significantly improved if the MOH also collaborated by providing a summary of the medically certified CoD statistics.

Civil registration and vital statistics stakeholders are represented in a **Technical Working Group**. The Technical Working Group (TWG) was formed in February 2011 following a recommendation by the National Stakeholders Conference in September 2011. The TWG consists of representatives from Government departments, UN agencies, and international development partners including World Vision and PLAN. TWG members meet monthly to advise the Department of Civil Registration on civil registration strategies and innovations; they drafted the draft 2013-2017 Strategic Plan in 2012, and they met to discuss the results of this assessment in March 2013.

Stakeholders also meet in an **Annual Stakeholders Meeting** that has taken place with WHO support for the past 2-3 years, with the last one in November 2012.

* * *

Summary Section 1.2.1
Both CRD and KNBS have the mandate to disseminate vital statistics, and informal collaboration between the two entities is good. Similarly, both CRD and MOH produce statistics on cause of death, and collaboration between these two entities is also good. There is not, however, an institutionalized structure to ensure that the vital statistics that are disseminated are systematically harmonized.

- *Establish a clear mandate regarding which entity is ultimately responsible for disseminating official vital statistics and cause of death statistics, and develop procedures for harmonizing final figures.*
- *Transform the CRD annual vital statistics publication which is, in practice, a joint publication between CRD, KNBS and MOH. Joint collaboration would significantly improve the quality of information (e.g. harmonized registration figures), enhance the content (e.g. include medically-certified CoD information) and broaden dissemination and use (e.g., reports and data summaries made available on respective websites).*

The regular TWG and annual stakeholder meetings are excellent forums to ensure efficient planning and coordination, and sufficient mobilization of resources, to maintain momentum in strengthening the CRVS.

- *Monthly and annual stakeholder forums should be actively sustained and should include periodic updates on such topics as progress and challenges implementing the electronic reporting system, M&E updates including on coverage, status of pilot projects to increase notifications, capacity building to improve cause of death, etc.*

1.2.2 Prior assessments

National census (1999 and 2009)[7]. In addition to the intercensal population projections needed to calculate fertility and mortality indicators, the census provides information to compute indirect estimates of childhood and adult mortality measures. These independent measures are important ones against which vital statistics can be compared.

WHO questionnaire on civil registration systems and certification and coding practices (2005). WHO conducted an assessment of national systems among all Member States, in which Kenya participated. National institutions involved with the collection, processing or storage/dissemination responded to questions about the legal and institutional framework, coverage and completeness, death certification, and coding.

Demographic and Health Surveys (1989, 1993, 1998, 2003 and 2008-09). These mainly USAID-supported household surveys provide periodic information on estimated coverage of birth registration and childhood mortality indicators.

Multiple Cluster Indicator Surveys (2000, 2009, 2010). These mainly UNICEF-supported household surveys provide periodic information on estimated coverage of birth registration and childhood mortality indicators.

Health Metrics Network: Health Information System in Kenya (2008). A broad group of data producers and users applied the HMN assessment tool (WHO/HMN 2005) to review the health information system in light of the framework and minimal standards for vital registration data collection (WHO/HMN 2008). While detailed results of the assessment are presented in the final report, 'Health sector Report for the Assessment of the Health Information System of Kenya' (Kibet *et al*. 2008), a brief summary of results is :

Table 2. HMN assessment result for mortality information

Elements for assessing selected indicator	Mortality information
Data collection method	present but not adequate
Timeliness	present but not adequate
Periodicity	present but not adequate
Consistency / completeness	present but not adequate
Representativeness / appropriateness	adequate
Disaggregation	highly adequate
Estimation method / transparency	highly adequate
Overall assessment of results	adequate

Source: Kenya Assessment Scoresheet (2006)
http://www.who.int/healthmetrics/library/countries/ken/en/index.html

Overall, the HMN assessment rates mortality information in Kenya as 'adequate', and the rating for each element seems fitting (Table 2). Other detailed results from the assessment show that 'Vital statistics as

[7] There are legal questions pending regarding enumeration results for some areas. As long as the verdict is pending in court, except for summary tabulations, no publications using the census data may be disseminated. Meanwhile, demographic techniques are being used to make adjustments to the data and once the court case is resolved then reports on fertility, mortality and intercensal population projections will be released.

an information source', not surprisingly, received a low score of 33% ('not adequate at all'); but the quality of mortality indicators for health status was 66% ('adequate') (data not shown). The latter estimate, however, is too optimistically high to refer to mortality estimates derived from the vital statistics system; it is likely that the score refers to mortality indicators derived from data sources other than vital registration, for example, from the census or national surveys.

CRVS rapid assessment (2011). WHO and HMN provided guidance to specialists from national institutions to conduct an assessment of the CRVS system using the standard WHO Rapid Assessment tool.[8] The resulting report provides a standard summary of the functioning of the national system. Overall, it was assessed as dysfunctional, with the weakest areas being: Data quality and plausibility checks, all areas related to certifying and coding cause of death according to ICD; Coverage of birth and death registration; and Registration infrastructure and resources.

Birth Registration in Kenya: Rapid Assessment (2012). The UNICEF assessment includes a review of national level functioning and local functioning at Kajaido civil registration office. Recommendations highlight the need for a programme system's approach (rather than fragmented interventions), a CRD government-led approach, and strengthening evidence-based programming.

KNBS assessment (2011). The ADB supported an assessment conducted by KNBS in five purposefully-selected registration regions: Embu, Mombasa, Nairobi, Nakuru, and Kisumu. The assessment provided mainly qualitative information about barriers to registration.

Country Accountability Framework. (2012). WHO convened a workshop in Dar-Es-Salam, Tanzania workshop, 13-15 February 2012 where a Kenya country team of four representatives from the MOH participated. The team drafted eight 'possible actions' on an Assessment/Scorecard that will be finalized and validated through a national accountability workshop involving a broader stakeholder group. The possible actions are:

1. Review the report and carry out dissemination
2. Resource mobilization for implementation to improve coverage
3. Establish a functional ICC involving all key stakeholders and give it powers to introduce changes to the civil registration and vital statistics (CRVS) system where needed
4. Create awareness in the general population and advocacy for birth and death registration at sub-national level
5. Improve hospital reporting, use of electronic reporting system, training of doctors and other clinicians in ICD 10, and conduct regular quality control of certification
6. Strengthen community reporting of birth and death through community workers, test new approaches, e.g. cell phones. Develop/strengthen use of verbal autopsies (VA) by community workers, test new approaches
7. Strengthen the analytical capacity of vital statistics office, including DQA
8. Develop and strengthen a national representative HDSS which is government led

* * *

Summary Section 1.2

Kenya has had several assessments in recent years which reveal strengths and weaknesses in the functioning of different aspects of the CRVS system. The results all substantiate that an existing system is in place, but one that is not functioning adequately to provide statistics that are complete and accurate enough to monitor and evaluate the health and demographic situation and to inform policy

[8] The rapid assessment tool is an automated Excel workbook and is part of a more detailed guidance tool entitled, Improving the quality and use of birth, death and cause-of-death information: guidance for a standards-based review of country practices (WHO 2010).

debates. The findings, coupled with objectives prioritized in the Civil Registration Strategic Plan 2013-2017 *and the* Health Sector Strategic Plan for Health Information Systems 2009-2014*, clarify the situation as well as indicate priority areas to strengthen.*

- *Stakeholders should coordinate actions to support CRD and MOH in undertaking interventions that are effective in the long term to produce reliable statistics. Future assessments should move away from situation analyses towards 1) measuring objective improvements in the system and the statistics it produces, and 2) the demand and use of vital statistics in monitoring the health situation and informing policy debates.*

1.3 Purpose of the baseline assessment

The purpose of the baseline assessment is to build upon the previous assessments in two main ways. First, it assesses the CRVS system in light of **international standards and tools for national systems** made available from the UN[9] and WHO[10]. Second, it **establishes an objective reference point** on which to track future improvements in the system. That is, in addition to describing the collection, processing and transmission, and storage and dissemination of vital statistics, the assessment defines and operationalizes baseline indicators that can be able to be objectively monitored to track future improvements in the system and in the quality of vital statistics.

Several approaches were used to conduct the assessment:
(1) Desk reviews drew on information from national and international sources
(2) Structured interviews were held with informants in key institutions including CRD, MOH, KNBS and UN agencies and NGOs involved in strengthening the CRVS system (See list of contact in Annex 1)
(3) Diagrams illustrate the flow of registration data and cause of death data
(4) Field visit provided insights into activities of a CRO and local registration agent (assistant chief)
(4) Reviews of birth and death registration forms, and the certificate of cause of death form, in light of UNESA (2001) and WHO (2011) recommendations
(5) Definition and computation of baseline indicators for availability of services, completeness (coverage) of registration, and the distribution and patterns of mortality based on CoD data

Recommendations resulting from this baseline assessment support the draft *Civil Registration Strategic Plan 2013-2017*, Strategy #10 Strengthening the Monitoring and Evaluation system, and the *Health Sector Strategic Plan for Health Information System 2009-2014*, Strategic objective #2, Improving the National Vital Registration System. It also responds to the Call to Action elicited from the 2010 Bangkok Meeting, to increase investments in the vital statistics systems[11]. The findings and recommendations provide the basis for discussion with stakeholders and will be used to inform the development of interventions to assist Kenya in moving towards a functioning CRVS system that is in accordance with international standards for national systems.

2. Birth and death registration

The CRD adopted the strategy of using **community-based informants** who initially notify and, in effect, pre-register births and deaths. An informant is a legally designated person or entity that is, or should

[9] UNESA 2001
[10] WHO 2010, WHO 2011a, WHO 2011b, WHO 2013
[11] The second target is investments and capacity-building: mobilizing resources and investing at least 5% of health resources in national health information systems, with at least 2% allocated to building vital statistics systems - with the aim of achieving by 2020 - 90% completeness of birth and death registration and improved cause of-death data.

be, required by law to notify the local registrar of the occurrence of births and deaths[12]. The informant serves as the legal witness to the event. In Kenya there are two types of **informants, also referred to as local registration agents**: health institutions and assistant chiefs of sublocations. Health institutions are responsible for notifying events that happen in their facility; assistant chiefs are responsible for notifying events that occur outside of the institution, that is, at home and in the community.

2.1 Notification and registration process

By law, the birth and death registration process must begin with a local agent within three and six months of the event, respectively. Notification and registration are both free within that period. After 6 months, there is a penalty of 150 Kenyan Shillings in addition to the usual cost of the certificate (50Ksh). In reality the penalty is not being enforced (Ma Fat and Nariani 2009). Birth and death registration and issuance of certificates are currently only issued at place of occurrence. This results in greater likelihood for double birth registration.

The **notification process** involves the local registration agent filling information on an official registration form (see Section 2.2.1) which includes a 'notification slip' that is separated and presented to the parents or next of kin. The notification slip is the perforated stub on the top part of the registration forms; on the death registration form it is called the Burial Permit. The local agent retains the counterfoil copy of the notification and the original notification is given to the family as proof of notification which they submit to the CRO to obtain a certificate. At this stage, the completed registration form can be considered 'pre-registration' until the time that the local agent submits it to the CRO to complete the legal registration.

The local registration agents are the first authorized points of contact that provide legal witness and notification of the event. The CRO are reliant on the assistant chiefs and medical institutions to carry out birth and death notifications in an accurate, timely and complete fashion. Technically, therefore, the informants should be held accountable to provide this information. However, there are inherent weaknesses in the system, especially regarding the notification of community events (see, for example, Table 9):

- Assistant chiefs work for the President's Office and are not employed by the CRD, they are therefore not directly supervised by or responsible to the CRO. Where the local agents do not or cannot perform notification tasks adequately, it is less likely that applying corrective measures or sanctions will be successful.
- Assistant chiefs carry out a range of administrative tasks for the President's Office in the smallest administrative units, the sublocation. The task of notifying births and deaths may not be among the priority tasks and therefore they do not see their role to include proactively notifying events; they may not even avail themselves when sought out for notification if there are other priorities at hand.
- Assistant chiefs oversee a sublocation that has 2500-5000 people. The number of expected annual births is only 100-400 per year (and 70% fewer expected deaths). Although this is not a large number to notify, some sublocations may be very vast and not easily reachable by the assistant chief.
- Two assistant chiefs could, in theory, notify the same event, for example, in the place of occurrence and again at the place of residence. This is especially the case for births if parents initiate the process at the place of occurrence and then again at the place of residence. There are currently no mechanisms to ensure against duplicate notifications and registrations. An integrated electronic system would

[12] The importance of the informant lies in the fact that the registrar can legally record a vital event only on the basis of a legally designated informant's declaration, either verbally or in writing. The informant must be able not only to supply the accurate information necessary for registration, e.g., for legal purposes, but also the particulars required for statistical purposes (UN 2001, *para. 374*).

minimize duplicate registrations by facilitating the search capabilities, and alert if duplicate information is entered.

The **legal registration** is most important step following notification. This is where the completed registration forms submitted by the local registration agents to the CRO are legally recognized, duly recorded, and issued a personal unique code (See Section 2.5.1). This constitutes legal registration and only after this step a legal certificate may be issued to the family/next-of-kin.

The local registrar is responsible for providing registration materials to the local registration agents. They can keep track of registration forms submitted by local agents because each registration form has a serial number. (The serial number is a number pre-printed on the top notification part of the form and on the bottom registration section. It is used for accounting and for filing and it is separate from the unique personal identification number). There used to be ruptures in the stocks of registration materials because the government printer could not keep up with demand. However, now the printing of these materials is outsourced and ruptures in stock is reportedly no longer a problem.

To obtain a **legal certificate**, the family/next-of-kin brings the original notification slip to the CRO who searches for the original registration form filed by the serial number, confirms personal identity, and issues the legal certificate. According to survey estimates, the proportion of families who follow-up to obtain a certificate from the local registrar is low—only about one quarter (KNBS and ICF Macro 2010). This cannot currently be measured at CRD because there is no mechanism to capture information on the percentage of certificates issued among those registered.

There is discussion at CRD about the benefits of designating a period of five years for mopping up unregistered births and then outlawing 'late registration' by the CRO. It is not clear if, or how, provisions would be made for registrations after six months.

* * *

Summary section 2.1

A community-based registration system with pro-active informants is appropriate for a country where civil registration services are not readily accessible to the population and/or the population does not for whatever reason comply with the legal obligation to register events. However, such a system has inherent weaknesses and should be used as an interim measure until such a time that all births and deaths will be medically certified.

- *In the interim, local registration agents should be facilitated with adequate training, supervision and logistics (e.g., registration materials, transport assistance) to fulfill the responsibility of notifying all events in a unique, timely and accurate manner, and this must be coupled with legal mechanisms to hold them accountable.*

2.2 Flow of vital statistics

CRO in 107 registration regions collect the completed registration forms submitted by the informants. Figure 1 and Figure 2 show the flow of registration statistics from events occurring at home and events occurring in the institution, respectively. In either case, local registration agents are the first point of contact with the family of the newborn or the deceased. These registration agents consist of assistant chiefs and personnel in the health records office of the district hospital, and in mortuaries (most of which are in hospitals, except self-standing mortuaries in Nairobi).

Note that the flow of cause of death data is discussed separately (see Section 3.1).

Figure 1. Flow of vital events information occurring in the home or community, Kenya 2013

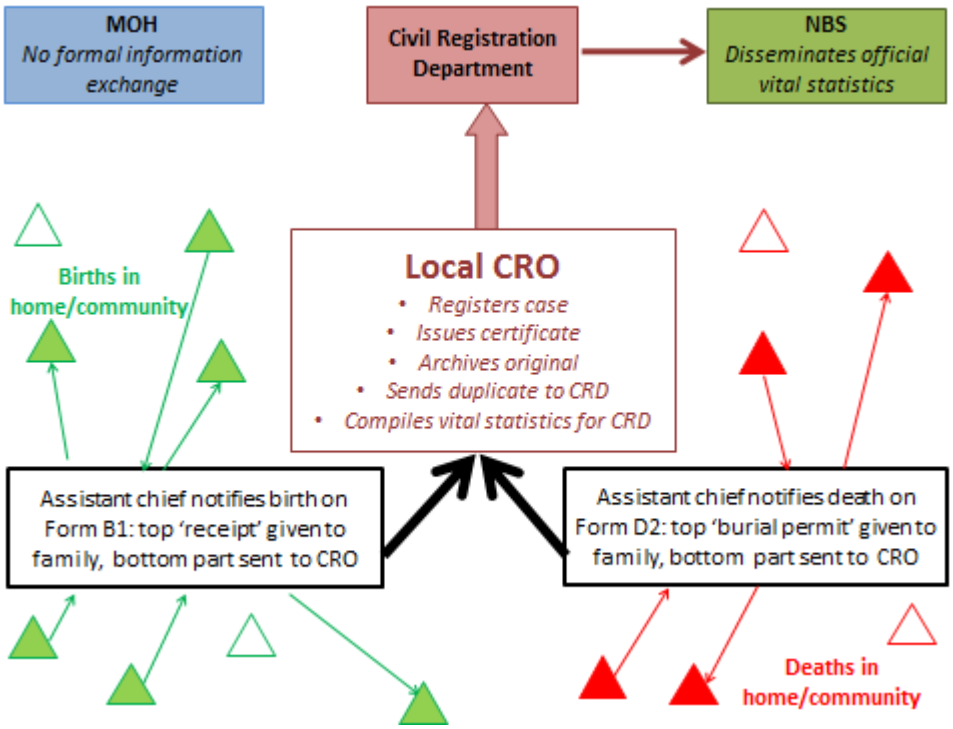
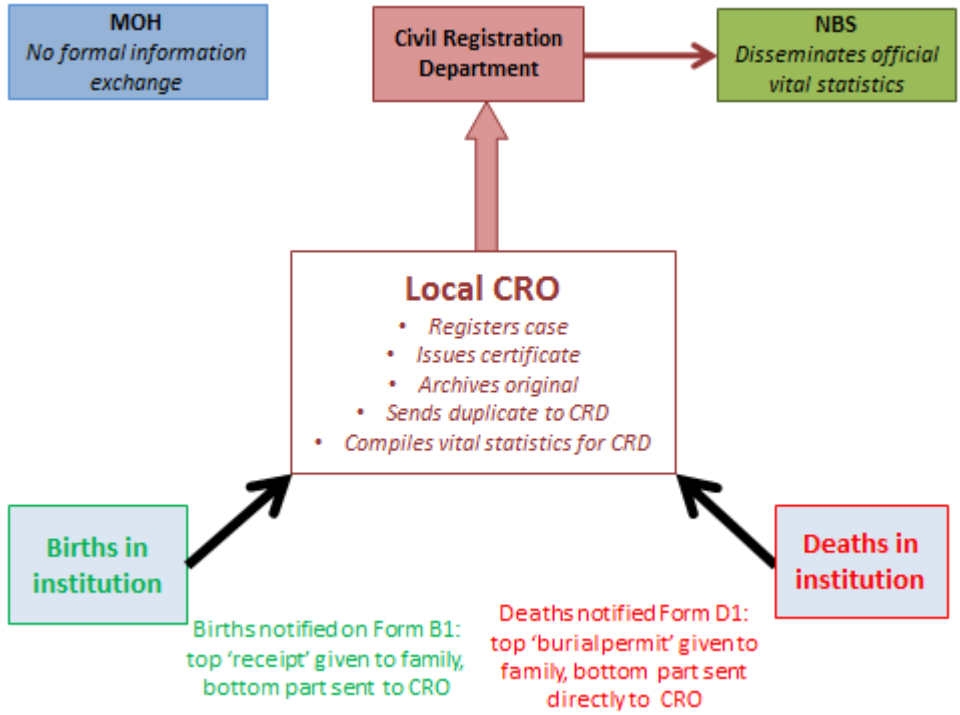


Figure 2. Flow of vital events information occurring in a medical institution, Kenya 2013



Although most events happen in the home or community, the majority of the notifications come through the medical system (see Section 2.4). The registration of rural events is weaker due to issues related to notification by assistant chiefs, discussed above.

2.2.1 Registration forms

The three main forms for birth and death registration are:

- Form B1 is birth registration form for both births at home and in the institution
- Form D1 is death registration form filled by qualified medical personnel who certify the cause of death including antecedent causes and underlying cause
- Form D2 is death registration form filled by assistant chief for a death in his community

These forms have been reviewed in light of UNESA (2001) minimal recommended information (see Annex 2 for the results of the review).

Several additional forms are also used at CRO for late birth registrations and for issuing a birth certificate. There are no international standards for these operational forms and they were not reviewed in detail. The relevance of these additional forms for this assessment is mainly because they may provide information for computing indicators of timeliness:

- FORM A1 and FORM 1 GP 138a. Application for late registration of birth
- FORM B3. Late registration of birth
- FORM B4. Application for a birth certificate

From the registration forms, vital statistics on births and deaths are tallied separately on Excel summary sheets and sent CRD by the 15th of every month (Annex 3)[13]. Up-to-date vital statistics at CRD are a problem because the local agents may not submit completed registration forms in a timely manner to CRO, and CRO may not send the summary sheets on time to CRD.

After registering the event, the CRO stores the original forms. The original and duplicate forms are filed sequentially according to the serial number, and eventually bound in volumes of 250. The volumes with original forms are stored at the CRO, and the volumes with duplicate forms are sent to be archived at the CRD.

2.2.2 Indicators of timeliness

Timeliness is an important indicator of quality, and there are various aspects of timeliness that can be measured. For some of the timeliness indicators below the data exist at CRD from monthly summary sheets. There was not, however, the opportunity in the course of the assessment to obtain the database and compute the values. For the other timeliness indicators, they will be able to be computed only once there are individual records available i.e., through the electronic reporting system.

Indicator 1. Timeliness

According to information provided during the assessment, these indicators can likely be computed based on information already being received by CRD on monthly summary sheets:

[13] Additional monthly forms are also submitted by CRO:
FORM CRDP 21. Contains a list of health institutions for each district in the registration region, and the number of births and deaths in each institution are reported e.g., Siaya district has about 25 institutions.
FORM CRDP 5. Contains a list of Divisions, which are further broken down into Townships and Locations, and the number of births and deaths in each area are reported (for births and deaths at home, e.g., Siaya district has about 175 rural areas.

a) Timeliness of submission of monthly summary sheets. Percentage of months in the year that summary sheets are received from CRO by CRD by the 15th of every month
b) Percentage of registered births and deaths that are 'late registration'[14]
c) Percentage of 'delayed registrations'[15]
d) Percentage of registered births for which a certificate has been issued.

These indicators will be able to be computed when the electronic reporting system is functioning and individual level information is readily available:

e) Timeliness of notification. Average number of days between the event occurring and notification.
f) Timeliness of legal registration. Average number of days between the time the local agents submit the registration form and legal registration at CRO.
g) Timeliness of issuing a birth or death certificate. Average number of days between legal registration by the CRO and the issuing of a legal birth or death certificate.

2.3 Availability of civil registration services

Administratively, Kenya is divided into eight provinces, 47 counties (provided by Articles 174-192 of the new Constitution), and districts whose number has grown from about 160 since the 2009 census to 285-289. The sublocation is the smallest administrative unit, each with an assistant chief overseeing a population of 2500-5000. By 2013, the CRD has defined 107 registration regions, each comprised of a district or group of districts with their sublocations, with a local civil registration office (CRO) to provide services in that region.

This section assesses the availability of civil registration services in the general population. Measures of availability are more easily operationalized than measures of access which, in addition to availability, also entail complex concepts such as affordability and cultural and social acceptability (WHO 2012). Although civil registration services must be available to everyone in the population, there are no exact guidelines on how many CRO a country should have. They should, however, be sufficiently staffed, equipped and organized to deliver quality services and to not fall behind schedule in timely delivery.

2.3.1 Distribution of CRO

Indicator 2. Percentage of the population living in districts that have at least one CRO

Availability of civil registration services can be measured in several ways. The simplest measure of availability is the percentage of people living in districts that have at least one CRO (WHO 2010, p34). Among the 160 districts enumerated in Kenya's 2009 census, 106 (66%) of them had a CRO in 2012; this corresponds to **70% of the total population who live in a district that has a CRO**. A slightly higher percentage of the population, 74%, live in a district with a CRO or/and informants.

Indicator 3. Average size of the population served by local CRO (density)

[14] A late registration is the registration of a vital event after the prescribed period but within a specified grace period. A grace period is usually considered to be one year following the vital event, but apparently the length of this is left up to the discretion of the CRO.

[15] Delayed registration is the registration of an event after the period prescribed in existing laws, rules or regulations (including any specified grace period). Since the grace period is usually considered to be one year following the vital event, delayed registration is usually considered to be the registration of a vital event one year or more after its occurrence (WHO & HMN 2012, Glossary p.205). It was not clear during the assessment if there is a distinction in definition and in registration procedures for a 'late' and a 'delayed' registration.

Relative to the density of local civil registration services in other regions and countries, the availability of services in Kenya is poor. **The CRO in Kenya serve an average population that is ten times and even larger than that of other regions and countries (Table 3). A CRO in Kenya serves populations ranging from 100,000 to one million, with the average size being 360,000.** In other regions of the world the average population served per civil registration unit is only 10,000 to 34,000. In terms of the averages of geographical area covered, the range is even larger between countries. Kenya's CRO cover an average about 5500 square kilometers, which is almost five times as much average area covered by service points in the USA or Brazil; more densely-populated countries including Germany and the Philippines cover, on average, cover an even smaller area.

Table 3. Average/range of population (in thousands) and area (in square km) served per CRO, Kenya compared to other regions or countries

	Range of population served per CRO (in thousands)	Average area served per CRO (in km2)
KENYA	**100-1000 (average 360)**	**5475**
North America (USA only)	<10-40 (31)	(1327)
South America (Brazil only)	<10-50 (15)	(1128)
Europe (Germany only)	<10-75 (10)	(66)
Asia (Philippines only)	<10-282 (34)	(199)

Source: UN 1985, Table A.3; for Kenya, CRD Annual Report 2010

The distribution of the 106 CRO in Kenya in 2012 indicates that almost a quarter of them serve populations greater than a half million, and these are located disproportionately in the Rift Valley (8 out of 24) (Table 4). Another quarter of CRO are those with the best availability, serving under 200,000, and are located in the Coast province (4 out of 11) and in Eastern province (6 out of 17). The distribution of CRO in North Eastern province is dichotomized, that is, about half serve very large populations- over half a million (3 out of 5); and the others serve relatively small populations under 200,000 (2 out of 5).

Table 4. Distribution of local CRO by the size of population served, according to province 2012

Population	Nairobi	Central	Coast	Eastern	North Eastern	Nyanza	Rift Valley	Western	**Total**
1,000,000+	1	0	0	0	0	0	0	0	**1**
500,000-999,999	0	2	2	4	3	1	8	3	**23**
300,000-499,000	0	6	3	1	0	9	8	2	**29**
200,000-299,000	0	4	2	6	0	3	5	5	**25**
50,000-199,000	0	2	4	6	2	4	5	2	**25**
Unknown*	0	2	0	0	0	1	0	0	**3**
Total	**1**	**16**	**11**	**17**	**5**	**18**	**26**	**12**	**106**

* Note: Three districts have unknown populations so the indicator was not computed. Two of these districts, Nyamache in Kisii county of Nyanza province and Kigumo in Muranga county of Central province, did not exist during 2009 census but a CRO was opened since then. The population data for these were not yet available for this assessment. For the other district, in Central province, the name and population was not provided.

2.3.2 Volume of services at CRO

Indicator 4. Average number of births and deaths the CRO is expected to process in a year

The local CRO is responsible for the legal registration of births and deaths, as well as the search and retrieval of registration records, legal amendments to information on the record, and issuance of legal certificates. In order to measure the relative volume of service delivery of CRO, we calculated the expected number of births (and deaths) expected to occur in the area covered by each. **Almost 20% of CRO (19 out of 106) could potentially register 20,000-40,000 births annually, or on average 100+ births per working day (Table 5). This number imposes a formidable burden if the process of registering,**

searching, and issuing certificates is not efficient. The searching for an individual record, in particular, as witnessed during a day-visit to Machakos CRO, can be a very tedious undertaking even in CRO that are not overburdened with a high number of births and deaths to register (see Section 2.2). Furthermore, if the record is not found in a timely manner then there is the risk of registering again which would effectively avoid prolonging a potentially unsuccessful search, but result in duplicate registration. **About one-third of local CRO register 35-50 births per day, and the remaining CRO about 20 births per day.**

Table 5. Distribution of local CRO by the expected number of annual births, according to province 2012

Expected number of annual births	Nairobi	Central	Coast	Eastern	North Eastern	Nyanza	Rift Valley	Western	Total
20,000-40,000*	1	0	1	4	2	1	7	3	19
15,000-19,999	0	3	4	1	1	3	3	0	15
10,000-14,999	0	6	0	2	0	7	7	3	25
2000-9,999	0	5	6	10	2	6	9	6	44
Unknown**	0	2	0	0	0	1	0	0	3
Total	**1**	**16**	**11**	**17**	**5**	**18**	**26**	**12**	**106**

* Nairobi 117,000 expected births

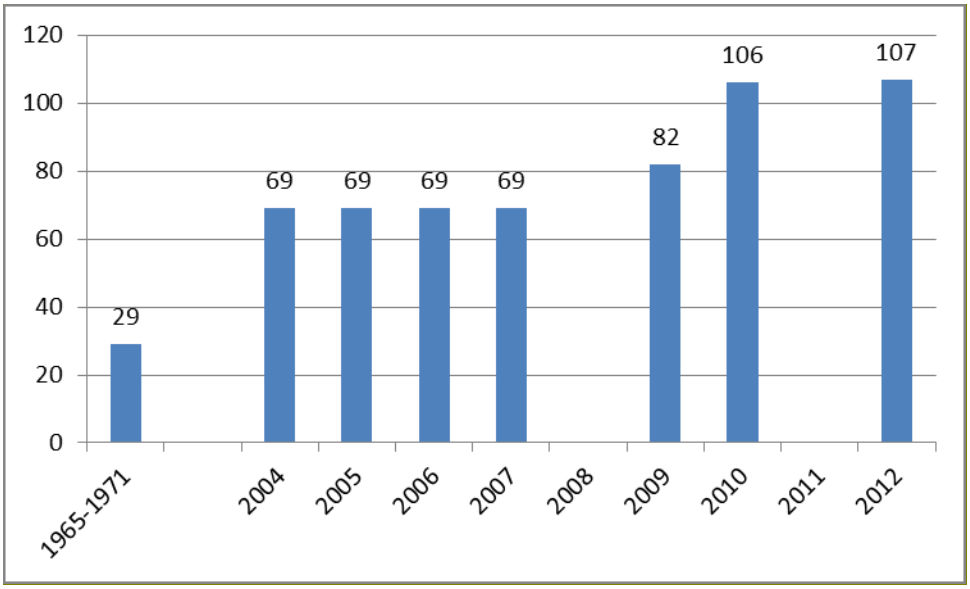
** See Note in Table 4.

Note: expected number of annual deaths number about 30% of the number of births

Indicator 5. Number of CRO

The CRD central administration in Kenya is addressing the problem of lack of services. It envisions a CRO functioning in each of the 289 districts although there are current limitations on capacity. In an attempt to control expenses the government has reportedly frozen the budgeting of new posts, however, the board of the Ministry of State for Immigration and Registration of Persons has acknowledged the need to expand services and is thus reviewing current positions, including in other departments of the Ministry, to determine if some existing staff might be assigned to CRO. **In the last five years, since 2007, almost 40 new offices have been established and they currently number 107** (Figure 3).

Figure 3. Number of civil registration offices, 2004-2012



Sources: 1965-1971, Kenya Birth and Death Registration Act, Form No 1; 2004-2012, CRD Annual reports 2004-2007, 2009 and 2010

2.3.3 Availability of informants per CRO

In addition to measuring the availability of civil registration services through CRO, it is also informative to quantify the availability of local agents responsible for notifying events.

Indicator 6. Average number of informants per CRO

Assistant chiefs. On average, there are **73 assistant chief informants per CRO**. About one third of CRO have less than 50 assistant chiefs informants, and about one-quarter have more than 100 (Table 6). Given that most CRO do not have a vehicle and dedicated staff that facilitates supervision visits and the timely collection of registration forms, the quality of work is highly dependent on the individual assistant chief.

Table 6. Number of assistant chiefs per CRO, according to province 2012

Number of assistant chiefs	Nairobi	Central	Coast	Eastern	North Eastern	Nyanza	Rift Valley	Western	Total
150-231	0	1	0	4	0	0	6	0	**11**
100-149	0	1	1	2	1	1	5	2	**13**
75-99	0	7	0	3	2	3	5	1	**21**
50-74	0	2	3	6	0	5	2	3	**21**
13-49	0	5	3	2	1	9	8	6	**34**
0	1	0	4	0	1	0	0	0	**6**
Total	**1**	**16**	**11**	**17**	**5**	**18**	**26**	**12**	**106**

The volume of expected notifications per assistant chief is not high, and in most cases numbering less than one birth or death, on average, to register a day (Table 7). If the assistant chief does not succeed in achieving close to 100% of notifications then there may be other professional or cultural factors that pose a barrier. These should be examined on a case to case basis and a specific plan to resolve the problem agreed upon by the CRD and CRO.

Table 7. Expected number of annual births per assistant chiefs, by CRO, according to province 2012

Expected number of annual births	Nairobi	Central	Coast	Eastern	North Eastern	Nyanza	Rift Valley	Western	Total
400+	0	1	2	0	0	1	3	0	**7**
100-399	0	10	3	11	4	16	15	12	**71**
<100	0	3	2	6	0	0	8	0	**19**
Unknown/NA*	1	2	4	0	1	1	0	0	**9**
Total	**1**	**16**	**11**	**17**	**5**	**18**	**26**	**12**	**106**

Note: expected number of annual deaths number about 30% of the number of births

* The indicator was not computed for three CRO for the reason of missing population in three districts (see Table 4). For six other CRO, there are no assistant chiefs notifying therefore the indicator is not applicable (NA).

Health institutions. On average, there are **32 health institution informants per CRO**, with almost all CRO having between one and 50 institutions (Table 8). Four CRO in the Coast province, and one in North Eastern, do not have any health institutions notifying events. On 18 February 2013, the Minister of Health released a Circular regarding 'Acceleration of registration of all births in Kenya', assigning the responsibility of birth registration to MCH clinics.

Table 8. Number of health institutions per CRO, according to province 2012

Number of medical institutions	Nairobi	Central	Coast	Eastern	North Eastern	Nyanza	Rift Valley	Western	Total
100+	1	0	1	0	0	1	0	0	3
50-99	0	3	3	0	0	2	1	0	9
25-49	0	7	1	9	3	8	14	5	47
1-24	0	6	2	8	1	7	11	7	42
0	0	0	4	0	1	0	0	0	5
Total	**1**	**16**	**11**	**17**	**5**	**18**	**26**	**12**	**106**

Similar to assistant chief informants, health institutions, on average, do not have an overwhelming number of births and deaths to notify. The great majority of them notify less than 1200 births per year, which corresponds to less than 3 per day (Table 9).

Table 9. Expected number of annual births per health institution, by CRO, according to province 2012

Expected number of annual births	Nairobi	Central	Coast	Eastern	North Eastern	Nyanza	Rift Valley	Western	Total
1500-3000	0	0	0	1	1	0	0	1	**3**
400-1200	1	5	0	9	2	6	13	10	**46**
<400	0	9	7	7	1	11	13	1	**49**
Unknown/NA*	0	2	4	0	1	1	0	0	**8**
Total	**1**	**16**	**11**	**17**	**5**	**18**	**26**	**12**	**106**

Note: expected number of annual deaths number about 30% of the number of births

* The indicator was not computed for three CRO for the reason of missing population in three districts (see Table 4). For five other CRO, there are no health institutions notifying therefore the indicator is not applicable (NA).

2.3.4 Services available by county

The indicators introduced in this section may also be evaluated by county, including the number of CRO and informants in each of the 47 counties. In particular, it is informative to compare the relative population sizes served by each. Namely, the median population that CRO serve is 329,000; the median population that assistant chiefs serve is 4,300; the median population that health institutions serve is 11,500. The median number of CRO per one million population is three.

In order to see deviations or outliers from the medians more readily, Table 10 is color-coded as follows:

- Gray highlights indicate counties where CRO serve very large populations (> half a million, or $\leq$ 2 CRO per 1 million population)
- Pink highlights indicate counties where CRO have the greatest number of assistant chiefs (> 250 assistant chiefs)
- Blue highlights indicate counties where assistant chiefs have the most potential notifications (> 5000 population)
- Green highlights indicate health institutions where health institutions have the most potential notifications (<20,000 population)

Table 10. Number of CRO and informants, and density per average population, according to county 2012

Province	County	POP county	Number of units			Density per average population (in thousands)			Registration offices per 1 million
			Registration offices	Informants		Registration offices	Informants		
				Assistant chiefs	Health institutions		Assistant chiefs	Health institutions	
Nairobi	NAIROBI	3,078,866	1	0	286	3079	-	10.8	0.3
Central	KIRINYAGA	521,095	1	88	42	521	5.9	12.4	1.9
	NYANDARUA	589,562	2	226	84	295	2.6	7.0	3.4
	KIAMBU	1,716,132	6	345	218	286	5.0	7.9	3.5
	NYERI	679,359	3	244	75	226	2.8	9.1	4.4
	MURANGA	822,954	4	256	72	206	3.2	11.4	4.9
Coast	KILIFI	1,098,681	2	203	143	549	5.4	7.7	1.8
	MOMBASA	920,569	2	30	156	460	30.7	5.9	2.2
	KWALE	642,680	2	0	0	321	-	-	3.1
	TAITA TAVETA	274,850	2	71	75	137	3.9	3.7	7.3
	TANA RIVER	238,817	2	62	20	119	3.9	11.9	8.4
	LAMU	99,480	1	40	19	99	2.5	5.2	10.1
Eastern	MERU	1,337,736	2	379	38	669	3.5	35.2	1.5
	MACHAKOS	1,085,648	2	223	84	543	4.9	12.9	1.8
	MAKUENI	874,395	2	220	76	437	4.0	11.5	2.3
	EMBU	508,469	2	128	44	254	4.0	11.6	3.9
	KITUI	997,861	4	376	87	249	2.7	11.5	4.0
	THARAKA NITHI	360,199	2	139	24	180	2.6	15.0	5.6
	MARSABIT	288,464	2	118	43	144	2.4	6.7	6.9
	ISIOLO	139,399	1	52	29	139	2.7	4.8	7.2
North Eastern	MANDERA	1,023,117	1	146	25	1023	7.0	40.9	1.0
	WAJIR	658,091	2	134	39	329	4.9	16.9	3.0
	GARISSA	616,874	2	78	37	308	7.9	16.7	3.2
Nyanza	NYAMIRA	481,135	1	69	100	481	7.0	4.8	2.1
	SIAYA	833,984	2	180	105	417	4.6	7.9	2.4
	HOMA BAY	955,203	3	220	88	318	4.3	10.9	3.1
	KISUMU	952,827	3	171	65	318	5.6	14.7	3.1
	MIGORI	907,743	3	177	137	303	5.1	6.6	3.3
	KISII	1,253,221	6	211	122	209	5.9	10.3	4.8
Rift Valley	TURKANA	848,248	1	162	27	848	5.2	31.4	1.2
	BOMET	579,442	1	73	36	579	7.9	16.1	1.7
	WEST POKOT	509,662	1	231	24	510	2.2	21.2	2.0
	KERICHO	885,203	2	276	58	443	3.2	15.3	2.3
	UASIN GISH	872,123	2	103	56	436	8.5	15.6	2.3
	NAROK	841,513	2	187	77	421	4.5	10.9	2.4
	TRANS-NZOI	809,584	2	61	45	405	13.3	18.0	2.5
	NAKURU	1,566,045	4	273	127	392	5.7	12.3	2.6
	NANDI	742,741	2	306	57	371	2.4	13.0	2.7
	KAJIADO	676,962	2	196	110	338	3.5	6.2	3.0
	BARINGO	548,706	2	263	64	274	2.1	8.6	3.6
	SAMBURU	221,289	1	108	42	221	2.0	5.3	4.5
	LAIKIPIA	391,639	2	72	39	196	5.4	10.0	5.1
	ELGEYO MARAKWET	366,848	2	190	54	183	1.9	6.8	5.5
Western	VIHIGA	549,013	1	134	36	549	4.1	15.3	1.8
	BUNGOMA	1,362,661	3	179	53	454	7.6	25.7	2.2
	KAKAMEGA	1,647,145	5	243	132	329	6.8	12.5	3.0
	BUSIA	737,092	3	182	42	246	4.0	17.5	4.1
Total		38,113,327	106	7825	3412				
Median per county		742,741.00	2	177	57	329	4.3	11.5	3.0

Sources: KNBS for 2009 census population by district; CRD for number of CRO and informants
Note: the highlighted counties designate 8 focal counties for the Kenya Associate Award project

* * *

Summary (Section 2.3)

There are too few CRO to provide timely, quality services including the legal registration of a birth or death, search and retrieval of a record, and issuance of certificates:

- *Promote strategic expansion of CRO in areas with very large populations, or where the area covered is very vast*
- *Adopt alternative measures to make services accessible to remote populations, such as mobile registration services, and creative use of technology to expand service reach*
- *Depending on the local situation, organize a trusted, central deposit where CRO may send certificates and families/next of kin may retrieve them more easily, for example, sending the certificates back to the informant that submitted the notification information i.e., assistant chiefs and health institutions*

In most registration areas there are numerous informants that, if adequately facilitated and held accountable, could achieve virtually complete coverage. Performance, however, is uneven and could be improved:

- *According to the MOH circular (18 February 2013), promote local MCH centers to train 'informant assistants' in the health system (e.g., CHEW, CHW) to proactively notify events. The MCH centers would be accountable to their 'home health institution' to train and oversee the transmission of timely, accurate, unique and complete notifications in their defined catchment area. The notifications, once checked and approved by the health institution, would be submitted to the CRO*
- *Promote similar 'informant assistants' to notify deaths*

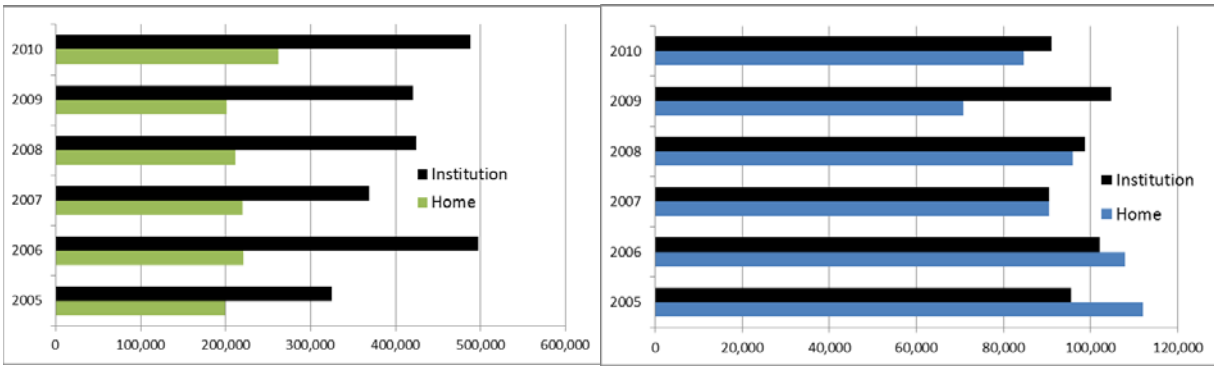
Even in CRO that do not serve an extremely large population, such as Machakos (see Section 2.6), the service delivery is inefficient due to the manual process;

- *Support roll-out of the electronic reporting system (Section 2.5).*

2.4 Completeness of registration

Prior to assessing completeness, it is informative to note the source of notifications for births and deaths. Between 2005 and 2010, most registered births and deaths were those that occurred in an institution and subsequently notified through that institution. This is especially the case for births where annually **62-69% of registered births were those that occurred in an institution** (on average, 66%) (Figure 4). For registered deaths, only since 2007 have most **deaths been notified through an institution-- ranging from 50-60%** annually -- and prior to that slightly more were notified through rural registration agents—presumably assistant chiefs.

Figure 4. Number of registered births and deaths in institutions versus in home or the community, 2005-2010



Source: Civil Registration Department (KNBS website)

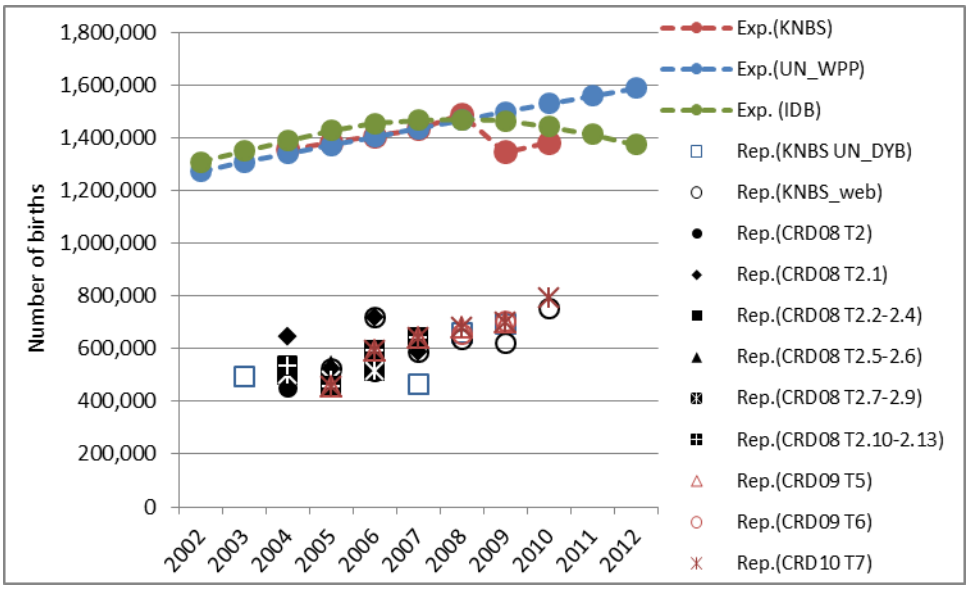
The CRD annual reports provide numbers of registered births and deaths, as well as the estimated population and number of expected births and deaths. Although the reports are not widely

disseminated, the fact that they are produced and were made available for this exercise is a significant step toward future improvements in quality and coverage. Data from these reports, including annual reports for 2004-2005, 2009 and 2010, were extracted and used as the basis for the assessment of completeness of registration. Information also used from the KNBS website that provides vital statistics, and from other international sources for comparison.

2.4.1 Birth registration

The reported number of registered births is published in several tables in the DRC annual reports, and also on the KNBS website. KNBS also reports the statistics to the Statistical Division of the UN Department of Economic and Social Affairs (UNESA) to be published in the Demographic Yearbook, where they are duly indicated as incomplete. Figure 5 presents the annual number of reported births in the past decade from the KNBS, UNESA and CRD sources, as well as the of total expected number of births as estimated by the UN World Population Prospects, the US Census Bureau International Database, and KNBS from intercensal projections.

Figure 5. Annual numbers of registered births reported by CRD and KNBS, and estimated total number of births from various sources, 2002-2012



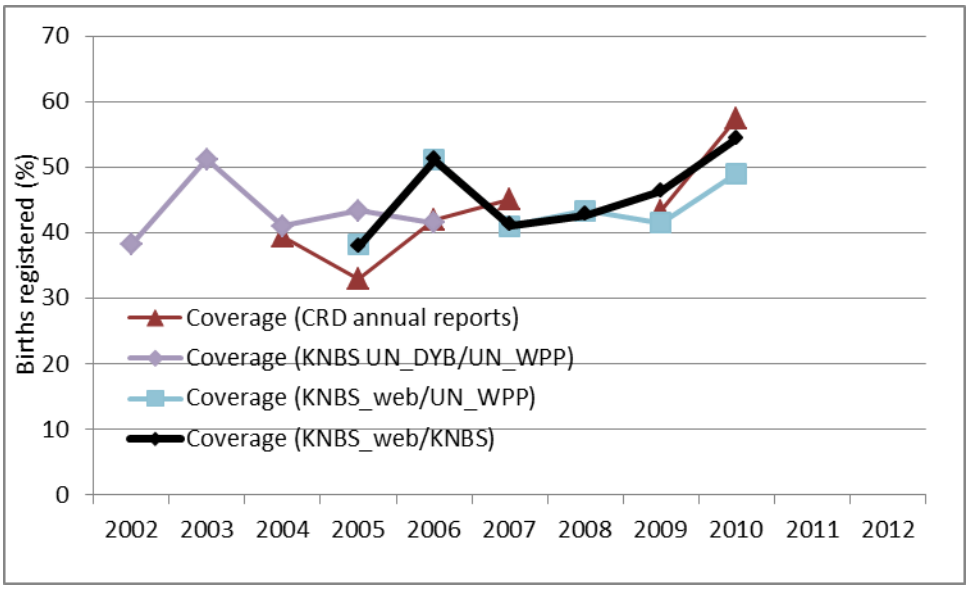
See Annex table 4.1 for exact values and their sources

The **scattered numbers of registered births** especially in earlier years (2004-2007) shows that annual figures are not harmonized between CRD and KNBS. The fact that there are disparate annual figures reported by CRD and KNBS suggests that the mechanism for compiling and disseminating official numbers is not systematized. The preliminary conclusion is that number of cases first need to be reconciled at local level, then the reporting streams to central level need to be closely monitored, and finally the officially reported figures at national level need to be harmonized. The reason for the discrepancies between CRD and KNBS annual figures are often due to differences in the timing of the request for data. The later the request from KNBS, the more updated the numbers will be from CRD because they will take into account the late submission of monthly reports. In addition, there could be corrections to monthly figures to account for late registrations, however, such adjustments were not mentioned during the course of the assessment.

Indicator 7. Percentage of births that are registered in the civil registration system

Trends of estimated coverage of registered births range from 40%-60% from 2002 to 2010, but differ according to which data sources are used (Figure 6). Taking into account official national sources, the number of births reported on the KNBS website and the expected number of total births estimated by KNBS from intercensal projections (using 1999 and 2009 censuses as base years), there appears to be a trend towards improved coverage in birth registration after 2008 (illustrated by the black line). Note, however, that the improvement in 2009 and 2010 is in part due to the fewer than expected number of births enumerated in the 2009 census; or conversely, the coverage rates in earlier years were underestimated because the number of births used in the denominator had been overestimated in the intercensal projections from 1999. Such phenomena are not uncommon given the 10-year interval between censuses.

Figure 6. Annual coverage of registered births 2002-2010



See Annex table 4.2 for exact values

If we break down the overall coverage rates by place of occurrence of birth, it is clear that the registration coverage among births occurring in institutions is substantially higher than those occurring at home. **From 2005 to 2010, home births are disproportionately unregistered compared to births in institutions—on average, only about a quarter of births at home were registered versus about two-thirds of births in institutions** (Table 11)**.**

Table 11. Annual coverage of registered births by place of occurrence, 2005-2010

Year	% of home births registered	% of instit births registered
2010	30.0	74.2
2009	23.6	65.3
2008	25.2	67.3
2007	26.9	59.8
2006	27.6	82.4
2005	25.4	55.1
Average 2005-2010	**26.5**	**67.4**

Note: computed by applying 43% of births occurring in institutions, the latest DHS estimate for births three years prior to the survey (DHS 2008-09) (NBS & ICF Macro 2010)

Survey estimates of completeness of birth registration are more favorable than the estimates from the routine data. The discrepancy is due in part to the different definitions used. While the indicator used by civil registration system and in this report refers to the number of births in a given year that are registered (in the same year), the standard indicator definition for the survey estimate is 'the percentage of children under 5 years of age who were registered at the time of the survey, as reported by the mother or caretaker (UNICEF 2012).' Because parents have tended to delay registrations until the age of school enrolment, we would expect estimates using the survey definition to be higher.

The most recent survey estimate for 2005 to 2010 estimated that 60% of children under five are registered, and this has not changed since 2000 when it was 62-63% (UNICEF 2000) (Table 12). The consistent national estimates, however, mask the extremely wide range of coverage. For example, the KNBS conducted the MICS3 in Kenya Eastern Provinces in 2008. At this time, the range in birth registration varied from 19% in Isiolo to 81% in Embu. In the year 2009 there were 69% of children under age five registered in Mombasa Informal Settlements (NBS and UNICEF 2009). The 2008-2009 DHS survey also provides subnational estimates and shows 42% of children under five registered in Nyanza and 86% in Nairobi. Further, it is important to point out that less than half of these children (24% of children under five) have a birth certificate. Similarly in 2000, when birth registration coverage among children 0-59 months was 62-63%, only 12% and 15% (males and females, respectively) reported that a birth certificate was issued. This raises the question of whether the children were fully registered in the civil registration system, and if yes, then why do so many not have a birth certificate? All survey estimates are consistent in showing that the main reason for not registering a birth is lack of awareness or the belief that registration is not necessary. This fact points to important sensitizing and promotional work that needs to be done across Kenya, at all levels regarding the importance and the procedures for registration.

Table 12. Survey estimates of the percentage of children under five whose birth is registered, 2002-2012

Year	Coverage of birth registration, <5 years* 2005-2010 *(a)*	Coverage of birth registration, < 5 years* *(b)*	Coverage of birth registration, < 5 years* *(c)*
2002			
2003			16-30
2004			
2005	60		
2006	60		
2007	60		
2008	60	60	
2009	60	60	
2010	60		
2011			
2012			

* The standard definition includes the percentage of children under 5 years of age who were registered at the moment of the survey. The numerator of this indicator includes children whose birth certificate was seen by the interviewer, or whose mother or caretaker said the birth had been registered (UNICEF 2012).
(a) UNESA 2010. The estimate comes from the 2008-09 DHS, also quoted in WHS 2012 (WHO 2012).
(b) KNBS and ICF Macro 2010. The national indicator of birth registration is also broken down by <2 and 2-4 years, there is no difference in the level. However, only 21% <2 had a certificate, while 26% 2-4 years had one.
(c) CBO *et al.* 2004. This indicator is difficult to interpret. It refers to birth notifications from the health facility or the assistant chief/village elder/local registrar, and birth certificate. Notifications are not necessarily equivalent to

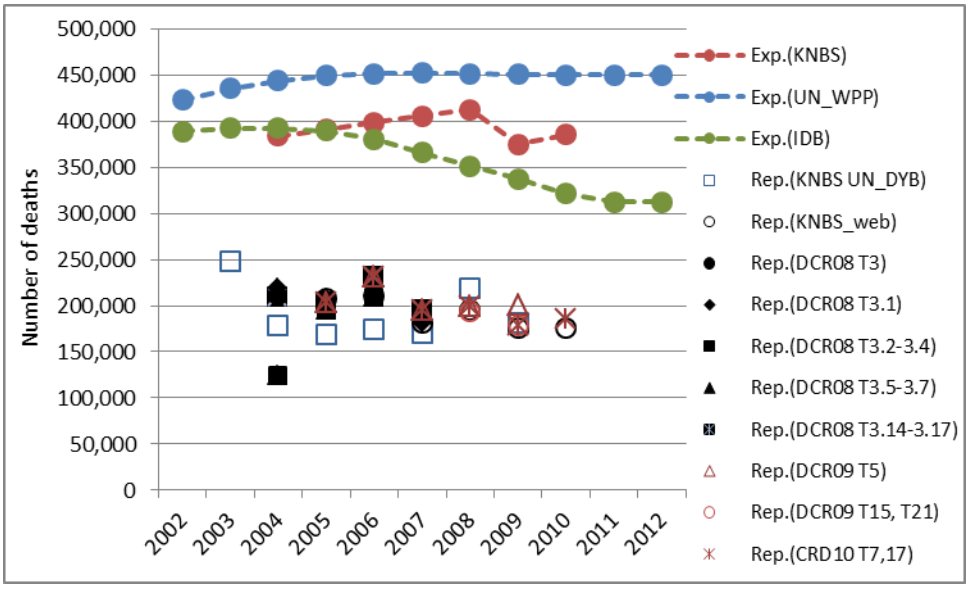
a birth being officially registered, but a birth certificate would be. This appears to have been corrected in the subsequent DHS.

2.4.2 Death registration

Indicator 8. Percentage of deaths that are registered in the civil registration system

The reported number of registered deaths is also published in several tables in the DRC annual reports, and on the KNBS website. KNBS also reports the statistics to the Statistical Division of the UN Department of Economic and Social Affairs (UNESA) to be published in the Demographic Yearbook, where they are duly indicated as incomplete. Figure 7 presents the annual number of reported deaths in the past decade from the KNBS, UNESA and CRD sources, as well as the of total expected number of births as estimated by the UN World Population Prospects, the US Census Bureau International Database, and KNBS from intercensal projections.

Figure 7. Annual numbers of registered deaths reported by CRD and KNBS, and estimated total number of deaths from various sources, 2002-2012

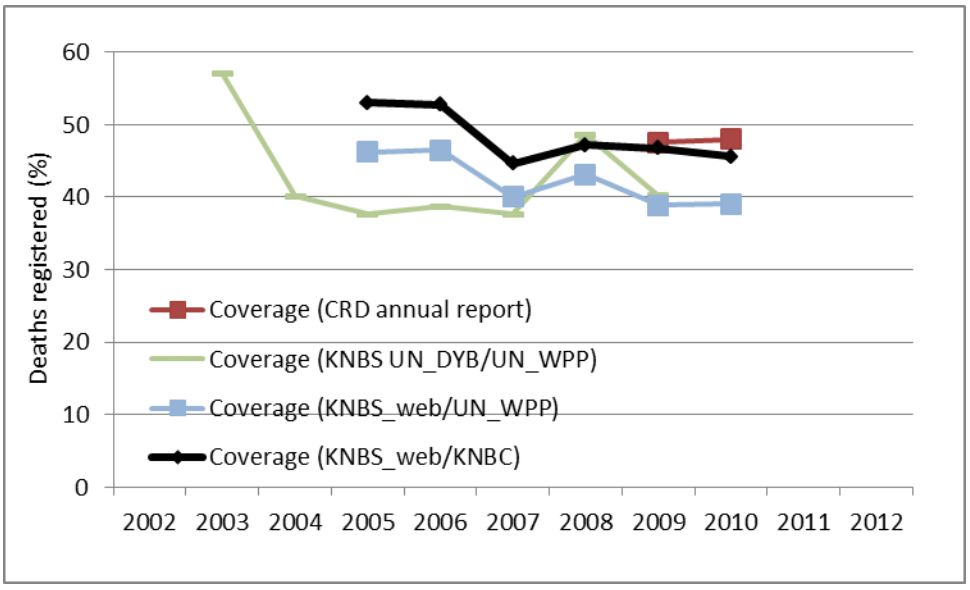


See Annex table 4.3 for exact values and their sources

As is the case with births, the comparison of reported numbers of registered deaths shows that final figures are not harmonized between CRD and KNBS. More pronounced than with births, however, is the variation in the expected number of deaths as estimated by different sources. The extent of variations in both the numerators and denominators make it even more important to define which sources will be used for each to monitor coverage estimates, and then to monitor trends using those sources.

Trends of estimated coverage of registered deaths also differ according to which estimate is taken into account. However, all estimates appear to have decreased from early or mid-2000s down from 50+% to 40% in 2009-2010 (Figure 8).

Figure 8. Annual coverage of registered deaths 2002-2010



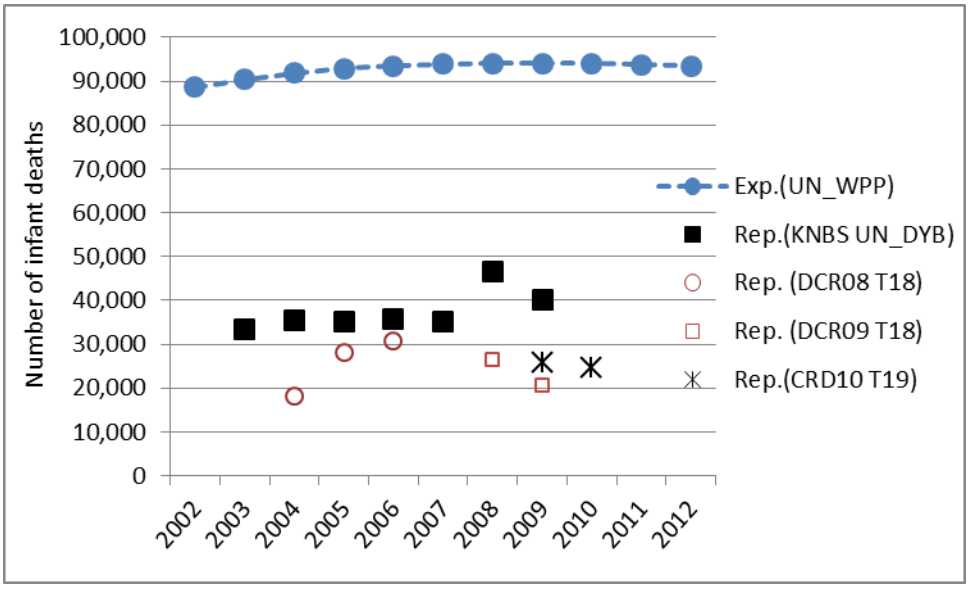
See Annex table 4.4 for exact values.

2.4.3 Registration of infant deaths

Indicator 9. Percentage of infant deaths registered in the civil registration system

Figure 9 shows the number of annual deaths among infants that are registered in the civil registration system, as reported by CRD and KNBS. The reported numbers differ again between the national institutions with KNBS showing consistently higher numbers. There could be different reasons from the discrepancy, one of which is because the KNBS may request the numbers at a later time, whereby the later number would include tallies from summary reports that were submitted late—and not be included in the earlier tallies in the CRD annual report.

Figure 9. Annual numbers of registered infant deaths reported by national authorities, and estimated total number of infant deaths from UNESA, 2002-2012

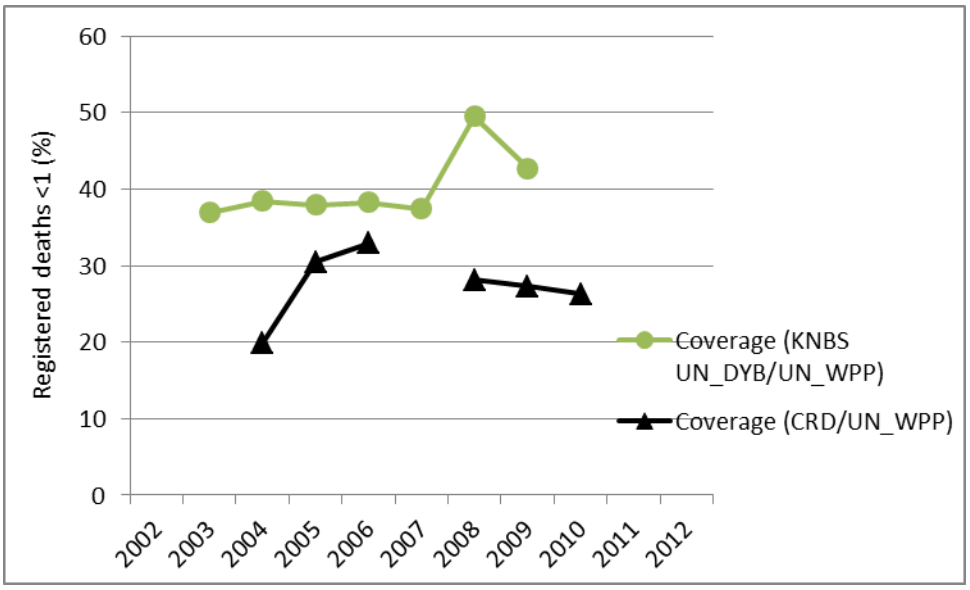


See Annex table 4.5 for exact values and their sources

Using the raw figures to compute coverage, there is roughly 40% coverage of infant deaths and tentative improvement in the most recent years (Figure 10). To compute the coverage of infant deaths, the

number of expected infant deaths estimated by the UN was used since a national estimate was not available.

Figure 10. Annual coverage of infant deaths registered in the civil registration system, 2002-2009



See Annex table 4.6 for exact values

Information on fetal deaths is also of high interest to the international community and the annual numbers are requested annually by WHO. While this information is collected on the CRO monthly tally sheets for births, it has not been published in the annual reports and it is not disseminated by the KNBS. The reason for this is not known.

* * *

Summary (Section 2.4)

- *The CRD annual reports are produced and provide raw numbers of registered births and deaths. Although there are issues related to data quality and content that could be improved, the fact that the reports make data and methods transparently available is already significant step toward future improvements in quality and coverage.*
- *Survey estimates are consistent in showing that the main reason for not registering a birth is lack of awareness or the belief that registration is not necessary. This fact points to important sensitizing and promotional work that needs to be done across Kenya, at all levels regarding the importance and the procedures for registration.*
- *There are variations in coverage estimates because of different sources of information that can be used to compute the indicator (i.e. number of registrations in the numerator, and expected number in the denominator). While a triangulation of trends using different sources is potentially informative, for M&E purposes the source(s) should be defined and used consistently to monitor completeness over time.*
- *Among births that are registered, most are notified through the health institutions (ranging from 62-69% from 2005-2010). However, survey results show that almost 60% of births occur outside of an institution; among these births, only about one-quarter are registered (24-30% from 2005-2010). Among births that occur in an institution, over the same period, about two-thirds are registered (55-74% from 2005-2010). For this reason, stakeholders are rightly putting much emphasis on increasing notification capacity in rural areas.*
- *Statistics on fetal deaths is important to monitor. They are collected routinely on the CRD monthly summary sheets but there is no information reported on this by CRD or KNBS. The*

perinatal form also containing statistics on fetal deaths was not available for review of its compliance with WHO-recommended data elements.

2.5 Electronic registration of vital events

An electronic system for registering vital events is being developed on two fronts. First, in 2010 the MOH implemented the DHIS2 electronic reporting system in about 255 districts, operating in district hospitals' health records divisions (the remaining approximately 30 districts do not yet have the infrastructure to report electronic reporting, so their information is currently captured in a neighboring district). MOH has good internet connectivity in 170 districts (*and we assume in the remaining districts the system works off-line with periodic uploads on-line, for example, from a USB*). The facility-based database includes information from about 8000 public and private facilities and is maintained on servers at the MOH and at University of Oslo. (The latter is a temporary measure and it is being arranged with Safaricom to maintain data in their cloud rather than at University of Oslo.) The DHIS2 handles aggregate reporting from health institutions and also individual-case reporting, for example, for tuberculosis cases. The MOH at central level has direct access to the data entered into DHIS2 in real time. Furthermore, some legacy data, dating back to early stages of electronic reporting in 2008, are being migrated into the DHIS2 system which will facilitate trends analysis.

The relevance of DHIS2 to the reporting of vital events is that the system includes a case reporting module for capturing individual deaths (*and births, presumably*), including ICD-10 cause of death. All approximately 14,000 ICD-10 classifications of morbidity or mortality have been programmed and may be assigned according to immediate, antecedent and underlying causes of death. Some minor revisions are needed to ensure that the COD data fields correspond to those in the international medical certification of death form (they do not, at present). The module is currently being piloted in a couple of hospitals; however, the electronic death records are not able to be integrated into the legal registration process because the civil registration system still operates manually. Therefore, even if individual deaths are captured in DHIS2 through the medical institution, they must also be reported separately on the official paper registration forms and submitted to the local civil registration office.

The DHIS2 has already established links with KNBS to share key data, and links with the CRD are also envisioned. The MOH Director of Public Health and Sanitation has proposed that an assessment be done of the IT capacity and electronic system that the CRD has developed, the civil registration and vital statistics system (CRVSS), to determine how the systems will interoperate.

2.5.1 CRD electronic system: Phase I CRVSS

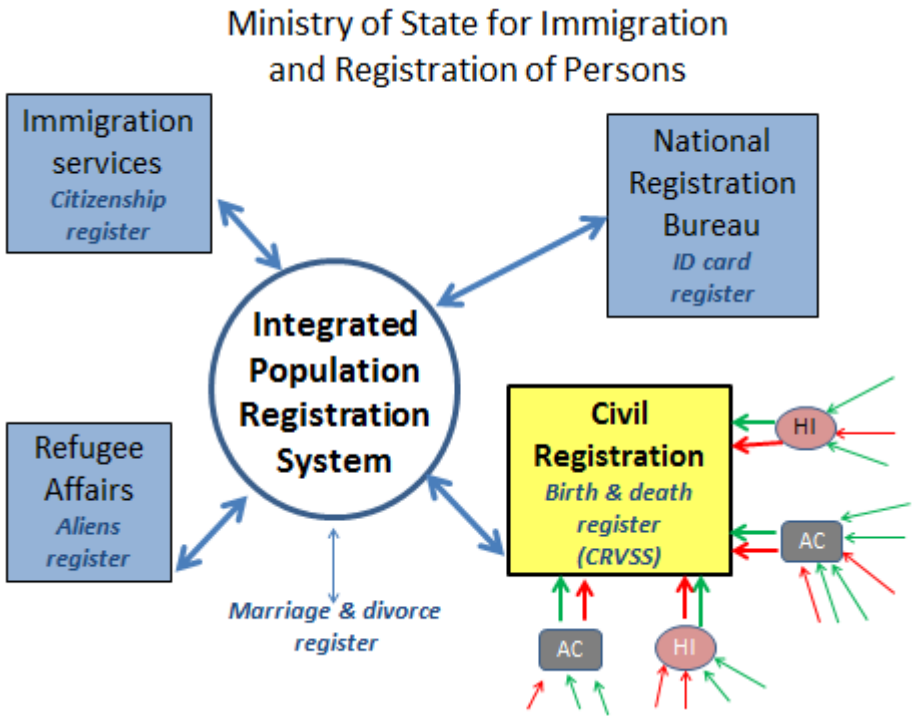
The second front entails the 2-phase project undertaken by the CRD to implement an electronic system. Phase I, from 2010 to 2012, was the creation of an electronic reporting system, the CRVSS, which was developed with the technical assistance of EDAPS[16], and funding provided by the GoK and the UK. The CRVSS is functioning under a 'test environment' at central level CRD, and the shortcomings are currently being addressed (see below). The system should be fully functioning in the next approximately four months and thereafter ready to roll-out to the local CRO offices (currently numbering 107).

An important aspect of the CRVSS is its integration with the Integrated Population Registration System (IPRS). The IPRS is the Immigration Ministry's central database and combines data from several registers: birth and death register, citizenship register, ID card register, aliens register, passport register

[16] The Ukrainian EDAPS Consortium specializes in the field of ID-documents and IT-systems development and implementation. It has provided assistance related to the supply, installation and operation of the IPRS in Kenya. http://www.edaps.com/en/news/n1961

and the marriage and divorce register (Figure 11). (It also has the potential to link databases maintained by other government agencies.[17]) The IPRS is initially populated by a birth registration (following notification of birth by local agents), at which time the case is automatically assigned a unique PIN number which will be used to link information from other registries to that individual throughout his/her lifetime. The Ministry of Immigration is the only entity with the authority and means to assign a unique PIN number. When that individual dies, at the time of his/her death registration the individual is searched by his or her PIN number, or other ID information if necessary, and the individual's case is inactivated. In this way the IPRS is maintained updated. Because the civil registration system is the basis for a complete and updated population registry– with some exceptions for immigrants who are registered at a later time—all events notified by local registration agents, including by assistant chiefs and medical officers, must routinely be introduced into the system via a local CRO where it is assigned the unique PIN code and definitively processed.

Figure 11. Integration of electronic birth and death registry with IPRS



The CRD IT department demonstrated the CRVSS software to the consultant during a visit to the central office. It was observed under a test environment where a local computer, theoretically at any location, first logs onto a secure network to establish communication with the central server at CRD, and then a birth or death record may be registered through the local CRO. The CRVSS was piloted in several districts and the results show that further programming is needed in order for the software to accommodate all registration records. At present, the CRVSS is limited to accepting registration records which are in a specific format and with all data fields completed, or otherwise the record is rejected. This poses a significant barrier to both registration and to populating the IPRS. For example, in the Kwale pilot district, only 5 out of 250 historical records were successfully entered mainly because they did not have the required national ID number. In short, the CRVSS remains a shell, unable to be

[17] This integration system has interlinked the database of the Ministry of Immigration and Registrar of persons with those of the Kenya Revenue Authority (KRA), the Teachers' Service Commission (TSC), the National Social Security Fund (NSSF), the Public Service Commission (PSC), the National Health Insurance Fund (NHIF), as well as telecommunication companies and government agencies. It is also reported to be linked with the electronic border management system.

populated due to a missing component that would allow registrations to captured regardless of format. To overcome this, a new component is being programmed, referred to as the 'CRD digitalization system', which is embedded in the CRVSS and will allow all registration records to be captured regardless of missing information. For records with complete information, these will be automatically taken-up by the IPRS. For other records, they are captured in a database but are not registered in IPRS. The CRD IT team is resolving how to best treat these partial records. One strategy discussed is to launch a 'mop up' exercise whereby missing information (mainly ID information) is obtained for all incomplete records.

Once this additional component is fully functioning, the CRVSS will have several practical advantages over the current manual system:

- automatic assignment of a unique PIN number for IPRS;
- possibility to retrieve the individual record from any location, regardless of place of occurrence, thereby allowing the family to obtain a birth or death certificate from any local CRO. In addition to being convenient for clients, this will also avoid the problem of duplicate registrations which happens when the original registration form cannot retrieved either through a failed search, or due to the event having been registered in another location;
- search and retrieval possibilities based on alternative information provided at the time of notification, e.g., name, national ID number, other ID number. (Note, the additional data fields for alternative forms of ID have not been added to the paper forms, so unless the mother, or next of kin, presents him/herself to the local CRO, the information will not be registered in the system. It is not clear how this will be addressed.);
- possibility to create a family tree.

In addition, the ICD-10 COD codes have been programmed into the electronic death registration form so that COD information can eventually be processed through CRD (these need to be slightly revised to meet international standards, but they are at least in the program). Finally, since the central office will obtain complete information in real time, the monthly reporting of vital statistics from the local CRO to CRD will not be done manually. This will improve the quality of statistics as tallying and other human errors will be avoided, as well as resolving the problem of late submission of reports from local CRO. Standard reports are programmed into the system and may be revised as needed.

2.5.2 CRD electronic system: PHASE II data conversion

There are an estimated 50 million historical birth and death records, dating from around 1905, that are being stored in bound volumes in the local CRO (original forms) and at CRD (duplicate forms). The World Bank is supporting the data conversion of these documents in the Nairobi CRO, located in the ACK building, including scanning the original documents with special equipment and also keying in digital information from individual records so that statistical information will be available. Starting from January 2013, the project is on-going. The scanning phase in Nairobi is almost complete, and will be followed by keying the data.

The GOK ICT Board has approached the World Bank to request further support in the data conversion in the remaining 46 counties. After Nairobi, the project will be extended to counties where software will be installed and scanning and digitalization of original historical records will take place. For roll-out beyond the county-level, to the CRO, the CRD indicates they would benefit from additional support.

* * *

Summary (Section 2.5)

1. MOH and CRD are well-advanced in developing their respective electronic reporting systems. The MOH DHIS2 system has been rolled-out in most districts already, including a notification module for

individual births and deaths that will function once the MOH and CRD systems are interoperable. If not already done:

- *carry out a thorough IT assessment of DHIS2 and CRVSS to:*
  - *accelerate progress towards interoperability between the two software platforms so that individual birth and death cases can be notified electronically and seamlessly from medical institutions to CRD;*
  - *identify and resolve legal data protection issues, if any, related to sharing personal data.*

2. CRVSS software is being programmed to capture all records, including historical and new registration records. Those with complete information will be fed into the IPRS system. After the Nairobi data conversion project, the CRVSS will be rolled-out to counties where historical records will be scanned and keyed digitally into a database. A mop-up exercise may be needed to complete missing information, mainly ID information, in order to populate IPRS. To ensure the successful national roll-out of CRVSS to capture new registration records:

- *Conduct an informal assessment of each CRO to determine hardware and IT capacity, and to identify any issues that might impede or accelerate the transition to electronic reporting;*
- *Support CRD in the roll-out the CRVSS system beyond the county level to local CRO, including installation of software, training and monitoring;*
- *Promote an official order by CRD to require routine electronic registration of births and deaths*

3. Internet connectivity is not yet available in all local CRO. Currently, internet is available in 28 of the 107 local CRO.

- *Track closely Telecom's (GOK) expansion of a local network IT cable and install internet connections in remaining districts as soon as possible.*

2.6 Field visit to Machakos CRO[18]

The objectives of field visit were to:

1) document notification and registration procedures
2) document challenges related to providing efficient and effective civil registration services
3) document barriers to achieving full registration coverage
4) document issues related the quality of vital statistics e.g., accuracy, timeliness, completeness
4) solicit feedback from the local registrar, and from the local registration agents, on how the system could be strengthened.

2.6.1 Situation

The Machakos civil registration office (CRO), in Machakos county in Eastern Province, is located in Machakos town about 65 kilometers southeast of Nairobi. The CRO is currently responsible for registering births and deaths in three of the four districts in Machakos county: Machakos, Mwala and Kangundo districts (although the registrar said it covered six districts, which suggests that the three districts may have been subdivided since the 2009 census?). The civil registration office in Yatta covers the fourth district of Machakos county. In 2009, the Machakos regional registration office covered a population of just over 800,000, representing about 15% of the population in Eastern Province.

Machakos registration region is comprised of 170+ sublocations, with an assistant chief in each sub-location whose responsibilities since 1986 include notification of births and deaths. There are also 43 health institutions that notify births and deaths. Together the assistant chiefs and the medical officers constitute the 'local registration agents' that provide a notification slip to the family and submit completed registration forms on a monthly basis to the registrar office. Births and deaths are supposed

[18] Joseph Kirima, CRD Officer, accompanied Fern Greenwell, CRVS Consultant, for a one-day field visit to Machakos CRO.

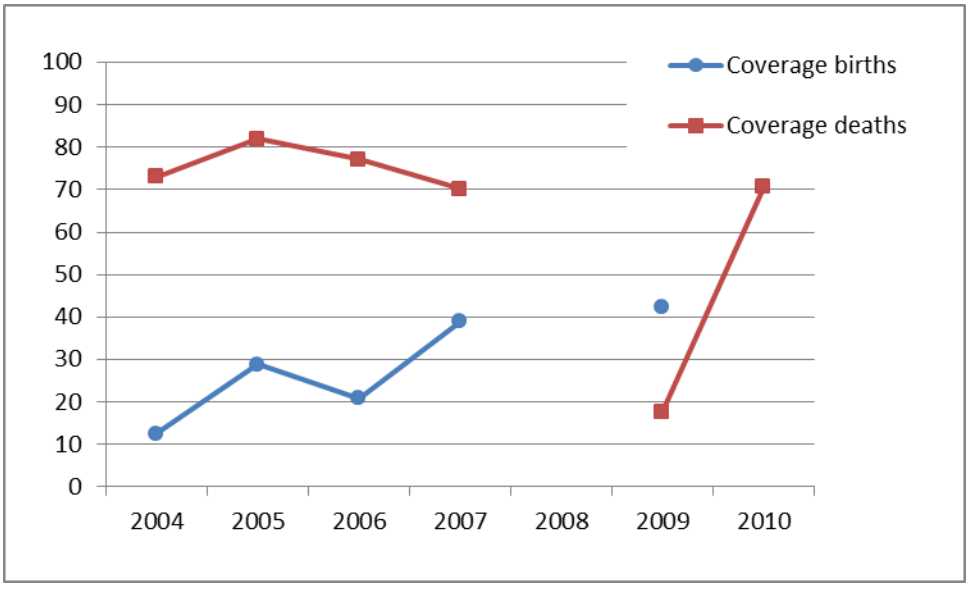
to be registered within six months. After this period, and an additional grace period, the event is registered as a 'late registration'. Collection of completed registration forms in a timely fashion is an on-going challenge because some sublocations are very remote. Luckily, within the Provincial Administration, the assistant chiefs have monthly meetings and may use that occasion to bring their forms to a central area where a civil registration officer can come and collect them.

The expected number of births and deaths per year is about 30,400 and 7200, respectively[19]. These numbers are a reasonable quantity to process if the CRO has adequate staffing, equipment and organization. The expected number of births and deaths per local registration agent (including assistant chiefs and health institutions) is about 145 births and 35 deaths per year, or an average of 2-3 births per week and three deaths per month. The deaths may even be fewer since a not insignificant number of people are reported to be admitted to and die in hospitals in Nairobi, where they are also supposed to be registered according to place of occurrence. As long as these local agents fulfill their tasks well, there appears to be a sufficient number to achieve near 100% coverage.

In 2009, the CRD annual reports document that almost 18,000 births and about 7000 deaths were registered in Machakos. These numbers show much room for further improvements in registration coverage, especially for births: from 2004 to 2009, the coverage of births increased from around 10% to about 40%; the coverage of deaths, although about twice as high as for births, has remained roughly 70-80% from 2004 until 2007, and in 2010 (Figure 14). Based on discussions with the local registrar and an assistant chief, in their qualitative judgment the burial permit requirement is enforced and all deaths are notified and subsequently registered. The statistics, however, show that 20%-30% of expected deaths are not registered.

Note that, in 2009, there was a sharp deficit in the number of deaths reported in the monthly summary. It is not clear whether this is an error in tallying, or is explained by some other interruption in the registration process, such as the establishment of a new registration office elsewhere.

Figure 12. Coverage of birth and death registration in Machakos registration region, 2004-2010

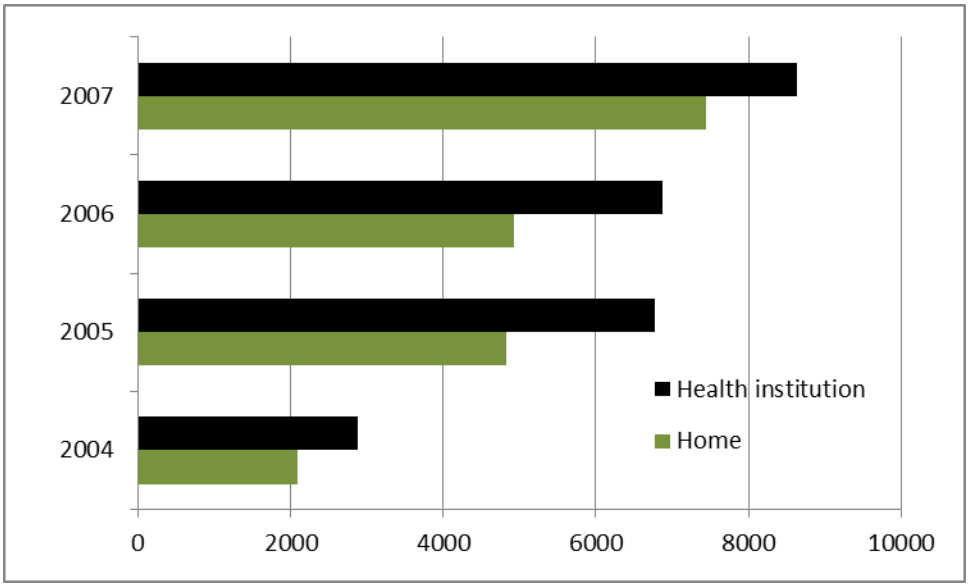


Sources:
CRD Annual Reports for numerators, and denominators where available. Where the denominators, 'expected number of births', were not available, these were computed using the latest CBR (0.038 in 2010) and CDR (0.009 n 2009) from the WHO Global Health Observatory.

[19] See Figure 12 for computation and source.

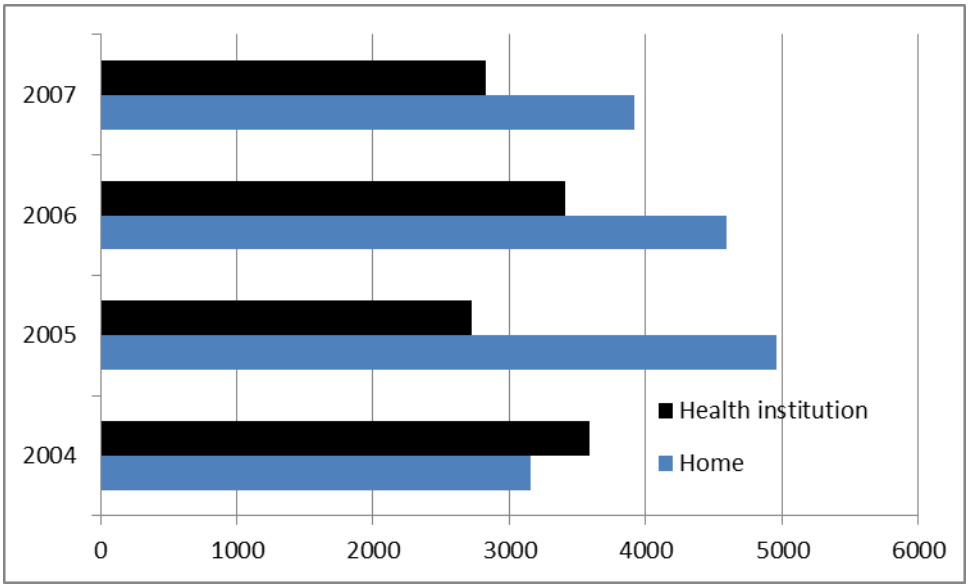
Birth registration is low in Machakos but, as suggested above, it is increasing. As is the case for Kenya nationally, most registered births in Machakos are notified through health institutions compared to births at home notified by the assistant chief (Figure 13).

Figure 13. Number of births registered in Machakos CRO, by place of birth, 2004-2010



Although at the national level more deaths are reported though health institutions since 2007, the pattern of deaths in Machakos until 2007 shows that a greater share of registered deaths are those that occurred at home and notified by the assistant chief (Figure 14). Discussions with the local registrar and an assistant chief confirm that most or all deaths that occur at home are notified and registered due to the requirement to have a burial permit in order to bury a body (even a stillbirth), and in order to obtain a burial permit the death must be notified (the top part of the D1 and D2 death registration forms is the burial permit, which is separated at a perforated line and given to the family at the time of notification).

Figure 14. Number of deaths registered in Machakos CRO, by place of death, 2004-2010



2.6.2 Organization

On the day of our field visit, there was a large crowd of people waiting for civil registration services. The crowds are, apparently, a routine phenomenon mainly due to the backlog of late registrations happening since 2010 when schools started to more strictly enforce birth certificates for each child prior to enrolment in primary school. (Birth certificates are needed to take state exams, to get married, and in future, to receive vaccinations.) Some of these children may have been notified and registered at birth, but the family did not present itself timely to the registrar office to collect the birth certificate. If the family still has the original notification slip, then a search may be done for the registration form and based on that, a certificate issued. This is the most straightforward scenario because all registration forms are archived according to a serial number that is the same on the notification slip and the registration form. The original and duplication registration forms are bound separately in volumes containing 250 forms; the volumes containing duplicate forms are sent to be archived in the central office in Nairobi. (The binding used to all be done in Nairobi, but due to high costs, and some volumes not being returned to the local CRO, the books are now bound locally.)

In other cases, a family may have lost the notification slip, in which case the search for the registration form may still be fruitful, but it is more complicated without having the matching serial number. There are many such cases and this overburdens the CRO (10 officers are assigned to conduct the searches) as well as obliges the family to wait in line for long periods. For this reason, the local registrar took it upon himself to invest in locally-developed software to facilitate the searching of registered births by key personal variables. The process of entering personal information from old registration forms is on-going.

There have been initial steps taken to introduce the integrated CRVSS electronic reporting system. The CRO has hardware, including computers, printers and a LAN. They are waiting for internet connectivity, installation of software, and training and support to carry out electronic registration.

This backlog presents a high risk of duplicate registrations, costs to the family to apply for late registration, and costs in time and labor for the CRO. With electronic registration, efficiency of issuing a birth certificate would be improved by facilitating the search and retrieval. It would also result in more accurate vital statistics and in a more timely fashion. There is not the possibility to track the percentage of registered births that were issued a certificate, an electronic system would facilitate this.

2.6.3 Kataloni local registration agent

The chief registrar and his officer accompanied Kirima and Greenwell to pay a visit to the assistant chief of Kataloni sub-location. The sublocation he oversees has a population of 6772 people. Although the assistant chief knows most of the people in his area, he works closely with six village elders who sensitize the people about registration and help to notify the assistant chief about birth and death events. The assistant chief also works closely with the school principals to ensure they enroll children who are registered. The assistant chief is responsible for mailing the application for a national ID to Nairobi when the person turns 18 years old. A national ID requires a valid birth certificate. The ID cards are mailed back to his office, from where he distributes them. It was learned that, in sublocations in the border areas of the country, where there may be disputed cases of Kenyan citizenship, individual cases are vetted by a special committee before they are eligible for national registration and an ID.

* * *

Summary (Section 2.6)

There are many local agents in this registration region—more than 170 assistant chiefs and 43 medical institutions—and probably too many for the one CRO to adequately train and oversee accurate, timely and complete notifications.

There are bottlenecks in services mainly because of manual processes that slow down the registration and search processes. This also increases the risk of duplicate registrations. The CRO has tried to address this by developing local software solutions. These are innovative solutions but not the integrated solution that is needed nationwide. Despite the bottleneck in services, the expected number of births and deaths per year would be a reasonable quantity to process if the CRO were adequately equipped with an integrated electronic reporting system.

Just as the national ID cards are mailed to the assistant chief from the ID Department in Nairobi for distribution, birth certificates could be more effectively distributed to the rural population in a similar fashion, rather than expecting reluctant or uninformed clients to travel to the CRO. This would also relieve the search and retrieval process that currently may happen 'a long time' after registration, thus increasing risk of not finding the original registration; or conversely, for a family to appear at the CRO to request a certificate that may not have been registered yet.

The registrar was asked about the priority needs in his area to improve the quality of registration and coverage. He recommended the following:

- *vehicles to carry out adequate supervision of 173 assistant chiefs in his area (some, but very few, registration offices throughout the country have a vehicle);*
- *sensitization of local authorities to promote birth and death registration among their constituent population;*
- *installation of the CVRSS software, internet connectivity, and training to use the electronic reporting;*
- *promotion of birth registration as a requirement for receiving vaccinations (using the birth certificate as proof of registration), this would be an incentive for earlier registration, rather than waiting for age of school enrolment.*

Such visits to CRO provide valuable insights that are particular to each registration area e.g., processes and procedures, IT capacity, geographical area covered, motivation, etc. A brief visit to each intervention area would similarly facilitate potentially important knowledge exchanges.

3. Cause of death

3.1 Collection and flow of cause of death statistics

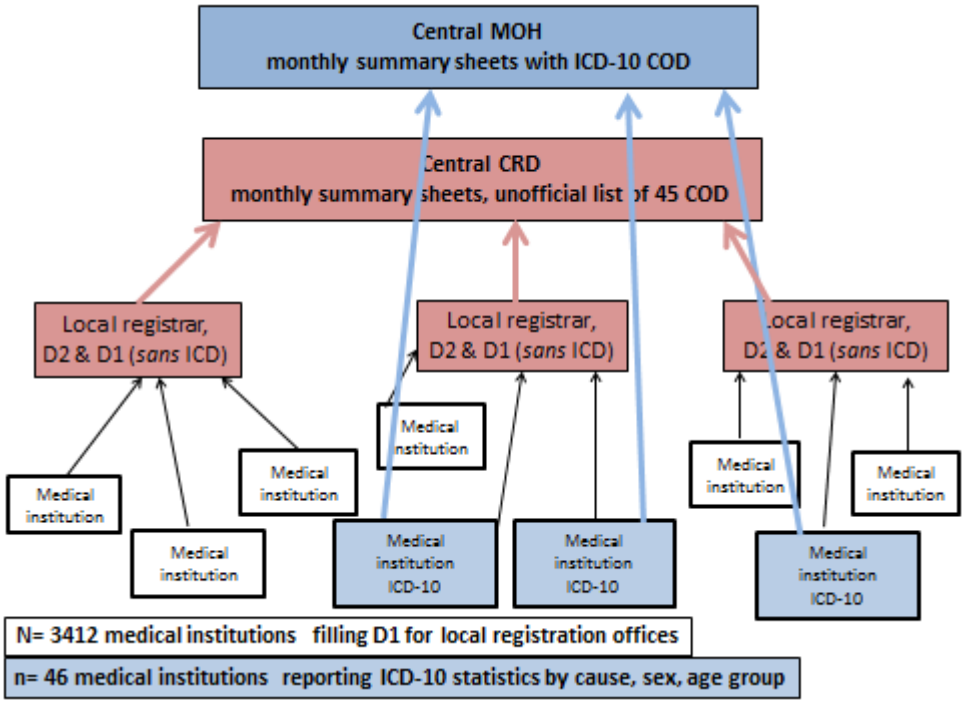
Cause of death information is currently collected on two death registration forms: Form D1 and Form D2. The Form D1 is the death registration form used for deaths in a medical institution. It contains a section for death certification that is filled by qualified medical personnel, including the antecedent causes and the underlying cause of death (CoD). The Form D2 is used to register deaths at home or in the community. It is filled by the local registration agent, usually the assistant chief (or signed by the local registration agent if the police or coroner certifies an unnatural CoD, as in the case of an accident or homicide). The deaths on Form D2 are generally not medically certified and the assistant chief simply selects the most probable CoD among about 14 natural causes listed, or for accidents, the proper authority such as the coroner selects one among the seven unnatural causes listed.

Death registration Forms D1 and D2 have been reviewed for compliance with UNESA minimal standards, the results of this review are presented in Annex 2.

Although the CRD collects cause of death statistics from CRO, the information does not meet international standards for several reasons. First, deaths occurring in the home or community are reported on Form D2 and a lay person who is not trained in ascertaining cause of death, usually the assistant chief, simply ticks the apparent cause of death. Second, the quality of medical certification on the Form D1 is questionable due to lack of up-to-date, systematized training on certifying deaths according to international standards. Third, the causes from Form D1 and D2 are aggregated monthly by the local registrar who must first determine, by using information provided on the Form D1 medical certificate, which is the most likely underlying cause of death. This is problematic because the registrar is not a medical specialist and may not be able to read and interpret terms of the medical diagnosis. Registrars also have not been trained in ICD rules and instructions to assign ICD codes. Finally, the local registrar tallies the causes of death from both forms on a monthly basis and groups them according to the CRD list of 46 deaths (Annex 3b). The list of deaths does not correspond to either of the WHO Special tabulation lists for mortality, including the condensed list (103 causes) or the selected list (80 causes) (WHO 2009).

Form D1, although it includes medical certification of death and cause of death, does not contain a field for capturing the ICD-10 code. In the health institutions where ICD -10 codes are assigned, the codes are documented on an index card and kept in the medical records. The underlying COD code is not, therefore, transcribed on the Form D1 prior to sending it to the local registrar office for processing registration (Figure 15). On a monthly basis, the health institutions tally the causes of death on the index cards, by the 3- or 4-digit codes for cause and by sex and age groups, and send the summary sheet in Excel format to the Health Information Division at the MOH. MOH manually concatenates the monthly tally sheets onto a single sheet which can then be used as the basis for analysis. Even though the CoD data reportedly arrive in a timely fashion to MOH, the process of cleaning and standardizing the final CoD data in order to analyze it is a very time consuming task that will be eliminated when electronic registration is finally implemented. Until that time, there does not exist at central level a database of individual causes of death, and, because the cause of death information is ascertained and reported separately by CRD and MOH, information on causes of death differ between them.

Figure 15. Flow of cause of death data to CRD and MOH, Kenya 2013



The fact that deaths are not routinely certified by qualified medical personnel is the biggest obstacle for obtaining complete and high quality cause of death information. In absence of sufficient capacity at present, the MOH is partnering with development partners to train local registration agents to administer a verbal autopsy (VA) tool. The paper-based VA tool and has been piloted in selected HDSS villages and uses independent reviews of the completed questionnaires by two trained clinical officer reviewers who attribute the most probable ICD-10 code for underlying cause of death. A related tool under development, the InterVA (Interpreting Verbal Autopsy), has also been tested in the Nairobi Urban Health and Demographic Surveillance System (NUHDSS) (Oti and Kyobutungi 2010). Rather than relying on the common method of physician review, the InterVA uses a computer-based probabilistic model to assign causes of death. The testing of this tool in NUHDSS and in other settings suggests it may be useful in providing information about community-level causes of death, but is limited in its ability to correctly identify individual-level CoD. WHO is also supporting the development of a version of the InterVA that can be conducted using a mobile phone, with automatic assigning of an ICD-10 code. The InterVA functions automatically without reviews by clinical reviewers -- except in cases where the algorithm cannot assign a code, in which case a third reviewer would the probable cause.

While VA causes of death resulting from physician review or from a computer algorithm may provide some insight into broad patterns of death in the community, they do not meet the international standards for assigning individual-level causes of death. For this reason, the VA CoD statistics should never be mixed with the CoD statistics that were obtained in accordance with ICD rules and instructions.

* * *

Summary (section 3.1)

1. ICD codes assigned by trained coders in health institutions by-pass CRD; however, CRD reports a list of CoD in its annual reports that are not assigned according to ICD rules and instructions.

- *Specially trained coders should be the sole persons responsible for assigning ICD codes. International guidelines do not necessarily recommend that coders must be in the health sector, but currently in Kenya health records officers carry out this task and this approach is fine.*
- *Since MOH at central level currently compiles the ICD CoD statistics from its health institutions and maintains the database, Kenya may consider MOH the most appropriate entity for analyzing and providing summary results of CoD. The mandate for compiling, analyzing and disseminating*

official CoD statistics should be formally agreed upon and operationalized with clear standard operating procedures.

- *If the MOH will not be responsible for CoD statistics then another entity, such as CRD or KNBS, should have access to information on medically certified deaths. The ICD coding of deaths may be done by any competent, specially trained team of coders.*

2. The death registration Forms D1 and D2 are not in compliance with international recommendations by UNESA and WHO.

- *Death registration form D1 should be revised to meet international standards (see Annex 2.2)*
- *Death registration form D2 should be made obsolete, replaced entirely by Form D1 (or as interim measure, ICD codes resulting from VA to be integrated)*

3. Deaths are not routinely certified by qualified medical personnel and this is the biggest obstacle for obtaining more complete and high quality cause of death information.

- *Although interim solutions like VA data may be used for deaths in the community, the long term goal remains be to have all deaths medically certified, in accordance with international standards laid out in ICD-10 (or, eventually, ICD-11 due to be released in 2015).*

3.2 Training on ICD death certification and coding

Among the earliest ICD-10 trainings were in 2007, with a focus on certifying and coding deaths in the HDSS sites. In 2011, WHO supported ICD-10 training by an external expert. This training-of trainers approach consisted of training ten medical certifiers (physicians, pathologists and clinical officers) and coders (health record officers) from institutions in different parts of the country to certify and code deaths according to ICD rules and instructions. Training was conducted over a 3-day period using the WHO electronic ICD-10 training tool. The training provided the opportunity for the physicians to bring difficult cases to certify and code according to internationally recommended standards.

Another WHO-supported training targeting physicians and coders from selected hospitals involved in the Road Safety program took place in February 2013. In this training, 15 (of 28 invited) medical certifiers and 21 (of 25 invited) coders from 12 hospitals in Naivasha and Thika districts participated in a 3-day workshop for ICD-10 training using the electronic WHO ICD-10 interactive training tool. The workshop was conducted by Dr. Chebiwot Kipsaina with assistance from Orimba (CDC), Wanjala, Mercy, Isabella and Ndug'u from Kenya. Results from a pre-test showed that medical certifiers of death had no former training on ICD-10 general principles, rules and guidelines, and post-test results showed that substantial understanding had been gained. For the coders, about half of them had had ICD training in college, and a few had had TOT training. The facilitators are due to follow-up in April 2013.[20]

Other than WHO—and possibly CDC who has reportedly indicated possible support in future—development partners have not prioritized ICD death certification and coding as an intervention to support. Furthermore, some hospitals express reluctance to let go of their physicians for the 3–day training. Under such conditions, the WHO electronic tool greatly facilitates cost-effective, flexible self-learning or classroom learning opportunities. This tool is freely available to download from the WHO website.[21]

Institutions that provide training on mortality and morbidity coding can also apply to have their curriculum assessed by the WHO-FIC Network (WHO & HMN, p90-91).

* * *

[20] Full report on the training workshop, 'ICD-10 Certifiers and coders training report', March 2013.
[21] ICD-10 Interactive Self Learning Tool, http://apps.who.int/classifications/apps/icd/icd10training/

Summary (Section 3.2)
All medical personnel who certify deaths should be trained in ICD death certification rules and instructions. However, it is not recommended that personnel in all institutions be trained to assign ICD codes because coding is a very specialized task that needs to be a dedicated activity among a well-trained cadre of coders. It is best carried out in a centralized place to facilitate the consistent application of common standards and procedures (WHO 2012, p95).

- *Train ICD coders at a centralized place, such as at county level, seeking a balance between fewer more highly trained coders coding more deaths, but who are not so far from the place of certification that the events cannot be followed-up for clarification with the certifying physician. Therefore, too, contact information of the certifying physician—or at least the medical records office of the institutions where the death was certified—should be readily available on the Form D1.*
- *Make a proposal to roll out training for medical certifiers in ICD based on a standard curriculum and using the WHO ICD-10 Interactive Self Learning Tool*
- *Make a proposal to roll out training for a specialized cadre of coders in ICD based on a standard curriculum and using the WHO ICD-10 Interactive Self Learning Tool*
- *Revise the medical school curriculum, and continued education for medical personnel, to include a comprehensive ICD curriculum (according to WHO-FIC and/or other standard models)*
- *Electronic ICD coding options exist, such as IRIS, but it is recommended to first train coders to code manually, and once proficiency has been proven then electronic coding may be introduced.*

Indicator 10. Indicators related to ICD-10 training

- Number of medical certifiers trained in ICD using the WHO ICD-10 Interactive Self Learning Tool
- Number of coders trained in ICD using the WHO ICD-10 Interactive Self Learning Tool
- Medical school curriculum revised and reviewed by independent experts, e.g., WHO-FIC network

3.3 COD baseline assessment

3.3.1 Data and methods

WHO requests all Member States to submit annual population and mortality statistics in standard format, including information on underlying causes of death coded according to the International Classification of Diseases (ICD)[22]. These data are made freely available through the WHO Mortality Database (MDB)[23]. Data from Kenya are not available because no official COD statistics have yet been submitted to WHO.

Source of data. The data used to conduct this baseline assessment consist of the most current CoD statistics available, for 2011, provided by the MOH for this purpose. These data were provided in the format of concatenated monthly Excel spreadsheets from medical institutions which contain hospital discharges aggregated by ICD-10 morbidity (for live discharges) and mortality (for deaths in the institution), according to sex and age group. The final data set represents 37,439 observations, including

[22] International statistical classification of disease and related health problems, tenth revision (ICD-10). Geneva, World Health Organization, 2010 (http://apps.who.int/classifications/icd10/browse/2010/en, accessed 27 January 2013).
[23] World Health Organization. On-line database. WHO Mortality database, http://www.who.int/healthinfo/morttables/en/

160 institutions reporting ICD-10 morbidity and/or mortality data, aggregated by ICD code, to the MOH for each month in 2011.

From this dataset we extracted the 46 institutions that reported any ICD-10 coded CoD. This number represents just 1.3% of health institutions (recall that 3412 institutions are responsible for notifying births and deaths to the CRS through the CROs, see Section 2.3). These institutions reported a total of 9497 ICD-10 coded deaths in 2011 to MOH, ranging from 1 to 1500 annual deaths (Table 16). Most of these deaths, however, were concentrated in just a few institutions, for example, only 17 institutions reported at least 100 deaths; the median number reported in 2011 among the 46 institutions was 9.5 deaths.

Although deaths in institutions are recorded on Form D2 that has a section for medical certification, only about 10% of these deaths are medically certified with an ICD-10 code.

Figure 16. Break down of the annual number of deaths being reported by medical institutions assigning ICD-10 coding, Kenya 2012

Number of deaths reported	Number of medical institutions
1-9	23
10-99	6
100-999	14
1000-1500	3
Total	**46**

Note: one institution reporting a death had no code assigned; this may in fact be one of the 45 institutions instead of the 46th.

The 9497 deaths represent about 2% of the expected number of deaths in 2011, i.e., approximately 450,000 deaths (UNESA 2010). Although we cannot assume that these deaths are representative in terms of age, sex and cause, of all deaths in Kenya, it is informative to objectively document the levels and patterns in order to establish a baseline on which future progress can be verifiably measured.

Analysis tool. To conduct this assessment we used the WHO ANACoD tool (WHO 2011b)[24]. ANACoD is a highly appropriate tool for monitoring the strengthening of the CRVS system. The input data consists of population totals by age and sex, the number of deaths by age and sex, and the underlying cause of death in ICD-10 3- or 4-character codes.

ANACoD automated output compares the age and sex distributions of reported deaths with the expected age and sex distributions of estimated deaths by World Bank income-group averages. Kenya falls in the low income group of countries. These comparison estimates are representative of the average experience of all countries in the low income group so it is unlikely that it will be matched exactly by Kenya's national distribution, however, departures from expected patterns can be indicative of underreporting of deaths at certain ages for males or females.

The tool also automatically generates several indicators that reveal potential data quality issues as well as standard indicators including sex and age-specific mortality rates (ASMR), crude death rates (CDR),

[24] ANACoD, 'Analysis of Mortality Levels and Causes-of-Death', consists of automated Excel spreadsheets developed in 2011 by the World Health Organization, in collaboration with Queensland Health Information Systems Knowledge Hub and Health Metrics Network. This tool is freely available to download from WHO website for Standards and tools, http://www.who.int/healthinfo/topics_standards_tools_data_collection/en/index.html.

life expectancy at birth, distribution of deaths by three global burden of disease (GBD) categories[25], estimated coverage of deaths, the top 20 causes of death, and the percentage of ill-defined cause of death codes.

Indicator 11. Decentralization of cause of death coding reporting practices

- Number of health institutions reporting medically certified deaths for which the ICD code was assigned
- Percentage of all deaths notified by institutions that have ICD code
- Median number of deaths reported by institutions that report CoD with ICD codes

3.3.2 CoD data quality

It is important to note up front two fundamental shortcomings regarding the format of Kenya's CoD and population data. One, the 2011 CoD obtained from MOH is reported according to 10-year age group categories, with the open-ended age category of 65+ years. These coarse age divisions lack sufficient precision for accurate monitoring and evaluation, especially since almost 20% of the deaths occurred after the age of 65. In order to prepare the input data in the format needed for ANACoD, it was necessary to redistribute the deaths reported in the 10-year age groups into 5-year age groups, assuming redistribution on a pro rata basis to the population shares in the same age groups. A similar redistribution could have been made for deaths in the 65+ age group-- using different redistribution assumptions since death rates rise sharply after age 65+ years-- however, since this is not a necessary step to take to use ANACoD, and the results would not contribute to the purposes of this data assessment, taking this step was considered a distraction from the main purpose. Furthermore, it is expected that Kenya will take the needed steps to collect mortality data according to standard age categories for future analyses.

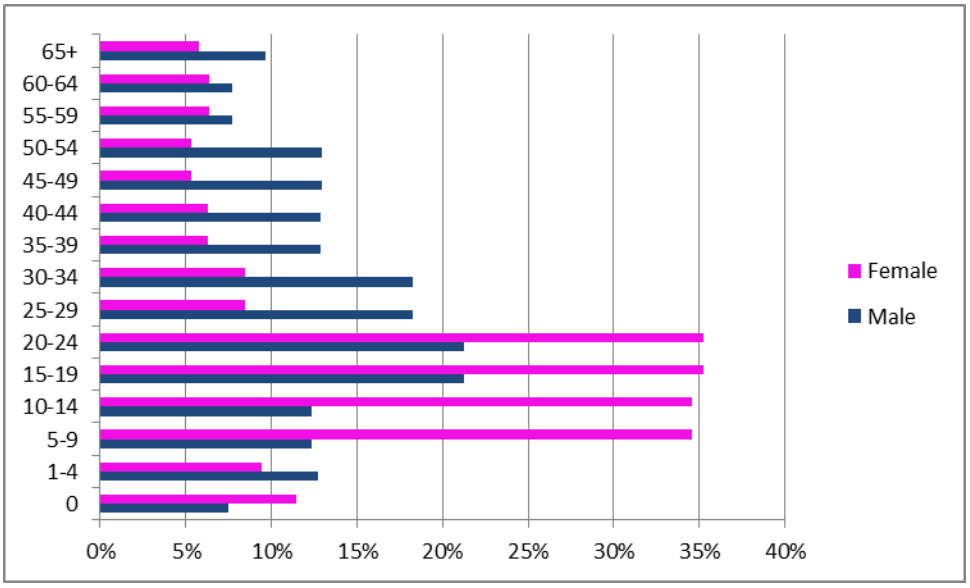
The second shortcoming is related to the input population data that was available to use in ANACoD. Since CoD data for year 2011 was used, population data for the same year should also be used to obtain accurate levels of mortality expressed in rates, prevalence, etc. In this assessment, however, we were obliged to use 2009 population data with 2011 CoD because, although Kenya conducted a recent population census in 2009, KNBS advised us that up-to-date projections cannot be released as long as the court case on the recent census is pending. Since this assessment is targeted more on indicators of quality, rather than assessing mortality levels, it is not an immediate issue. For future monitoring and evaluation, however, Kenya should use annual population data corresponding to the mortality data.

The overall number of ICD-10 3-character codes used was 498 codes for males, and 419 codes for females. This represents about one-third of all possible 3-character mortality codes that can used. (Note, some ICD-10 4-character codes were applied. For the assessment the 4th character was not taken into account and all data were evaluated using 3 characters.) In future, with more training and supervision, the number of codes used will grow as certifiers improve the quality of death certification and coding.

Among the 9497 deaths, 11% (males) and 12% (females) were assigned codes that should not be used, or do not exist in ICD. These invalid codes could simply be due to being wrongly keyed, or they are codes that should not be used for mortality. The invalid codes in Kenya are mostly concentrated in ages 10-25 for females (a third of deaths have invalid codes), and ages 15-35 for males (a fifth of deaths have invalid codes) (Figure 17). The large shares of invalid codes are concentrated in two ICD chapters: Maternal conditions, and Conditions arising during the prenatal period.

[25] The Global Burden of Disease: 2004 Update, World Health Organization 2008.

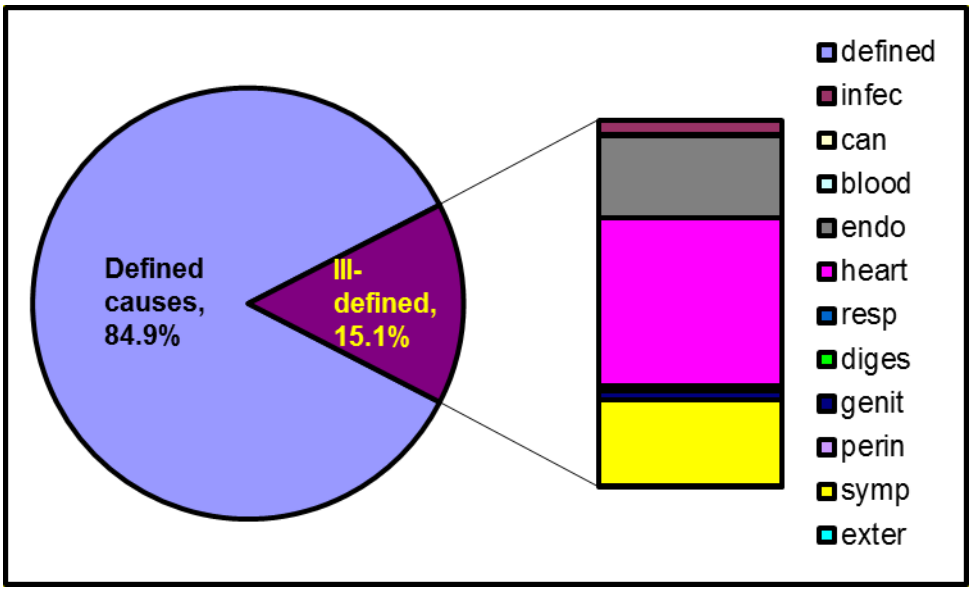
Figure 17. Percentage of deaths coded with invalid codes for underlying cause of death according to ICD-10, by sex and age, Kenya 2011



In addition to the invalid codes, there are also 15% of deaths with ill-defined codes (Figure 18). Ill-defined CoD codes have no value for public health purposes. They fall into two categories including *(1)* codes R00-R99 (ICD-10 Chapter XVIII Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified), and *(2)* codes corresponding to vague or unspecific diagnoses in the other chapters. Ill-defined causes are a results of poor death certification e.g., incomplete, lacking sufficient detail, illegible, or/and poor coding practices.

The largest shares of ill-defined causes were related to the following ICD chapters: Diseases of the circulatory system ('heart'); Symptoms and signs and abnormal clinical and laboratory findings ('symp'); and Endocrine, nutritional, metabolic diseases ('endo').

Figure 18. Proportion of defined causes vs ill-defined causes, Kenya 2011



Indicator 12. Adequacy of input data to assess mortality indicators

- Deaths reported in standard age groups [0, 1-4, 5-79 in 5-year groups, and 80+] (Yes/No)
- Up to date annual projected population figures available (Yes/No)

Indicator 13. Indicators related to the validity and accuracy of ICD certification and coding:

- Percentage completeness of reported deaths with ICD CoD assigned
- Number of ICD-10 codes used
- % invalid codes
- % ill-defined codes

* * *

Summary (3.3.1 and 3.3.2)
Reporting ICD certified deaths is very weak in Kenya, however, the potential for rapid increases in coverage and improvements in quality of coding are strong. The assessment of the MOH CoD database resulted in the following summary of coverage and quality:

In 2011, only 1-2% of all medical institution informants reported any ICD-10 mortality data, and less than half of those report 100+ annual deaths.

In 2011, 40-50% of all expected deaths are registered, 65% of those are notified through a medical institution, and 10% of those are medically certified with ICD-10 code, of those 25% of codes are invalid or ill-defined.

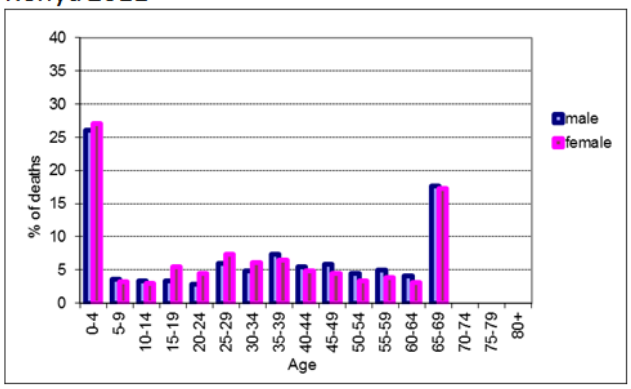
3.3.3 Patterns of mortality

The age distribution of deaths by sex varies according to the overall level of mortality in the population. As mentioned above, the ANACoD tool provides a comparison of the age and sex distribution of reported deaths in Kenya with the average expected age and sex distribution of low income group of countries. Normally, ANACoD shows the distribution of deaths in 5-year age groups from age 0 to 80+, but it was necessary to truncate the deaths in the low income comparison in order to compare the distribution directly with the Kenya's.

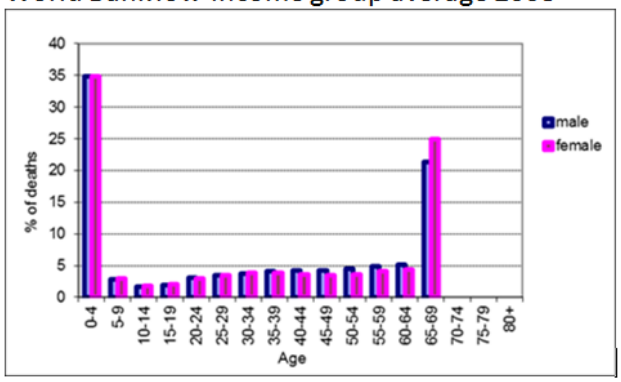
An examination of the two distributions shows that they are similar to each other, but in Kenya relatively more deaths are being captured in young adulthood years (15-39) than are expected for a population with similar overall mortality level (Figure 19). There appears a deficit of deaths reported under five years in Kenya compared to low income countries (about 25% and 35%, respectively) as well as a deficit of deaths reported over age 65 years (about 17% compared to 20-25%, respectively). These deaths among the very young and very old population are more likely to happen at home and therefore less likely to be medically certified.

Figure 19. Age distribution of reported deaths

Kenya 2011



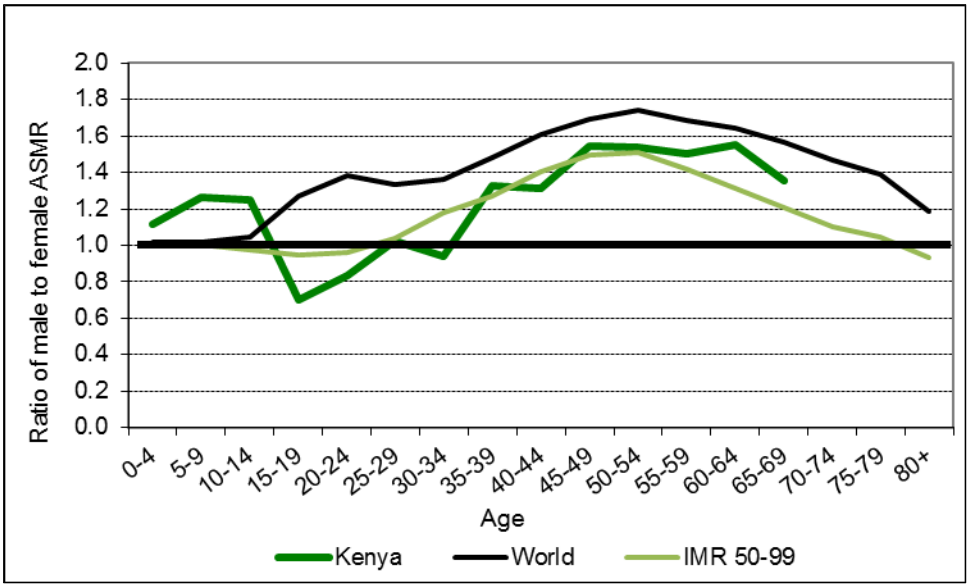
World Bank low-income group average 2008



Mortality rates are generally higher at all ages for males than females, and this is the case all over the world. ANACoD provides a comparison of the ratio of male to female ASMR by age group in Kenya with the observed average ratio for the world and for other countries with similar overall mortality level as indicated by the IMR 50-99. [Kenya IMR in 2010 was 55 (WHO 2012)]. If the ASMR is the same for both sexes, then the ratio would be 1 (i.e. a straight line); a ratio larger than 1 indicates higher male ASMR than female ASMR; a ratio smaller than 1 indicates lower male ASMR than female ASMR.

The ratios of male to female ASMR in Kenya are lower than the world average for all ages after age 15; however, under age 15 there is a higher than expected ratio (Figure 20). This highlights an important pattern to monitor as it suggests that hospital services are sought more readily for male infants and children than for female infants and children. Kenya's sex ratio levels by age group compare well with those in other countries with similar mortality levels. Compared to both comparison distributions, however, there is an excess of female deaths over male deaths from age 15-30. This may be related to maternal causes which occur most commonly during those ages.

Figure 20. Ratio of male to female age-specific mortality rates (ASMR), Kenya and world average 2011



Source: Institute for Health Metrics and Evaluation (IHME). M/F ratios by age came from the sum of deaths from 1981 to 2011 of all countries (192) sorted by IMR. Both numbers (deaths and IMR) are from IHME estimates.

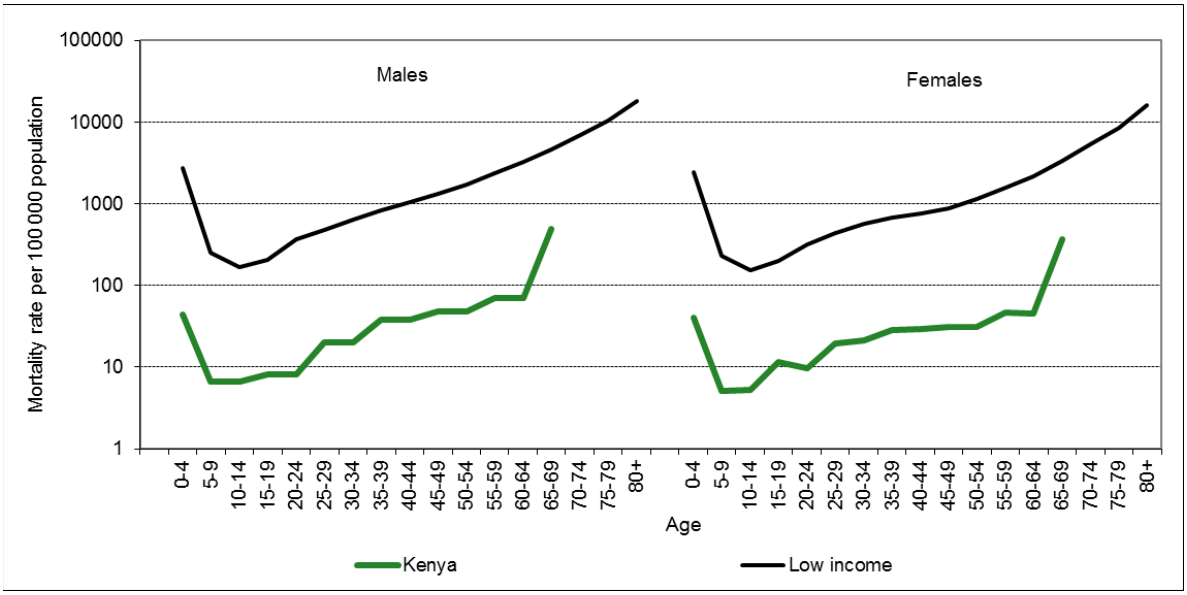
ANACoD plots the natural logarithm of ASMR on a log scale to show the relative variation of mortality rates across age groups in Kenya compared average ASMR of low income group countries (Figure 21).

The level of the Kenya curve is, as expected, unrealistically low because, as stated earlier, the number of deaths represents only 2% of total deaths. However, the pattern and the extent of smoothness of the curve are informative.

The Kenya ASMR curve roughly takes the expected shape of low income countries. For example, the steep upward slope between ages 0 and 4 years for both males and females shows the most rapid change of all age groups before 65 years; the horizontal lines, ages 5−24 years for males but only 5−14 years for females, show no significant change in mortality; the increasing lines throughout adulthood (these should be smooth but in Kenya they are jagged owing to few deaths, and/or assumptions made when redistributing deaths from the 10-year age groups to the 5-year age groups) show a constant change in rates over time indicating an exponential rise in mortality with age.

ASDR log scales can reveal age heaping in the oldest age group by a hook or bend in the right tip of curve. This is particularly exaggerated in Kenya because almost 20% of deaths are heaped at 65+ years.

Figure 21. Log of age-specific mortality rates (ASMR), Kenya 2011 and World Bank income group averages 2008



Source for income group data: Disease and injury regional estimates - Cause-specific mortality: regional estimates for 2008. Geneva, WHO Department of Health statistics and informatics, 2011 (http://www.who.int/healthinfo/global_burden_disease/estimates_regional).

Indicator 14. Indicators related to distributions and patterns of mortality:

- Comparison of the age-sex distribution of deaths with the average distribution of low-income countries i.e., percentage of deaths 0-4 years among all deaths, percentage of deaths 65+ among all deaths
- Comparison of ratios of male to female ASMR by age group with the average ratios of countries with similar mortality level (e.g., IMR 50-99)
- Comparison of the level and pattern of age and sex-specific log ASMR with the averages from low income countries

3.3.4 Levels of mortality

ANACoD generates several mortality indicators from the raw input data. When the mortality data have reached a high level of completeness then these point estimates are useful to monitor the mortality situation over time and across subnational areas. When the data are incomplete, as is the case in Kenya, then the measures are useful to monitor the strengthening of the civil registration and vital statistics systems. It is also informative to compare the estimates computed directly from the vital statistics with periodic survey estimates and other modeled estimates. Over time, as improvements are made and the CRVS system is strengthened, the measures will start to converge.

Currently, due to the extent of under-reporting in Kenya, the indicators generated from the raw vital statistics data are drastically implausible (Table 13). However, monitoring these indicators on a regular basis, and documenting their steady increase towards convergence with expected levels, will reveal objectively measurable improvements in strengthening the system.

Table 13. Comparison of mortality indicators generated from raw data (2011) with WHO estimates

Mortality indicator	Level generated from 2011 raw data in ANACoD	Global estimate in World Health Statistics (WHO 2012)
Crude death rate (both sexes) per 1000 population	0.2	8.8 (2009)
Life expectancy (Males) in years	263	58 (2009)
Life expectancy (Females) in years	334	62 (2009)
Infant mortality per 1000 live births	1.4	55 (2010)
Under-five mortality per 1000 live births	2.1	85 (2010)

Indicator 15. Mortality levels that indicate the completeness of vital statistics

- Crude death rate (both sexes) per 1000 population
- Life expectancy (Males) in years
- Life expectancy (Females) in years
- Infant mortality per 1000 live births
- Under-five mortality per 1000 live births

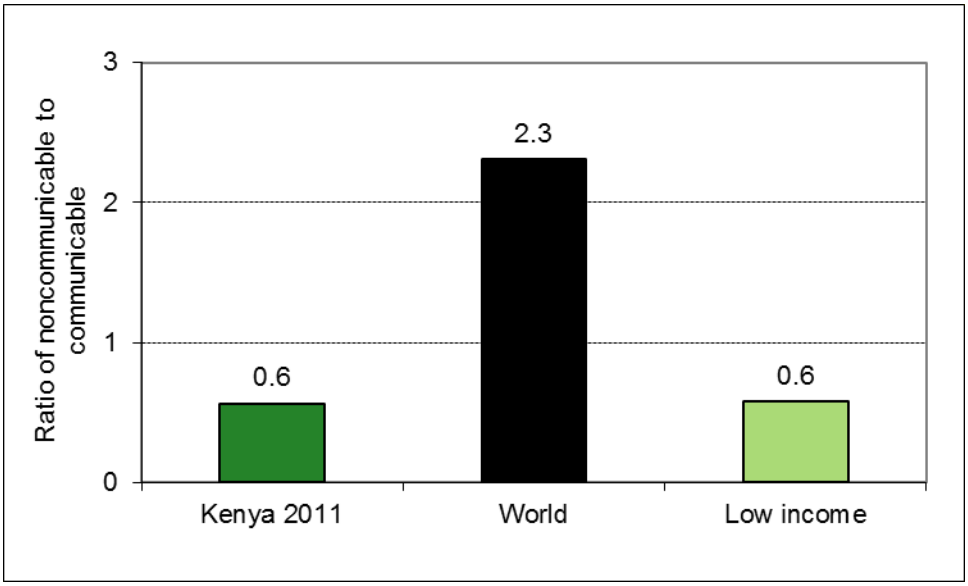
3.3.5 Distribution of reported CoD

According to Omran (1971), developments in health services and new insights into health behaviours will result in an 'epidemiological transition', meaning a shift from a burden of communicable diseases to a burden of chronic or non-communicable diseases (NCD) with people living longer. The transition can be monitored by the ratio of deaths from NCD to those from communicable diseases, which should progressively increase as the country moves through the transition.

In Kenya 2011, the ratio of deaths from NCD to communicable diseases was the same as the average ratio for low income countries (0.6) (Figure 22). It is less, however, than the world average (2.3), and substantially less than the average ratio of high income countries (13.1, data not shown).

The fact that the ratio for Kenya matches that of low income countries suggests that, even though deaths are severely underreported, the current mix of NCD and communicable causes is similar to other low income countries.

Figure 22. Ratio of deaths from non-communicable to communicable diseases, Kenya 2011 and comparison groups including the world and average for low income countries



Source: Disease and injury regional estimates - Cause-specific mortality: regional estimates for 2008. Geneva, WHO Department of Health statistics and informatics, 2011, http://www.who.int/healthinfo/global_burden_disease/estimates_regional

In order to facilitate the monitoring and evaluation of causes of death, the GBD project classified all causes of death into three categories: Communicable, maternal, perinatal and nutritional conditions (group I); Noncommunicable diseases (group II); and Injuries (group III). The distribution of the three main categories has also been modeled by WHO for each of the six WHO regions, and for each Member State.

The WHO modeled distribution for Kenya in 2008 shows almost equal proportions for communicable diseases (44%) and NCD (48%), and 8% of deaths caused by injuries (Table 14). Comparing these expected proportions with the reported data in Kenya in 2011, the results suggest that the reported data are actually missing a substantial share of deaths attributable to NCD—suggesting also that Kenya is actually further along in the epidemiological transition than other low income countries and not on par, as shown above. The under-reporting of NCD deaths is in-line with the earlier finding that there is a deficit of deaths reported over age 65 years, since these older deaths are usually attributable to NCD (Figure 19, above).

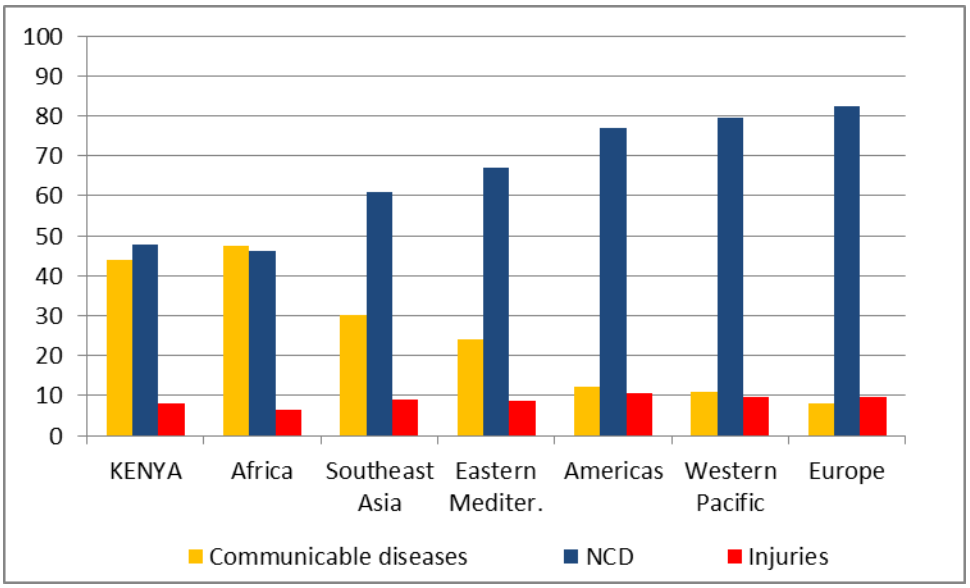
Table 14. Proportion of deaths according to three major classifications (communicable disease, non-communicable disease, and injury, Kenya 2011 (reported) and 2008 (modeled)

	Causes of death	Kenya 2008 Expected proportions[a] (%)	Kenya 2011 Reported proportions (%)
1.	Communicable, maternal, perinatal and nutritional conditions	44	61
2.	NCD	48	35
3.	Injuries	8	4

[a] The expected proportions are from WHO models representing the 2008 mortality situation in Kenya (WHO 2012)

Figure 23 simply plots the WHO proportions for each of the three classifications of causes and compares Kenya to the different geographical regions. As explained by the epidemiological transition, the more developed regions have the largest shares of NCD.

Figure 23. Burden of mortality by percent distribution of three major causes of mortality, Kenya and WHO Regions 2008



Source: WHO 2012

The expected patterns of deaths by age and major cause category has been established by demographers and epidemiologists based on many years of data in many different settings. As above, standard distributions for various income groups are provided by ANACoD and it is useful to compare the reported pattern of deaths in Kenya with the expected pattern in countries with similar mortality burdens. The Kenya distribution (Figure 24) is compared to the low income countries' in (Figure 24b).

The first observations related to the distributions are that the Kenya data are truncated at 65 years due to lack of more detailed input data after that age. Comparing Kenya with the low income country standard distribution, group I and group II deaths (from communicable diseases and NCD, respectively) appear roughly similar in their patterns and even their levels. The biggest difference is the age at which the group distributions cross-over each other: Kenya group II crosses over group I at 50-55 years, while it is much earlier for the low income countries (40-45 years for males, and 35 years for females). In fact, standard distributions for any level of income show the cross-over at a much earlier age than Kenya's. It is possible that communicable diseases later in life, such as HIV, are maintaining the level higher than average.

Group III, deaths from injuries, appear to be under-represented in the reported data. This is a surprising result since these might be considered to be the most likely cases to die in hospital and therefore be medically certified and assigned and ICD code.

Figure 24a. Proportion of deaths due to communicable diseases (group 1), non-communicable diseases (group 2) and injuries (group 3), Kenya 2011

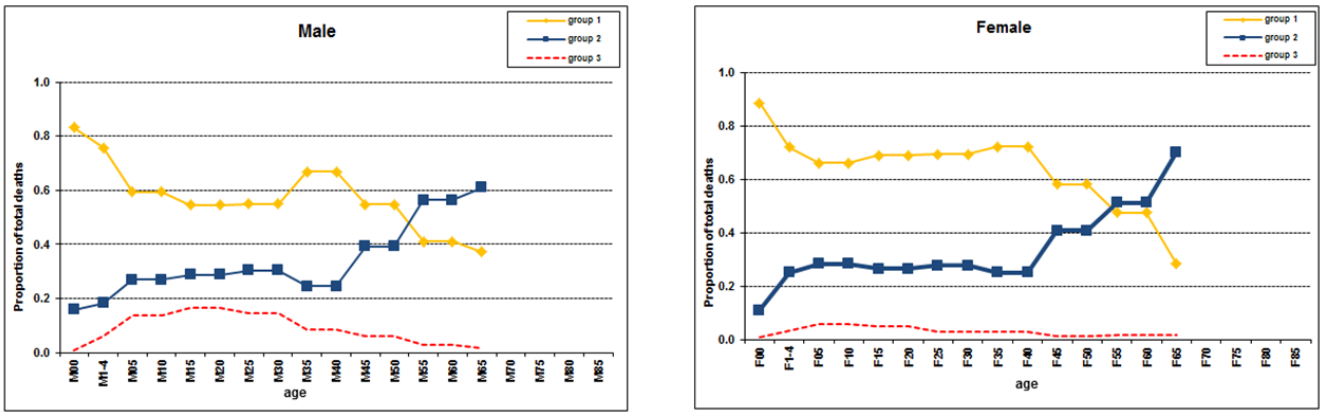
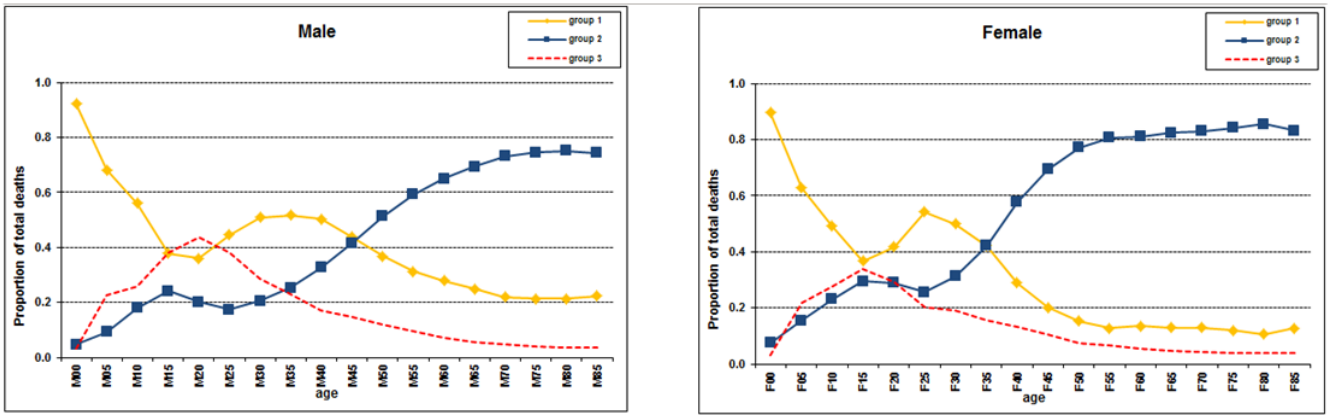


Figure 24b. Proportion of deaths due to communicable diseases (group 1), non-communicable diseases (group 2) and injuries (group 3), low income country (comparison distribution)



Source: Disease and injury regional estimates - Cause-specific mortality: regional estimates for 2008. Geneva, WHO Department of Health statistics and informatics, 2011, http://www.who.int/healthinfo/global_burden_disease/estimates_regional

Annex 5.1 shows the age and sex pattern for the number of specific causes of death reported. Note that there appears to be an improvement in assigning codes to HIV-attributable deaths rather than 'hiding' them in diarrheal causes, respiratory causes, ill-defined codes (*cf.* Ma Fat and Nariani 2009). Annex 5.2 shows the top 20 causes of death among the reported deaths in Kenya in 2011.

Indicator 16. Indicators of biases in reporting CoD

- Ratio of non-communicable to communicable to communicable diseases
- Proportions of deaths according to three major classifications (communicable disease, non-communicable disease, and injury

3.4 Maternal deaths

In 2010, there were an estimated 5500 maternal deaths in Kenya, which translates into about 10% (53,000) of total deaths of reproductive-age women (WHO *et al*. 2012). In 2011, the MOH ICD-10 COD database identified 342 maternal deaths, which translates into about 20% (1692) of total deaths of reproductive-age women. This indicates that, although the number of maternal deaths reported is only

about 5% of the number of expected maternal deaths, these types of deaths are being identified and reported relatively more frequently than other causes of death.

Two-thirds of these maternal deaths occurred during delivery, followed by deaths related to pregnancies with abortive outcomes (mainly unspecified abortions), followed by deaths due to other maternal disorders related to pregnancy (Table 15). The review of causes of maternal deaths raises a red flag when broken down by age. A full 15% of maternal deaths occur at improbable ages, that is, 50 maternal deaths to girls under 10 years and 5 to women over 54 yrs. The death records show that 44 deaths occurred to girls under age 10 during delivery. This is a very disconcerting observation and the deaths should be reviewed for accurate classification and age, and if found accurate, then measures taken to prevent such early pregnancies in the first place.

Table 15. Cause of maternal deaths reported through MOH vital statistics, 2011

ICD-10 Chapter XV. Pregnancy, childbirth and the puerperium		Number*		
ICD-10 code	Cause of maternal death	Total	*<10 yrs*	*>54yrs*
O00-O08	Pregnancy with abortive outcome	35	*1*	
O10-O16	Oedema, proteinuria and hypertensive disorders in pregnancy, childbirth and the puerperium	6		
O20-O29	Other maternal disorders predominantly related to pregnancy	36	*1*	
O30-O48	Maternal care related to the fetus and amniotic cavity and possible delivery problems	13		
O60-O75	Complications of labour and delivery	11	*3*	*1*
O80-O84	Delivery	226	*44*	*4*
O85-O92	Complications predominantly related to the puerperium	7	*1*	
O94-O99 *(except O96 & O97 for late maternal deaths)*	Other obstetric conditions, not elsewhere classified	8		
O00-O99	**Total**	**342**	***50***	***5***

*an additional 6 maternal deaths were classified in the 0-4 year age-range. A total of 64 maternal deaths, therefore, are not within the expected age of 10-55 years.

A further problem with several deaths coded with chapter O codes-- causes related to pregnancy, childbirth and the puerperium-- is that several of these codes are not supposed to be used for cause of death according to mortality and morbidity coding rules and guidelines in ICD-10 Volume 2 (WHO 2011a): O08 (2 deaths)[26]; O80 (211 deaths); O82 (3 deaths)[27].

One approach to improving statistics on maternal deaths is to establish a maternal audit mechanism for systematically reviewing the circumstances surrounding the deaths of women of reproductive age. In Kenya, agencies such as UNICEF are supporting the establishment of maternal (and perinatal) death reviews (MDR) in order to ensure the correct classification of cause of death among women of reproductive age, and thereby improving vital statistics related to maternal mortality. The goal of the

[26] Complications following abortion and ectopic and molar pregnancy: Not to be used for underlying cause mortality coding. Use O00-O07.

[27] O80-O84 Method of delivery: Not to be used for underlying cause mortality coding. If no other cause of maternal mortality is reported, code to Complication of labor and delivery, unspecified (O75.9)

MDR in countries with a weak civil registration vital statistics system, including Kenya, is to establish a national surveillance system which systematically identifies all deaths of women of reproductive age, and which are consequently reviewed by a panel of specialists according to clear guidelines. With proper training and coordination at all levels, this is a potentially good approach to improving statistics on maternal mortality (as well as to identify causes of maternal deaths that were avoidable). On the other hand, in countries with functioning civil registration vital statistics systems, a MDR is usually conducted as a special study to determine the extent of misclassification of maternal deaths. The resulting adjustment factor–specifically, the ratio of maternal deaths to nonmaternal deaths–may be used to correct for under-identification of maternal mortality in the civil registration system (WHO *et al.* 2012 pp47-48).

One shortcoming of a MDR surveillance system is that it is usually implemented by the MOH and often the cause of death information that is corrected as a result of the review is not integrated with the COD data reported through the civil registration system. In Kenya, however, the MOH maintains both the COD database as well as oversees the MDR, so integration may be more likely. If the MDR is envisioned to strengthen the civil registration vital statistics system, as it should be, then the correct cause of death information of women of reproductive age that occur in regions where the medical institution reports ICD-10 COD to the MOH, must enter into the monthly reports of causes of death submitted by the medical institution to the MOH. (Eventually, these COD data may also be channeled through the CRS.)[28]

Another approach to improving the identification of potentially misclassified maternal deaths is to revise the Form D1 death registration form. In particular, WHO recommends that pregnancy-related deaths and late maternal deaths be captured on the medical certificate of death form[29]:

> *"A pregnancy-related death is the death of a woman during pregnancy, childbirth and puerperium or within 42 days of termination of pregnancy, irrespective of the cause of death (obstetric and non obstetric)" (WHO 2011a, p.156).*

> *"Late maternal death is the death of a woman from direct or indirect obstetric causes more than 42 days but less than one year after termination of pregnancy" (WHO 2011a, p.156).*

Such additional information would permit monitoring the proportion of pregnancy-related deaths to maternal deaths, and also inform the maternal review process of deaths that are more likely to be misclassified maternal causes. Figures 25a and 25b show examples of death certificates from the United States and from Turkey that include the recommended questions.

Figure 25a & 25b. Extracts from death certificates, Turkey and United States

a. Turkey

G	If female	☐	Death occurred during pregnancy	☐	Death occurred during delivery	☐	Death occurred within 42 days after

[28] For information on maternal death audits, see the World Bank article, Maternal Death Audit as a Tool for Reducing Maternal Mortality (2011) http://siteresources.worldbank.org/INTPRH/Resources/376374-1278599377733/MaternalDeathAuditMarch22011.pdf

[29] "In order to improve the quality of maternal mortality data and provide alternative methods of collecting data on deaths during pregnancy or related to it, as well as encourage the recording of deaths from obstetric causes occurring more than 42 days following termination of pregnancy, the 43rd World Health Assembly in 1990 adopted the recommendation that countries consider the inclusion on death certificates of questions regarding current pregnancy within one-year preceding death" (WHO 2010, p.156).

		pregnancy
	☐ Death occurred between 43 and 365 days after pregnancy	☐ Not maternal mortality

25b. United States

36. IF FEMALE:
☐ Not pregnant within past year
☐ Pregnant at time of death
☐ Not pregnant, but pregnant within 42 days of death
☐ Not pregnant, but pregnant 43 days to 1 year before death
☐ Unknown if pregnant within the past year

* * *

Summary (Section 4.3)
Among deaths that are assigned an ICD-10 cause of death code, maternal causes do not appear to be under-represented. This is probably due, in part, to the fact that the 'universe' of deaths certified and coded in Kenya includes those that happened in institutions, and are not necessarily representative of all deaths.

The quality of ICD classification, however, raises a red flag because 1) an improbable share of deaths is among girls under 10 years of age, and 2) well over half are invalid codes for mortality.

- *Increase quality control over the quality of ICD death certification and coding in general, and in particular regarding maternal deaths to minimize the invalid and ill-defined codes*
- *Support efforts to conduct maternal death audits to verify correct classification of deaths among women of reproductive age*
- *Ensure that the final cause of death resulting from the maternal death review is correctly transcribed onto the death registration form, and/or processed through the MOH who is currently the repository for cause of death data.*
- *Revise the death registration form to include the WHO-recommended data fields to capture pregnancy-related deaths and late maternal deaths.*

4. Stakeholder interventions

There are several recent or on-going interventions initiated by national stakeholders and development partners (DP) that aim to strengthen different aspects of the civil registration vital statistics system e.g., improving coverage, testing tools, and improving availability of data.

In order to obtain the greatest benefit, it is important that the interventions are:

- in-line with priorities identified by the national authorities
- harmonized with other interventions

- integrated into the national system
- plan for roll-out and sustainability

This assessment intends to document the major activities in order to possibly contribute to them or build on them, and to avoid duplicating efforts. During the mission in January/February 2013 the main DP were contacted by email and/or telephone to request an interview. Not all were available for a face to face meeting. For those that provided information on their interventions, a summary description is presented below.

KEMRI/CDC Health Demographic Surveillance Sites

A meeting was not possible during the assessment period, but below is information learned indirectly about the interventions.

Since the early 2000s KEMRI/CDC has established health demographic surveillance sites (HDSS) in 385 villages.[30] In some of these villages, village reporters notify births and deaths while specially trained interviewers administer the verbal autopsy (VA) tool on paper questionnaires. The completed VA questionnaires are then given to two clinical officers who review the information and derive the most probable underlying cause of death.[31] For cases where the two officers do not agree on the cause, a third officer evaluates the case and assigns the cause.[32]

This activity has been conducted mainly for research purposes and the information is not necessarily registered by the assistant chief nor otherwise integrated into the national CRD system. In order that the general population might benefit from this potentially important information, MEASURE Evaluation has attempted to harmonize the six HDSS sites. The MOH has also suggested meeting quarterly with CRD and CDC to jointly review the HDSS vital statistics and cause of death data, and to determine if and how findings may be extrapolated to the national level. One of the barriers is that data collection and analysis is financed by DP, and not the GOK, so the information is not made available for public use.

PLAN International

PLAN International, in Kenya since 1982, oversees child protection programs in nine districts. In 2005, during a UNICEF regional meeting in Mombasa, the Assistant Chief of Kwale indicated to international partners that registration had increased for births and deaths because community-based organization (CBO) were acting as local agents. The population may have found the local agents more approachable than the AC, both in terms of social receptivity and geographic access.

From 2008-2012, the Finnish Govt. funded an IT pilot study in five rural communities in Kwale, Msabweni and Kinango districts of Kwale County. This was a research project where NOKIA provided 'NOKIA data gathering' technical services and the CBOs in the districts were each provided with a mobile (smart) phone in which the birth registration form (B1) was programmed into it. The CBO registered births directly and, by the end of the third year, results clearly showed that from a technical standpoint the decentralized transmission of personal registration information can successfully happen. However, one of the difficulties was that, at the time of these pilots, there was no existing repository or

[30] Kenya Health Demographic Surveillance System (HDSS), http://www.cdckemri.org/index.php?option=com_content&view=article&id=59:health-demographic-surveillance-system-hdss&catid=36:hdss&Itemid=54

[31] Trainings are conducted using MEASURE Evaluation Verbal Autopsy Field Manuals, http://www.cpc.unc.edu/measure/tools/monitoring-evaluation-systems/savvy

[32] Methodology is based on Verbal Autopsy Standards: Ascertaining and attributing causes of death (WHO 2007)

infrastructure in the CR system in which the transmitted data could ultimately be stored. The project therefore developed its own storage system, with computers and a local server in Kwale, but even so the final data fell short of being integrated into the national CR system. If the data do not reach the national CR system then the event is not legally acknowledged and it is not counted in the vital statistics. There were furthermore legal issues related to data security, especially as the IPRS is being developed and this draws from information in the CR system.

Within the last two years, the new CRD electronic reporting system (CRVSS) is connected with the IPRS. The CRVSS is being piloted in ten districts, and has the potential to make the system much more efficient, and at the same time, reduce duplicates in the system. Currently, in the manual system, duplication of registration is a problem. For example, if a birth was registered but five years later, when a birth certificate is needed for school enrolment, the individual's original registration cannot be found. The parents therefore are obliged to re-register the child. There is also potential for duplication if the event is registered in the medical institution, and the family re-registers with a community agent. Now, since the primary schools are pressed to require a birth certificate, there is potential for a wave of duplication in the system. This may, at least temporarily, inflate coverage rates artificially.

The Civil Registration Policy is under development (according to the CRD Strategic Plan). One recommendation in the Policy should be that all events should be electronically recorded, and no cases should be rejected from the system due to missing information. Multiple sources of ID should be entered in order to increase search and find probabilities, and also to verify the individual seeking services after registration.

PLAN at international level as well as in Kenya, are very much in favor of using IT to improve the coverage and quality of vital events. M-Pesa Agents model was cited as a potential model, or at least proof, that electronic registration with proper security mechanisms, can be achieved in a matter of just a couple/few years if it is a government priority.

The GOK is collaborating with PLAN in awareness creation on birth registration in selected districts (HIS Strategic Plan 2009-2014). The selected districts include Kwale, Msabweni and Kinango districts of Kwale County and Kaloleni and Ganze districts of Kilifi County.

PLAN used to help families in Kilifi district to obtain their child's birth certificate by paying the required processing fee for them to the CRO. This improved the situation of more children having a birth certificate, but the support was not sustainable and improvements seen in short term dropped off when PLAN stopped paying.

UNFPA

A meeting was not possible during the assessment period. Below is information learned from CRD about the interventions.

In 1982 UNFPA provided assistance to CRD to improve coverage through awareness campaigns and training. This was done through a pilot project, 'Civil registration improvement project', involving community workers reporting births and deaths in Nyeri and Lurambi divisions of Kakamega district. This resulted in rapid increase in coverage but could not be sustained without donor funding. 'As a result, the government introduced community-based registration system whereby community members were required to notify events in their community' (CRD 2008 p2).

Interestingly, despite results in the initial efforts to use CHW to increase registration coverage, in 2012 UNFPA again supported the training of community health workers (CHW) to sensitize families to report

events, it also trained all MCH service providers and provided them with registration materials to notify home births. This was piloted as part of the MCH strategy by UNFPA in Migori and Kilifi districts in July and November 2012. CRD reports that results were very good, and is considered a sustainable approach because the health sector is also motivated to have complete, timely information.

UNICEF

Up until the late 1990s, UNICEF collaborated with CRD to support social sensitization. This stopped support in the late 1990s (Ma Fat and Nariana 2009).

Currently, UNICEF is planning to pilot a 'modeling strategy' to increase birth registration in four counties, including three in Nyanza/Western Kisumu (with high IMR and low registration) and one in North Eastern, Turkana (with vast, remote areas). This is approach is in line with the Community Health Strategy and promotes the use all local stakeholders to assist with notifying events, including religious leaders, CHW, schools, thereby increasing registration coverage including the registration of OVC. The model also strives to create strategies whereby families may obtain their child's birth certificate more easily, for example, the CRO sending certificates to the local health institution or to the assistant chief for more convenient, faster retrieval. Successful strategies will be recommended for application in other areas, with adaptations made for each unique setting.

In addition, UNICEF supported a very informative report, Birth Registration in Kenya Rapid: Rapid Assessment visit 23-29 March 2012 (UNICEF 2012). The assessment aimed to accomplish the following: expound on birth registration in light of the new Constitution; describe the situation in a local CRO (Kajiado district); identify steps and support mechanisms to support the GoK in achieving universal birth registration.

World Bank

The World Bank was not contacted during the mission, and no further details were found on the World Bank Kenya website.

Through the STATCAP project, World Bank has supported CRD undertake community mobilization and sensitization campaigns in ten densely populated districts with low registration coverage. This involves training of registration agents and sensitizing key stakeholders (primary school heads and CHWs) in registration. STAT-CAP also supported an assessment conducted by KNBS and University of Nairobi Population Studies and Research Institute (PSRI) in three purposefully-selected districts, Mombasa, Nakuru, and Kisumu. This was mainly qualitative information that was gathered about the barriers to registration.

The CRD archives approximately 50 million birth and death registration forms dating back a century ago. World Bank is funding the 'data conversion' of some of these historical data, starting in the Nairobi ACK CRO during the first six months of 2013. It will scan and digitalize the original paper birth and death forms that are bound and stored separately in volumes of 250 forms. Although at central CRD the duplicates of all original forms are stored in similar bound volumes, the duplicates may not be clear enough for the image scanning. The data conversion project will expand outside of Nairobi to the remaining 46 counties. It is envisioned that the original volumes from local CRO will be collected at county level to facilitate the most completed and efficient conversion process.

World Health Organization

WHO funded a 4-day working retreat in Naivasha to draft the Department of Civil Registration Strategic Plan 2013-2017 (MSIRP circa 2011). The final Plan is pending formal adoption by the government.

As part of the WHO initiative, Monitoring of Vital Events with IT component (MoVE-IT), a project where community health workers use mobile phones with RapidSMS to notify births and deaths was piloted in two districts (Naivasha and Gilgil)[33]. One lesson learned using mobile phone technology was that notifying the assistant chief with an SMS did not necessarily result in the event getting legally registered through the CRO. Furthermore, during the pilot, the mobile phone programming was sometimes interrupted with bugs, and the transmission of the SMS was not free. The results of this project and its wider applicability will be discussed during the dissemination workshop planned for May 2013.

Also in the context of the MoVE-IT project WHO supported a rapid assessment using the WHO rapid assessment tool (WHO 2010). The objective of the rapid assessment was to determine the current status of the National Civil Registration and Vital Statistics System NCRVS and to identify areas for improvement. An informative summary report was produced entitled, National Civil Registration and Vital Statistics Rapid Assessment, Final Report (WHO & HMN 2011).

WHO facilitated the initiative, Accountability for Women and Children's Health, and held a meeting in Tanzania in February 2012 where a Framework assessment was presented and team of Kenyan participants drafted possible actions to strengthen CRVS.

Finally, WHO is investing in the development of an InterVA tool that may be installed on a smart phone and the results assessed automatically to generate the probable underlying cause of death. For those cases where the results do not result in an automatically-generated cause, then a physician review will be done. The tool was due to be ready for piloting in 2012 but is not yet available.

WHO has also supported holding of two National Stakeholders' conferences to strengthen the CRVS collaboration and linkages.

World Vision

World Vision confirmed that they are involved with improving birth registration, but were not met during the assessment period. No information was found on the World Vision Kenya website.

Others

In addition to the development partners listed above, the CRD Strategic Plan 2013-2017 [draft] mentioned also ADB, CDC and UNDP as development partners who may be able to provide additional financial resources (MSIRP *circa* 2011, p36).

* * *

Summary (Section 4)

Development partners are providing a variety of support including:

(1) increasing notifications by supporting the expansion the potential for increased notifications (UNFPA, UNICEF, WHO) and by using mobile phone technology (PLAN, WHO).
(2) capturing historical registration information in electronic medium (World Bank)

[33] Registering births and deaths using mobile phones in Kenya, project description, http://www.who.int/healthmetrics/news/registering_birth_death/en/index.html

(3) documenting a situation assessment (UNICEF)
(4) using verbal autopsy to assign cause of death to deaths in the community (CDC/HDSS)

There are important lessons learned from these interventions. The potential of mobile phone technology to rapidly convey notification information is weighed against the costs of purchasing and maintaining hardware, information transmission, and programming bugs. Furthermore, increasing notifications, either by mobile phone technology or by expanding the number of local agents, does not necessarily result in full legal registration if that registration must occur through inefficient, ill-equipped, and manually-operating CRO. Furthermore, if the number of authorized informants is expanded beyond the existing ones, then this will require additional oversight by the CRO to ensure a constant provision of official registration materials, to collect completed forms, and to provide training and feedback on the quality of notifications.

There are more interventions that target births than deaths. Death registration requires similar procedures as birth registration except that, by international standards, a death must also be certified and assigned an ICD cause of death code for underlying cause. Given that nationally only 2% of deaths are assigned an ICD code, and none of these are currently processed through the civil registration system, there is surprisingly little emphasis on ensuring that this information will become available for analysis and use.

- *As long as the civil registration system operates manually, paper notifications will remain necessary. The CRD integrated electronic system for birth and death registration should be rolled out, and eventually electronic notifications from mobile phones, and from the MOH electronic system (DHIS2), can be processed seamlessly and eventually phase out manual notification and registration.*
- *Assigning cause of death is a huge obstacle even for deaths occurring in an institution. An interim measure to improve availability of cause of death data would be wider use of the electronic verbal autopsy tool that WHO is developing. However, since the cause of death resulting from verbal autopsy does not meet international standards for attributing CoD at individual level, there should be at the same time accelerated efforts to train medical students, physicians and coders to certify and code deaths according to ICD rules and instructions.*

5. Summary of findings and recommendations

To-date, Kenya's civil registration system has not functioned adequately enough to produce useable vital statistics on births, deaths and cause of death needed for planning, administration, and monitoring health and demographic trends. However, Kenya does have a national structure in place that, with coordinated investments to modernize the system in line with international standards for national systems, could rapidly progress towards improved functionality and more complete, higher quality vital statistics.

Several sections of this report provide summaries and recommendations for specific areas of the civil registration system. In addition to these, the main findings and related recommendations are:

(1) Community-based strategy
Community-based registration relies on local registration agents that are not sufficiently facilitated and held accountable for notifying all events. This concerns assistant chiefs, in particular (Section 2.1).

⇒Notify all vital events through the health system. The logic of this solution is that, for births, the notification would also serve to initiate early infant and early childhood care in the health system; for deaths, the notification would also prompt medical certification and diagnosis of the causes of death. Staff connected to health institutions e.g., health extension workers, public health officers and/or community health workers, would be the most appropriate cadre for notifying/pre-registering events that occur outside of the institution (*see Minister of Health circular, February 2013, promoting birth notification through MCH centers*).

(2) Civil registration services
There are inadequate civil registration services to reach clients and provide sufficient registration and certification of events in the population, and to supervise local registration agents (Section 2.3).

⇒Establish additional CRO where current registration regions are serving large or sparse populations; ensure personnel designated to oversee the completeness, accuracy and timeliness of notifications from local registration agents. Other measures to expand services such as mobile services or application of technology could also be explored.

(3) Processing and storage of vital registration data
Civil registration services are manual and inefficient, resulting in unsuccessful or time-consuming search and retrieval, duplicate registrations, and unreliable vital statistics (Section 2.6).

⇒Implement the CRVSS integrated electronic system in all CRO (Section 2.5). This will automatically address many barriers that exist due to a manual reporting system. The CRVSS must ensure 1) CRO are connected to the CRD for timely reception of cases at central level, 2) CRO are networked in order to search and retrieve registered cases anywhere in the country (e.g., to prevent duplicate registration, to register cases outside of place of occurrence, and to issue certificate outside place of registration), 3) interoperability with MOH for seamless notification of cases through the health system, and with KNBS to verify data prior to disseminating official statistics.

(4) CoD statistics
It is not clearly mandated how CoD statistics should flow, and who is responsible for compiling, analyzing and disseminating the official statistics (Section 3.1).

⇒Review the Statistical Act for guidance on a clear decision on which entities are to be responsible for compiling, analyzing and disseminating official cause of death statistics. This decision would determine the flow of statistics. In many countries, for example, the health sector compiles and processes the statistics and the national statistics office disseminates aggregate information (the CRD does not compile, process, use or disseminate CoD information).

CoD statistics are inadequate because medical certification and coding procedures are weak due to lack of standardized ICD training (Section 3.2), resulting in a large majority of deaths that are not medically certified and assigned a valid ICD-10 code (Sections 3.3.1 and 3.3.2).

⇒ Develop a standard ICD-10 training curriculum in line with international standards. Train all medical certifiers of death and a cadre of specialized coders using standardized training, and conduct regular quality assurance to follow up. Expand the medical certification of all deaths followed by the assigning of ICD-10 code by specialized coders in a semi-centralized fashion.
⇒ Verbal autopsies may be conducted as an interim measure, with an understanding that causes of death from VA may shed light on community patterns of mortality, but they are not in accordance with international standards for assigning individual causes of death. The CoD statistics from VA and ICD certification and coding should therefore not be mixed.

(5) Dissemination official vital statistics
Vital statistics reported by CRD in annual vital statistics reports are not consistent due to: poor data quality in CRO monthly summary reports, lack of verification and correction of statistics reported by CRO, and failure to explain or otherwise point out inconsistent numbers in the annual report. Further, the KNBS vital statistics are not harmonized with those reported by CRD, and, although there are valid explanations for some differences e.g., due to late registrations, the consumer is left quite uninformed and therefore with little confidence in the statistics (Sections 2.4.1 and 2.4.2).

⇒Develop procedures and conduct regular reconciliation, verification, and harmonization of vital statistics.
Reconciliation occurs monthly in the registration region where the CRO and health officers reconcile individual births and deaths recorded in the health system to ensure that are each one is notified to the CRS.
Verification occurs monthly when CRD systematically verifies vital statistics reported by CRO to ensure their completeness and consistency.
Harmonization occurs periodically between CRD and KNBS, prior to releasing official vital statistics.

(6) Monitoring and evaluation of CRVS system
Aside from the CRD annual reports which provide annual statistics on vital events, there is not a monitoring and evaluation framework in place (Section 2.4). While investments are increasingly being made to strengthen the CRVS system there needs to be regular **monitoring of the system**, and of the progress towards completeness and quality of the statistics it produces. When the completeness and quality reach sufficiently high levels (e.g. 85% completeness and <10% ill-defined causes of death), then the vital statistics will be useful for monitoring demographic trends and causes of death.
⇒Use a set of objectively verifiable indicators, such as the ones presented in this report, to regularly monitor system strengthening.
⇒ Transform the CRD annual vital statistics publication into a joint publication between CRD, KNBS and MOH. Joint collaboration would significantly improve the quality of information (e.g. harmonized registration figures), enhance the content (e.g. include medically-certified CoD information) and broaden dissemination and use (e.g., report and even data made available on respective websites).

* * *

From this assessment, there are four main areas identified that would make the biggest impact on strengthening the CRVS system:

1) Expand the CR services in target areas
   (political, bureaucratic challenges)
2) * Phased roll-out of the CRD integrated electronic system
   (technical challenges)
3) Transition the responsibility of notifications to health system
   (political, legal, social challenges)
4) * Phased roll-out of training on ICD death certification & coding using standard tool & curriculum
   (technical challenges)

* indicates areas where coordinated partner contributions would be the most useful, i.e., supporting technical challenges

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Road Map to Improve Causes of Death Data with Verbal Autopsy and ICD-10. Developed in 2010 with input from MOH, CRD and NBS.

Annexes

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Annex 2. Review of birth and death registrations forms: minimal recommended information

Annex 2.1. Review of birth registration form, *FORM B1*, in light of UNESA-recommended information

UNESA-recommended information	*FORM B1* *Register of Birth*, Kenya
Information about birth	
Date of occurrence (of birth)	yes
Date of registration	yes
Place of occurrence (of birth)	yes
Place of registration	yes
Type of birth (i.e. single, twin, triplet, quadruplet, or higher multiple delivery)	yes
Attendant at birth	no
Sex	yes
Birth weight	yes
Information about Mother	
Date of birth	no
Marital status	yes
Educational attainment	yes
Place of usual residence *(see definition below)*	yes
Children born alive to mother during her entire lifetime	yes
Children born to mother during her entire lifetime and still living	no
Foetal deaths to mother during her entire lifetime	yes
Date of last previous live birth	no
Date of marriage	no
Information about Father	
Date of birth	no
Marital status	no
Educational attainment	no

Source: UNESA 2001, pp 16-18, with an explicit definition of each item pp 27-42

Annex 2.2. Review of death registration form, *FORM D1*, in light of UNESA-recommended information

UNESA information	*FORM D1 Register of Death, for use in health institutions and by Medical Practitioners*	Observations *Includes a burial permit on top part.*
Information about death		
Date of occurrence (of death)	yes	
Date of registration	yes	
Place of occurrence	yes	
Place of registration	yes	
Cause of death (*per WHO standard form*)	no	Needs 4 lines including immediate cause (1), antecedent conditions (2), underlying cause (1); also need intervals between onset of conditions and death.

Certifier[34]	yes	
Personal characteristics		
Date of birth	no	Age is recorded
Sex	yes	
Marital status	yes	
Place of usual residence	yes	
Place of usual residence of the mother (for deaths under one year of age)	no	

Source: UNESA 2001, pp 19-20, with an explicit definition of each item pp 27-42

The main form revisions needed to FORM D1 include:
(a) updating the cause of death certification section to comply with the International Form of Medical Certificate of Death (WHO 2011) (See below, International Form of Medical Certificate of Death).

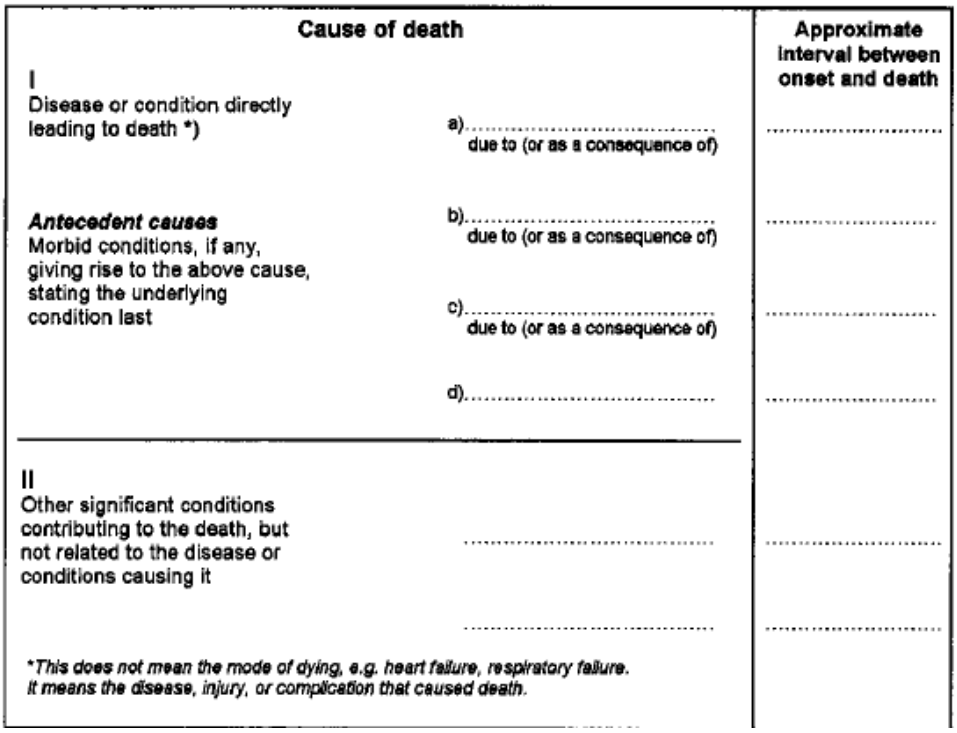
(b) adding a data field for recording the ICD-10 code. MOH is the entity that is currently processing medically certified deaths with ICD codes. CRD processes CoD that are not medically certified, as well as also those that are, but without any assigned ICD codes. If CRD is responsible for processing CoD then the ICD coded deaths must be systematically transmitted to them, for example, on the death registration forms.

> *ICD codes may be assigned by any coder specially trained in ICD rules and instructions. They may be medical personnel in the medical records units of hospitals, as is the case now, or they may be other specially trained clerical staff, for example, in the CRS or in the Statistics offices. Because the number of deaths is numerous in Kenya, reaching almost a half million per year, it is recommended that decentralized coding be done e.g., at the county level, so that coder may follow-up or clarify information by contacting the certifying physician.*

(c) including the WHO-recommended data fields to capture pregnancy-related deaths and late maternal deaths. This addition would help to ensure that maternal deaths are identified and correctly classified as such (see Section 3.4).

International Form of Medical Certificate of Death

[34] The certifier is the person who certifies the fact of death or foetal death, and who in the case of death also certifies the circumstances (accident, suicide, homicide, natural causes) and the specific disease, injury or other cause(s) of death. Data should be collected in such a way as to permit classification of deaths according to whether the death was certified by a physician or surgeon who attended the decedent in his terminal illness, a medical practitioner who examined the body after death, a coroner or other medical-legal authority, a midwife, a nurse (other trained person) or a layman. (UNESA 2001, p.39)



Cause of death		Approximate interval between onset and death
I Disease or condition directly leading to death *)	a)..... due to (or as a consequence of)	.....
Antecedent causes Morbid conditions, if any, giving rise to the above cause, stating the underlying condition last	b)..... due to (or as a consequence of)	.....
	c)..... due to (or as a consequence of)	.....
	d).....	.....
II Other significant conditions contributing to the death, but not related to the disease or conditions causing it	.....	.....
	.....	.....

**This does not mean the mode of dying, e.g. heart failure, respiratory failure. It means the disease, injury, or complication that caused death.*

Source: WHO 2011, Section 4.1.3

Annex 2.3. Review of death registration form, *FORM D2*, in light of UNESA-recommended information

The current FORM D2 Register of Death, for use by registration assistants for home death, should be made obsolete. The form includes a list of 15 natural causes, or other known cause to be specified, that the assistant chief selects. It also includes 7 unnatural causes, with other known cause to be specified, that the Police officer or magistrate selects. The assistant chief is not an authorized medical certifier of death. The deaths should be medically certified and then the causes of death coded with ICD-10.

Annex 2.4. Perinatal mortality reporting form

This form was not reviewed because it was not possible to obtain a copy of this form from MOH. Apparently these forms are in the hospitals and maternities but information is only transmitted to central level in aggregated format. The WHO-recommended form for Certificate of Cause of Perinatal Death (see below) is a model form from WHO that shows the recommended minimal information to collect. In the 2005 WHO survey, Kenya indicated that the WHO-recommended certificate of cause of perinatal death is used (WHO 2005).

WHO-recommended form for Certificate of Cause of Perinatal Death

To be completed for stillbirths and liveborn infants dying within 168 hours (1 week) from birth

Identifying particulars 1

☐ This child was born live on ____ at ____ hours
and died on ____ at ____ hours

2 ☐ This child was stillborn on ____ at ____ hours
and died before labour ☐ during labour ☐ not known ☐

Mother 3

Date of birth ☐☐☐☐
or, if unknown, age (years) ☐☐

Number of previous pregnancies: 4
Live births ☐☐
Stillbirths ☐☐
Abortions ☐☐

Outcome of last previous pregnancy: 5
☐ Live birth
☐ Stillbirth
☐ Abortion
Date ☐☐☐☐

1st day of last menstrual period 6 ☐☐☐☐
or, if unknown, estimated duration of pregnancy ☐☐
(completed weeks)

Antenatal care, two or more visits:
☐ Yes 7
☐ No
☐ Not known

Delivery: 8
☐ Normal spontaneous vertex
Other (specify)
.....

Child

Birthweight: ..... grams 9

Sex: 10
☐ Boy ☐ Girl ☐ Indeterminate

☐ Single birth ☐ First twin 11
☐ Second twin ☐ Other multiple

Attendant at birth

☐ Physician ☐ Trained midwife
Other trained person (specify)
.....
Other (specify) 12
.....

Causes of death

a. Main disease or condition in fetus or infant 13

b. Other diseases or conditions in fetus or infant

c. Main maternal disease or condition affecting fetus or infant

d. Other maternal diseases or conditions affecting fetus or infant

e. Other relevant circumstances

☐ The certified cause of death has been confirmed by autopsy
☐ Autopsy information may be available later
☐ Autopsy not being held 14

I certify .....
.....
.....
15
Signature and qualification

Source: WHO 2011, Section 4.3.2

Annex 3. Monthly tally sheets for vital statistics

A. Birth statistics

		……DISTRICT SUMMARY:- PLACE OF BIRTH OCCURANCE.																					
	AGE GRO	HEALTH INSTITUTION							HOME								TOTAL						
	Status of the	MARRIED		NOT MARRIED		NOT STATED (Unknown status)		Sub-Total	MARRIED		NOT MARRIED		NOT STATED (Unknown status)		Sub-Total	MARRIED		NOT MARRIED		NOT STATED (Unknown status)		Grand Total	
	Gender of the	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE		MALE	FEMALE	MALE	FEMALE	MALE	FEMALE		MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
Age Category of the Mother (Indicate the Number of newborn(Live Birth) by sex Against the age of the	UNDER 15							-							-	-	-	-	-	-	-	-	-
	15-19							-							-	-	-	-	-	-	-	-	-
	20-24							-							-	-	-	-	-	-	-	-	-
	25-29							-							-	-	-	-	-	-	-	-	-
	30-34							-							-	-	-	-	-	-	-	-	-
	35-39							-							-	-	-	-	-	-	-	-	-
	40-44							-							-	-	-	-	-	-	-	-	-
	45-49							-							-	-	-	-	-	-	-	-	-
	50+							-							-	-	-	-	-	-	-	-	-
	NOT STATED (Unknown Age)							-							-	-	-	-	-	-	-	-	-
	TOTAL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	STILL	BIRTHS (BORN DEAD)						-							-	-	-	-	-	-	-	-	-

Total LIVE BIRTHS	
MALE	-
FEMALE	-
TOTAL	-

Total Live births by PLACE OF BIRTH	
HOME	-
H/INST	-
TOTAL	-

Total STILL BIRTHS	
MALE	-
FEMALE	-
TOTAL	-

B. Death statistics

..... DISTRICT SUMMARY :- CAUSES OF DEATHS BY SEX, AGE OF DECEASED AND CAUSE OF DEATH																						
	AGE GROUP	Under 1		1 -4 YRS		5-14YRS		15-24YRS		25-34YRS		35-44 YRS		45-54 YRS		55-74 YRS		75+		Total		Grand
ICD 10	GENDER	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	Total
A09	DIARRHOEA																			-	-	-
A15–A19	TUBERCLOSIS																			-	-	-
C00–D48	CANCER																			-	-	-
B54	MALARIA																			-	-	-
G03.9	MENINGITIS																			-	-	-
A33–A35	TETENUS																			-	-	-
J45	ASTHMA																			-	-	-
B05	MEASLES																			-	-	-
P05–P08	PREMATURITY																			-	-	-
E40–E46	MALNUTRITION																			-	-	-
D64.9	ANAEMIA																			-	-	-
I26-I52	HEART DISEASE																			-	-	-
J18.9	PNEUMONIA																			-	-	-
B24	AIDS																			-	-	-
V00-V99	ROAD TRFC. ACC.																			-	-	-
W00-X59	OTHER ACCIDENTS																			-	-	-
A09	GASTRO ENTERITIS																			-	-	-
F10.2	ALCOHOLISM																			-	-	-
J20–J22	BRONCHITIS																			-	-	-
B15-B19	HEPATITIS																			-	-	-
R07.4	CHEST PAIN																			-	-	-
E10-E14	DIABETES																			-	-	-
I70-I79	EMBOLISM																			-	-	-
	EPILEPSY																			-	-	-
	RENAL FAILURE																			-	-	-
	HAEMORRHAGE																			-	-	-
	HEADACHE																			-	-	-
	LIVER CIRRHOSIS																			-	-	-
	HYPERTENSION																			-	-	-
	JAUNDICE																			-	-	-
	KIDNEY PROBLEM																			-	-	-
	ABORTION																			-	-	-
	RESPIRATORY DISEASE																			-	-	-
	SEPSIS																			-	-	-
	DEHYDRATION																			-	-	-
	POISONING																			-	-	-
	ASPHYXIA																			-	-	-
	PREGNANCY																			-	-	-
	INTESTINAL OBSTRUCTION																			-	-	-
	SEPTICAMIA																			-	-	-
	STOMACH ACHE																			-	-	-
	STROKE																			-	-	-
	SUDDEN DEATH																			-	-	-
	TYPHOID																			-	-	-
	URINARY OBSTRUCTION																			-	-	-
	OTHER CAUSES																			-	-	-
	TOTAL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Annex 4. Coverage estimates

Annex Table 4.1. Comparison of reported and estimated births, and percentage of births registered, various sources 2002-2012

Year	Births reported *(a, b)*	Births reported *(c)*	Births reported (CRD-T4) *(d)*	Births reported (CRD-T5) *(d)*	Births reported (CRD-T6) *(d)*	Birth reported (CRD-p15) *(d)*	Birth reported (CRD10 T7) (e)	Expected births *(f)*	Expected births *(g)*	Expected births (h)
2002								1 272 254	1 307 404	
2003	495 433[a]							1 306 832	1 348 078	
2004								1 340 088	1 389 130	1 354 982
2005		523 874		455 264			455,264	1 372 119	1 426 066	1 381 283
2006		717 867		590 004			590,004	1 403 437	1 452 646	1 406 093
2007	464 283[b]	588 604		642 359			642,359	1 434 710	1 466 428	1 431 152
2008	660 383[b]	635 413		680 112	655 569		680,112	1 466 278	1 469 176	1 487 142
2009	691 312[b]	621 656	181 115	698 447	704 111	200 812	698,447	1 497 958	1 462 832	1 586 582
2010		749 693					790,937	1 529 288	1 442 580	
2011								1 559 624	1 413 496	
2012								1 588 298	1 373 416	

(a) UNESA 2006
(b) UNESA 2010
(c) Tables are sourced from the Department of Civil Registration, *'Statistical Abstract 2011',* on the KNBS website http://www.knbs.or.ke/vital%20statistics.php
(d) MIRP 2010
(e) MIRP 2011
(f) UNESA 2011
(g) US Census Bureau, International Database [on-line]
(h) KNBS intercensal projections of deaths

Annex Table 4.2. Comparison of births registration coverage, various sources 2002-2012

Year	Variation in reported (international vs national)	Coverage (KNBS UN_DYB /UN_WPP)	Coverage (KNBS_web /UN_WPP)	Coverage (KNBS_web /KNBS)	Coverage (CRD annual reports)
2002					
2003					
2004					39.4
2005		37.9	38.2	37.9	33.0
2006		51.1	51.2	51.1	42.0
2007	-21.1	41.1	41.0	41.1	45.0
2008	3.9	42.7	43.3	42.7	
2009	11.2	39.2	41.5	46.3	43.4
2010			49.0	54.3	57.4
2011					
2012					

Annex Table 4.3. Comparison of reported and estimated deaths, and percentage of deaths registered, various sources 2002-2012

Year	Deaths reported *(a b)*	Deaths reported *(c)*	Deaths reported (CRD-T5) *(d)*	Deaths reported (CRD-T4) *(d)*	Deaths reported (CRD-T15) *(d)*	Deaths reported (CRD10 T7,17) (e)	Deaths Estimated (f)	Deaths Estimated (g)	Expected deaths (h)

2002							422 967	389 054	
2003	248 254[a]		203 759				435 282	392 621	
2004	178 051[a]		230 912				443 971	392 201	383 857
2005	168 919[a]	207 372	194 485			203,759	449 195	389 472	391 308
2006	174 856[a]	209 912	199 567			230,912	451 488	380 230	398 336
2007	170 167[b]	180 767	200 812			194,485	451 930	365 859	405 435
2008	219 477[b]	194 618			193 971	199,567	451 526	351 492	412 604
2009	181 220[b]	175 312		52 906	178352	178352	450 871	337 515	462 253
2010		175 760				185099	450 393	321 435	
2011							450 273	312 060	
2012							450 403	312 277	

(a) UNESA Population and Vital Statistics Report Statistical Papers, bi-annual issues 1/2006, 7/2006, 7/2007, 7/2008

(b) UNESA 2010

(c) KNBS intercensal projections of deaths

(d) MIRP 2010

(e) MIRP 2011

(f) UNESA 2011

(f) US Census Bureau, International Database [on-line].

(g) Tables are sourced from the Department of Civil Registration, *'Statistical Abstract 2011',* on the KNBS website http://www.knbs.or.ke/vital%20statistics.php

Annex Table 4.4. Comparison of deaths registration coverage, various sources 2002-2012

Year	Variation in reported (international vs national)	Coverage (KNBS UN_DYB /Exp_WPP)	Coverage (KNBS_web /UN_WPP)	Coverage (KNBS_web /Exp_KNBS)	Coverage (DCR annual reports)
2002					
2003		57.0			
2004		40.1			
2005	-18.5	37.6	46.2	53.0	
2006	-16.7	38.7	46.5	52.7	
2007	-5.9	37.7	40.0	44.6	
2008	12.8	48.6	43.1	47.2	
2009	3.4	40.2	38.9	46.7	47.5
2010			39.0	45.6	48.0
2011					
2012					

Annex Table 4.5. Comparison of registered number of infant deaths and the total estimated number, various sources 2002-2012

Year	Infant deaths reported (from among total deaths) *(a, b)*	Infant deaths reported (c)	Infant deaths reported *(d)*	Infant deaths reported (e)	Estimated Infant deaths *(f)*	Fetal deaths reported *
2002					88 612	
2003	33 399				90 429	
2004	35 321	18 261			91 842	
2005	35 252	28 264			92 849	
2006	35 786	30 757			93 493	
2007	35 154				93 865	
2008	46 565		26 442		94 052	
2009	40 190		20 516	25680	94 088	
2010				24685	94 008	
2011					93 821	
2012					93 513	

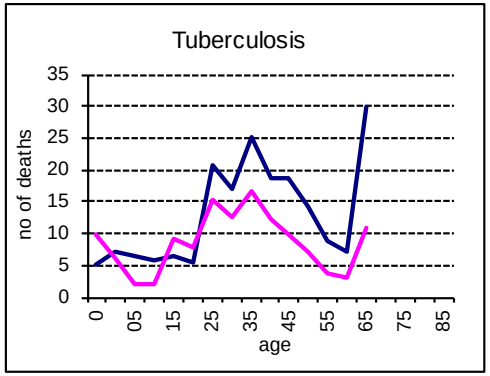
(a) UNESA Population and Vital Statistics Report Statistical Papers, bi-annual issues 1/2006, 7/2006, 7/2007, 7/2008
(b) UNESA 2010
(c) MIRP 2008
(d) MIRP 2010
(e) MIRP 2011
(f) UNESA 2011
*This information is requested annually by WHO and UN, but it is not reported.

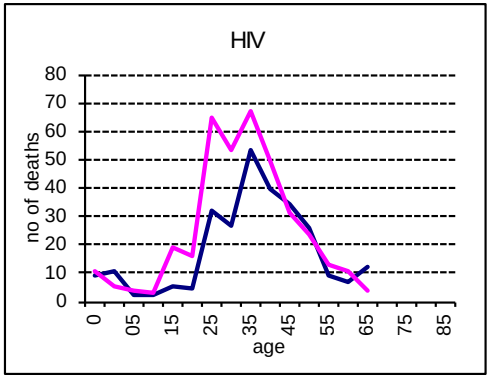
Annex Table 4.6. Comparison of infant death registration coverage, various sources 2002-2012

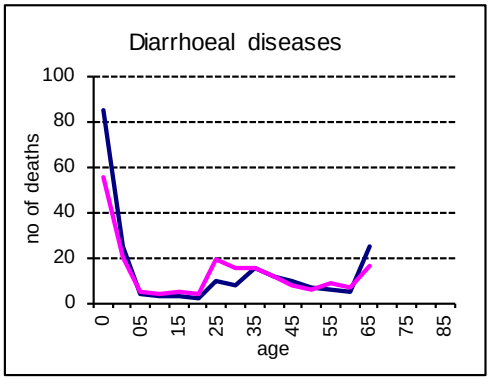
Year	Variation in reported (international vs national)	Coverage (KNBC UN_DYB /UN_WPP)	Coverage (CRD /UN_WPP)
2002			
2003		36.9	
2004	93.4	38.5	19.9
2005	24.7	38.0	30.4
2006	16.4	38.3	32.9
2007		37.5	
2008	76.1	49.5	28.1
2009	95.9	42.7	27.3
2010			26.3
2011			
2012			

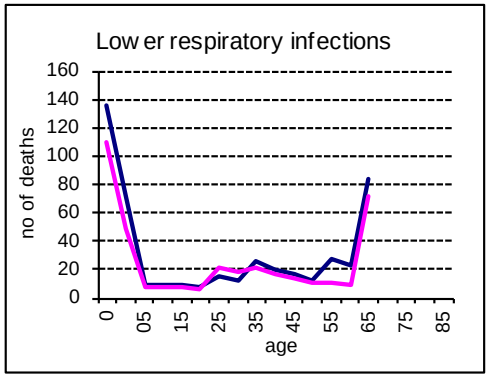
Annex 5. Cause of death

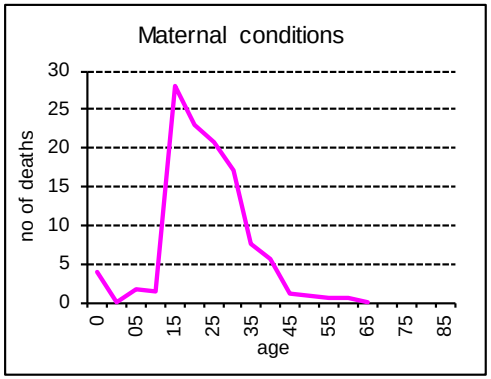
Annex Figure 5.1. Age and sex pattern of selected causes of death

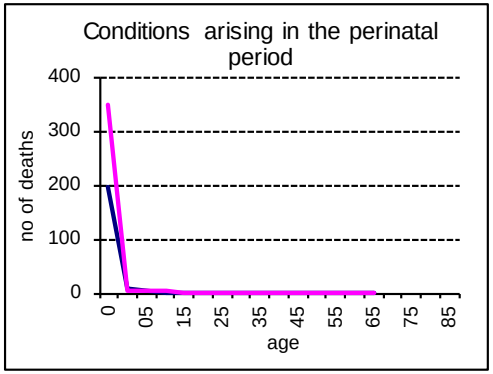


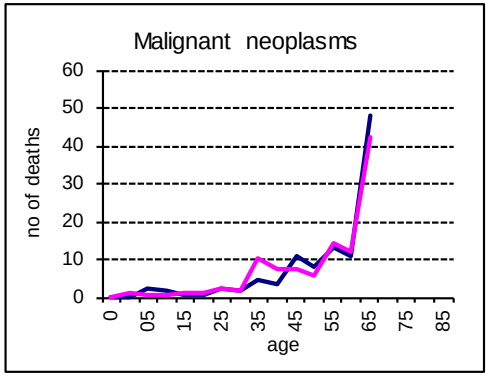


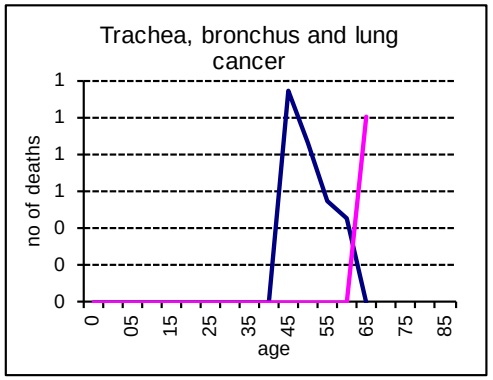


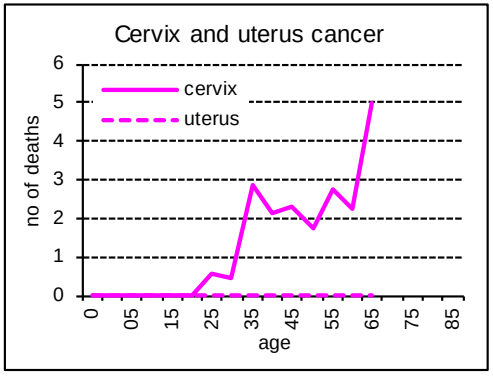


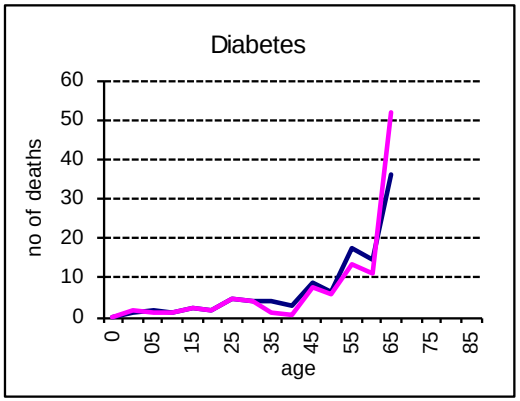


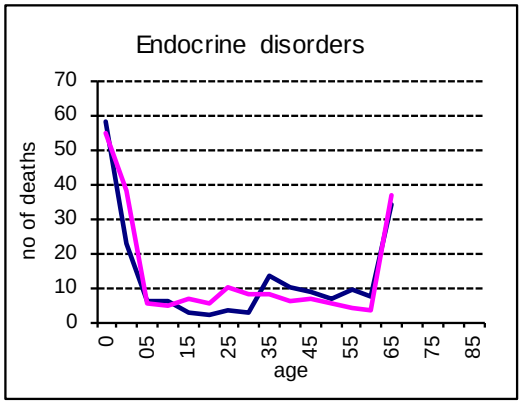


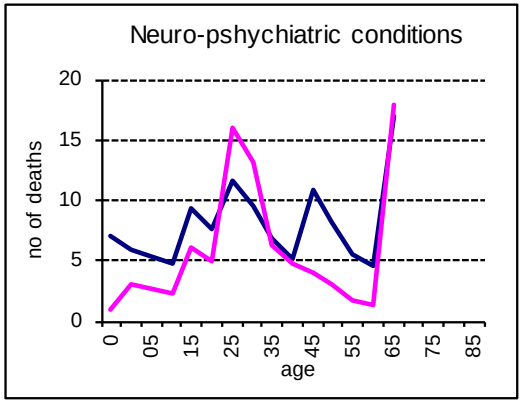


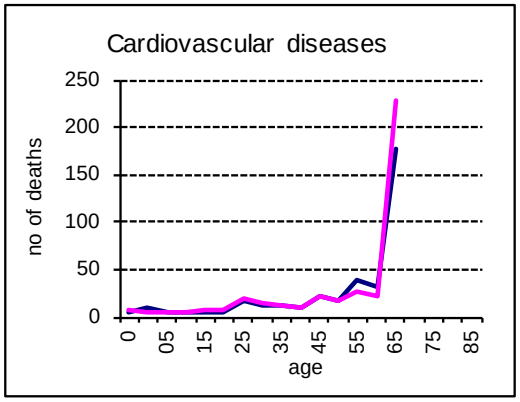


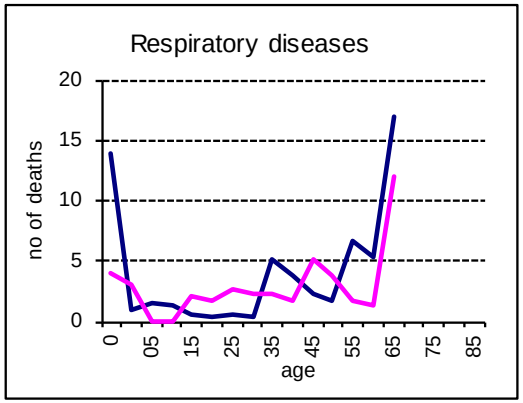


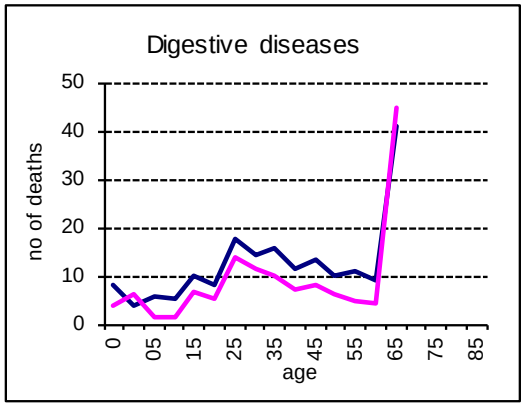

Diabetes
no of deaths
60
50
40
30
20
10
0
0
05
15
25
35
45
55
65
75
85
age

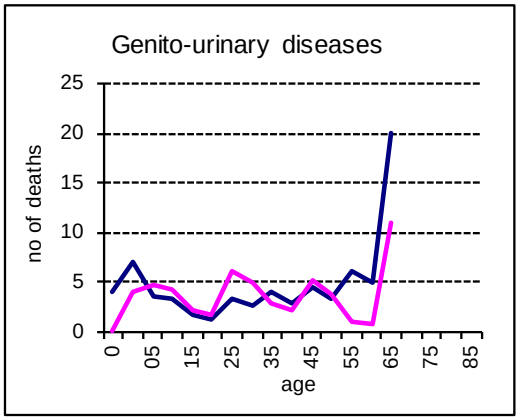

Endocrine disorders
no of deaths
70
60
50
40
30
20
10
0
0
05
15
25
35
45
55
65
75
85
age

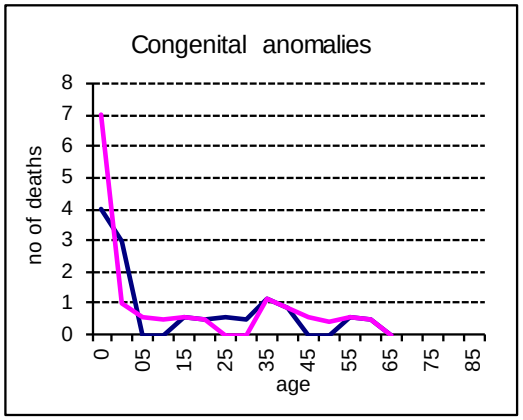

Neuro-pshychiatric conditions
no of deaths
20
15
10
5
0
0
05
15
25
35
45
55
65
75
85
age

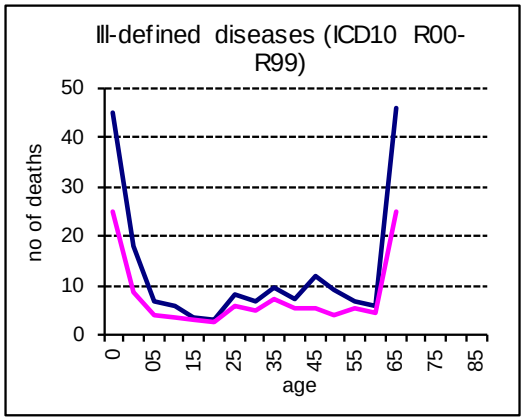

Cardiovascular diseases
no of deaths
250
200
150
100
50
0
0
05
15
25
35
45
55
65
75
85
age


Respiratory diseases
no of deaths
20
15
10
5
0
0
05
15
25
35
45
55
65
75
85
age


Digestive diseases
no of deaths
50
40
30
20
10
0
0
05
15
25
35
45
55
65
75
85
age


Genito-urinary diseases
no of deaths
25
20
15
10
5
0
0
05
15
25
35
45
55
65
75
85
age


Congenital anomalies
no of deaths
8
7
6
5
4
3
2
1
0
0
05
15
25
35
45
55
65
75
85
age


Ill-defined diseases (ICD10 R00-R99)
no of deaths
50
40
30
20
10
0
0
05
15
25
35
45
55
65
75
85
age

Annex Figure 5.2. Reported 20 main causes of death for all ages, by sex, Kenya 2011

	Male		
1	Lower respiratory infections	556	*10.9*
2	Malaria	340	*6.7*
3	HIV	293	*5.7*
4	Diarrhoeal diseases	245	*4.8*
5	Iron deficiency Anaemia	244	*4.8*
6	Other cardiovascular diseases	224	*4.4*
7	Ill-defined diseases (ICD10 R00-R99)	219	*4.3*
8	Tuberculosis	209	*4.1*
9	Endocrine disorders	206	*4.0*
10	Meningitis	155	*3.0*
11	Other digestive diseases	140	*2.7*
12	Hypertensive disease	123	*2.4*
13	Other conditions arising during the perinatal period	120	*2.3*
14	Diabetes mellitus	118	*2.3*
15	Birth asphyxia and birth trauma	90	*1.8*
16	Road traffic accidents	79	*1.5*
17	Protein-energy malnutrition	76	*1.5*
18	Other infectious diseases	68	*1.3*
19	Prematurity and low birth weight	63	*1.2*
20	Homicide	60	*1.2*
	Female		
1	Lower respiratory infections	385	*8.8*
2	HIV	377	*8.6*
3	Malaria	256	*5.8*
4	Iron deficiency Anaemia	233	*5.3*
5	Other cardiovascular diseases	218	*5.0*
6	Endocrine disorders	205	*4.7*
7	Diarrhoeal diseases	201	*4.6*
8	Hypertensive disease	158	*3.6*
9	Other conditions arising during the perinatal period	143	*3.3*
10	Meningitis	142	*3.2*
11	Tuberculosis	133	*3.0*
12	Birth asphyxia and birth trauma	129	*2.9*
13	Ill-defined diseases (ICD10 R00-R99)	118	*2.7*
14	Diabetes mellitus	111	*2.5*
15	Other digestive diseases	89	*2.0*
16	Prematurity and low birth weight	87	*2.0*
17	Other infectious diseases	69	*1.6*
18	Other maternal conditions	59	*1.3*
19	Protein-energy malnutrition	57	*1.3*
20	Skin diseases	54	*1.2*

Annex 6. Proposed selection of national indicators for M&E of vital events *

*SMART indicators: Specific, Measurable, Achievable, Relevant and Time-bound

Several baseline indicators have been defined and computed in this assessment report. Below is a summary of these indicators and the most recent values that could be computed with available information. Monitoring such indicators on a regular basis will track the strengthening of the CRVS system until it eventually provides information reliable enough to be used to assess levels of patterns of fertility, mortality and causes of death. They may, of course, be adapted as necessary for future M&E.

	Indicator	Indicator definition	Type of indicator/Notes	Value	Date
1	**Availability of services**				
1a	Percentage of the population living in districts that have at least one CRO		Output.	70%	2012
1b	Average size of the population served by local CRO (density)		Output.	360 000	2012
1c	Average number of births and deaths the CRO is expected to process in a year	Assumes 100% coverage of births and deaths	Input.	13 000 births; 3600 deaths	2010
1d	Number of CRO		Output.	107	2012
1e	Average number of informants per CRO	Average number of assistant chiefs and average number of health institutions	Output.	73 assistant chiefs; 32 health institutions	2012
1f	No. local registration agents (assistant chiefs) per 10,000 population	Total number of assistant chief informants divided by population, multiplied by 10,000	Output. 2012 projected population from 2009 census not available, so used 2009 population in denominator	2.1	2012
1g	No. local registration agents (medical and other) per 10,000 population	Total number of health institution informants divided by population, multiplied by 10,000	Output. 2012 projected population from 2009 census not available, so used 2009 population in denominator	0.9	2012
2	**Completeness**				
2a	Percentage of births that are registered in the civil registration system		Outcome.	57.4	2010
2b	Percentage of deaths that are registered in the		Outcome.	48.0	2010

	civil registration system				
2c	Percentage of infant deaths registered in the civil registration system		Outcome.	26.3	2009
3	**Timeliness**[1]				
3a.	Timeliness of submission of monthly summary sheets	% of months that CRO submit timely birth registration data (by 15th of each month)	Output. Not measured in the assessment. CRD subject estimate is 70-90% of CRO comply with timely submission	na	
3b.	Percentage of late registrations	% of registered births and deaths that are registered after 6 months following the event.	Outcome. Not measured in the assessment.	na	
3c	Number of 'delayed registrations'	% of registered births and deaths that are registered after 1 year following the event.	Outcome. Not measured in the assessment.	na	
3d	Percentage of registered births for which a certificate has been issued.	% of registered births and deaths that are registered after 6 months following the event.	Outcome. Not strictly a 'timeliness' indicator. Information not currently compiled to measure from the CRVS system, only through nationally representative surveys.	24%	5-years prior to 2008-09 (KNBS & ICF Macro, 2010)
4	**Cause of death**				
4a	Number of medical certifiers trained in ICD using the WHO ICD-10 Interactive Self Learning Tool		Output.	na	
4b	Number of coders trained in ICD using the WHO ICD-10 Interactive Self Learning Tool		Output.	na	
4c	Medical school curriculum revised and reviewed by independent experts, e.g., WHO-FIC network		Input.	na	
4d	Number (or percentage) of health institutions reporting medically certified deaths	The percentage of institutions using 2011 CoD data and 2012 information on total possible number of reporting instititions.	Outcome. Could also be defined at the percent of institutions that report mortality.	46 (1.3%)	2011

	for which the ICD code was assigned				
4e	Percentage of all deaths notified by institutions that have ICD code		Outcome.	10%	2011
4f	Median number of deaths reported by institutions that report CoD with ICD codes		Outcome.	9.5	2011
4g	Percentage completeness of reported deaths with ICD CoD assigned		Outcome	2%	2011
4h	Number of ICD-10 codes used		Outcome	498 (males); 419 (females)	2011
4i	% invalid codes		Outcome	11-12%	2011
4j	% ill-defined codes		Outcome	15%	2011
5	**Mortality levels indicating usefulness for monitoring mortality**				
5a	Crude death rate (both sexes) per 1000 population		Outcome. Impact. (Once CoD completeness is 85+% and ill-defined causes are <10%, then statistics can be reliably used to monitor mortality)	0.2	2011
5b	Life expectancy (Males) in years		Outcome. Impact. (see above)	263	2011
5c	Life expectancy (Females) in years		Outcome. Impact. (see above)	334	2011
5d	Infant mortality per 1000 live births		Outcome. Impact. (see above)	1.4	2011
5e	Under-five mortality per 1000 live births		Outcome. Impact. (See above)	2.1	2011
	Other cause of death				
a	Ratio of deaths due to NCD to communicable diseases			0.6	2011
b	No. counties with trained personnel to certify ICD CoD			na	

c	No. districts with trained personnel to code ICD CoD					na		
	Dissemination: The international community requests annual, national-level information on vital events (births, deaths, infant deaths, fetal deaths, and cause of death). Births, deaths, infant deaths have been reported in recent years; fetal deaths and cause of death have not been reported.							
			2005	2006	2007	2008	2009	2010
a	Annual registered births are reported to UNESA (e.g. Demographic Yearbook and bi-annual Vital Statistics Reports)		NO	NO	YES	YES	YES	na
b	Annual registered deaths are reported to UNESA (e.g. Demographic Yearbook and bi-annual Vital Statistics Reports)		YES	YES	YES	YES	YES	na
c	Annual registered infant deaths reported to UNESA (e.g. Demographic Yearbook and bi-annual Vital Statistics Reports)		NO	NO	NO	YES	YES	na
d	Annual registered fetal deaths reported to UNESA (e.g. Demographic Yearbook and bi-annual Vital Statistics Reports)		NO	NO	NO	NO	NO	na
e	Annual population, birth and death, including cause of death data, submitted to WHO-HQ, in requested format.		NO	NO	NO	NO	NO	na

[1] In addition, these timeliness indicators will be able to be computed when the electronic reporting system is functioning and individual level information is readily available:

- Timeliness of notification. Average number of days between the event occurring and notification.
- Timeliness of legal registration. Average number of days between the time the local agents submit the registration form and legal registration at CRO.
- Timeliness of issuing a birth or death certificate. Average number of days between legal registration by the CRO and the issuing of a legal birth or death certificate.