THE UNIVERSITY OF MELBOURNE

Bloomberg Philanthropies

DATA FOR HEALTH INITIATIVE

CRVS best-practice and advocacy

Understanding CRVS systems: The importance of process mapping

April 2018

Resources available from the University of Melbourne, Bloomberg Philanthropies Data for Health Initiative

CRVS course prospectuses
These resources outline the context, training approach, course content and course objectives for the suite of CRVS trainings delivered through the Bloomberg Philanthropies Data for Health Initiative. Each course focuses on a specific CRVS intervention or concept, and is designed to support countries to strengthen their CRVS systems and data.

CRVS Fellowship reports and profiles
The CRVS Fellowship Program aims to build technical capacity in both individuals and institutions to enhance the quality, sustainability and health policy utility of CRVS systems in Fellows' home countries. *Fellowship reports* are written by Fellows as a component of the program, and document, in detail, the research outcomes of their Fellowship. *Fellowship profiles* provide a summary of Fellows' country context in relation to CRVS, an overview of the Fellowship experiences, the research topic and the projected impact of findings.

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Generated through the Initiative, CRVS best-practice and advocacy resources are based on a combination of technical knowledge, country experiences and scientific literature. These resources are intended to stimulate debate and ideas for in-country CRVS policy, planning, and capacity building, and promote the adoption of best-practice to strengthen CRVS systems worldwide.

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CRVS country reports describe the capacity-building experiences and successes of strengthening CRVS systems in partner countries. These resources describe the state of CRVS systems-improvement and lessons learnt, and provide a baseline for comparison over time and between countries.

CRVS technical guides
Specific, technical and instructive resources in the form of *quick reference guides, user guides* and *action guides*. These guides provide a succinct overview and/or instructions for the implementation or operation of a specific CRVS-related intervention or tool.

CRVS tools
Interactive and practical resources designed to influence and align CRVS processes with established international or best-practice standards. These resources, which are used extensively in the Initiative's training courses, aim to change practice and ensure countries benefit from such changes by developing critical CRVS capacity among technical officers and ministries.

Published by the University of Melbourne, Civil Registration and Vital Statistics Improvement, Bloomberg Philanthropies Data for Health Initiative.

Melbourne School of Population and Global Health
Building 379
207 Bouverie Street
Carlton, VIC 3053
Australia

CRVS-info@unimelb.edu.au
www.mspgh.unimelb.edu.au/dataforhealth

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Abbreviations

BD4H	Bloomberg Philanthropies Data for Health Initiative
COD	cause of death
CRVS	civil registration and vital statistics
EA	enterprise architecture
LMICs	low and middle-income countries
UN	United Nations
WHO	World Health Organization

Key terms

Business process:	The set of activities and tasks that logically group together to accomplish a goal or produce something of value for the benefit of the organisation, stakeholder, or customer.
Enterprise:	An organisational unit, organisation, or collection of organisations that share a set of common goals and collaborate to provide specific products or services to customers/users.
Enterprise architecture:	A methodology that provides a conceptual blueprint of the structure and operation of a system. The aim of enterprise architecture is to determine how an organisation can most effectively achieve its current and future objectives.
Process mapping and modelling:	One of the tools used in enterprise architecture to describe and analyse the processes and work flows of a system.

Key points

- Civil registration involves the legal notification and recording of individual vital events, including births and deaths, by government. Vital statistics are then generated by countries from aggregated birth and death registration data. These data are crucial for population health policy and planning purposes.
- Civil registration and vital statistics (CRVS) systems share a common purpose but differ in each country in terms of their organisation, implementation, processes, scale, partners and capacities.
- CRVS systems are highly complex.
- Almost all CRVS systems in low and middle-income countries are failing to achieve adequate levels of completeness and quality despite attempts to improve system flaws.
- The tools of enterprise architecture can help countries and their technical partners assess whether CRVS system goals and objectives are aligned with current country operations – as well as explore what a country's desired CRVS system might look like.
- Process maps can meaningfully capture the complexity in CRVS systems, including key stakeholders and activities, as well as identifying system bottlenecks.
- Process mapping examines system, management and support processes of four core CRVS processes, which are processes for the declaration, notification and registration of births in the community and health facilities, and deaths in the community and health facilities.
- The process mapping and modelling exercise, for each of the above, should occur in four phases: preparation, description, analysis, and improvement.
- Often, CRVS processes must be re-engineered to fulfil the objectives of the system, to improve efficiency and to provide better services to users.
- Although CRVS system processes vary, the process maps that are developed can be systematically analysed using the 'Ten CRVS Milestones' framework.
- The cycle of describing and analysing the current processes, and proposing a future design, is an approach that must be implemented routinely in complex systems such as CRVS systems.

Understanding CRVS systems: The importance of process mapping

This *CRVS best-practice and advocacy* paper introduces the concept of enterprise architecture, specifically focussing on its process mapping methodology: an extremely useful tool to understand civil registration and vital statistics (CRVS) systems and strengthen their design. This paper will also explain the four phases involved in process mapping a CRVS system, and highlight how the Bloomberg Data for Health Initiative is using process mapping as part of its activities.

- **What are civil registration and vital statistics (CRVS) systems?**
  - **Why are so many CRVS systems failing?**
- **CRVS systems strengthening – what is enterprise architecture?**
- **Why is process mapping and modelling important for CRVS systems strengthening?**
  - **What are the four core CRVS system processes?**
  - **What are the four phases in process mapping?**
- **Experiences from the Bloomberg Philanthropies Data for Health Initiative**
- **Summary**

Civil registration involves the legal notification and recording of vital events

Civil registration and vital statistics systems

Civil registration is a process where major vital events occurring in a population are officially recorded. It is defined as the continuous, permanent, compulsory and universal recording of the occurrence and characteristics of vital events in a population, in accordance with the legal requirements of the country.[1] The goal of civil registration is to record all vital events in a country as they occur. Vital events covered in a CRVS system include:

- Events that occur at the level of individuals – live birth, death and foetal death
- Events that relate to family and civil status – marriage, registered partnership, separation, divorce, legal dissolution of registered partnership and annulment of marriage
- Events that relate to descendants – adoption, legitimation and recognition (**Figure 1**).

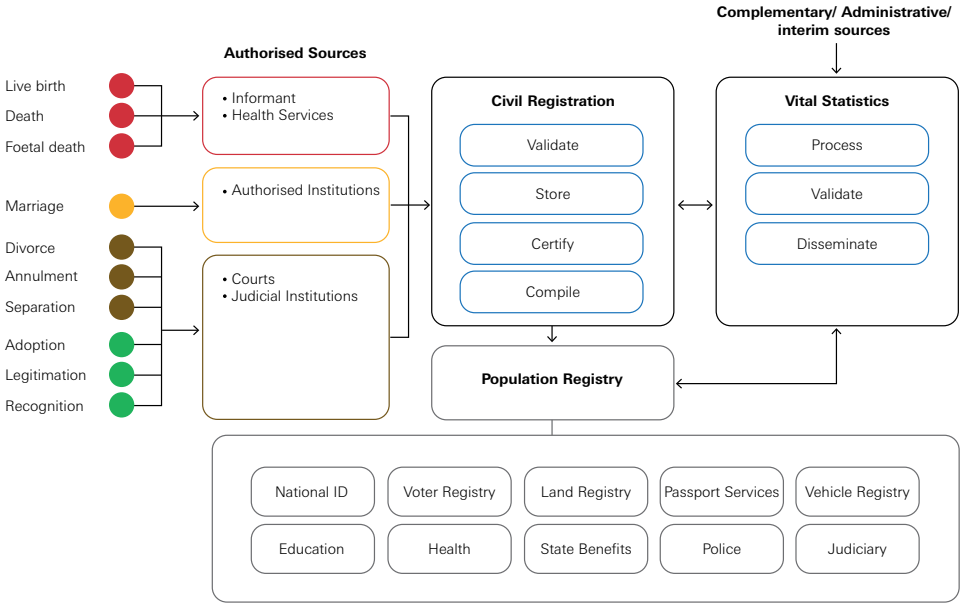
According to the World Health Organization (WHO), 'A well-functioning CRVS system registers all births and deaths, issues birth and death certificates, and compiles and disseminates vital statistics, including cause of death information. It may also record marriages and divorces'.[2]

The office of the civil registrar maintains the records and registers that contain information about vital events, and issues legal certificates on demand to entitled claimants. This legal documentation can be used by people to support claims of nationality, identity, civil status and family relationships.

1 United Nations Department of Economic and Social Affairs (Statistical Division). *Principles and recommendations for a vital statistics system, Revision 3*. New York, USA: UNSD; 2014. Available at: unstats.un.org/unsd/demographic/standmeth/principles/M19Rev3en.pdf

2 World Health Organization. Health statistics and information systems: *Civil registration and vital statistics (CRVS)*. Available at: who.int/healthinfo/civil_registration/en/

Figure 1 Elements of a CRVS system



Source: *Adapted from United Nations Department of Economic and Social Affairs (Statistical Division)*. Principles and Recommendations for a Vital Statistics System, Revision 3. New York, USA: UNSD; 2014.

In addition to this legal function, the information collected through the civil registration system is aggregated, analysed and disseminated in the form of vital statistics of the population. Vital statistics include:

Vital statistics are generated from civil registration data and used in policy and planning

- numbers and rates of births
- key characteristics of births, such as births by sex, location and maternal age
- numbers and rates of deaths, and
- deaths by key characteristics such as age, sex, location and cause of death (COD).

Even though all CRVS systems have the same purpose, each country's CRVS system has moved along different paths. Countries differ in their CRVS organisation, implementation, processes, scale, partners and capacities. To complicate matters further, all CRVS systems are part of a country's larger political, economic, social, health and information systems. For example, CRVS systems nest within broader system landscapes concerned with governance, security, identity, planning, resource allocation and so on.

CRVS systems are highly complex and technically challenging

Why are so many CRVS systems failing?

Almost all CRVS systems in low and middle-income countries (LMICs) are failing to achieve adequate levels of completeness and quality despite government attempts to apply standard methods proven to work well in high-income nations.[3] This suggests that LMICs may be facing additional or different kinds of systemic challenges, rather than just technical issues.

To date, most attempts to improve CRVS systems have been reductionist, ad hoc, and aimed at technical faults rather than system change. Consequently, CRVS strengthening efforts have been slow to achieve results. System strengthening has the potential to efficiently and cost-effectively achieve high-leverage tipping points that could rapidly improve overall performance of CRVS.[4]

CRVS systems strengthening – what is enterprise architecture?

Enterprise architecture (EA) is a methodology that provides a framework to describe the 'fundamental concepts or properties of a system in its environment embodied in its elements, relationships, and in the principles of its design and evolution'.[5] It provides a conceptual blueprint of the structure and operation of a system. EA bridges the vision and objectives of a system (for example, to produce timely and accurate vital statistics for births and deaths) with its operating model (system processes, information flows and technology).

The tools of EA can help countries assess whether CRVS systems' goals and objectives are aligned with current activities

EA can help countries and their technical partners to assess whether CRVS systems goals and objectives are aligned with current country operations. When applied to analyse health information systems, especially those in LMICs, EA methodology can strengthen CRVS systems design.

Why is process mapping and modelling important for CRVS systems strengthening?

Process mapping and modelling is one of the tools used in EA to describe and analyse the business architecture of a system. It is a systematic approach to understand, analyse and optimise processes within complex adaptive systems in order to achieve intended system goals. A process is a set of activities and tasks that logically group together to accomplish a goal or produce something of value for the benefit of the system and its stakeholders.[6]

A process map is a visual snapshot of an end-to-end description of the activities, stakeholders and requirements of a process. Process maps can capture complexity and meaningfully display the multiple interactions (or lack of them) among different stakeholders in the CRVS system (**Figure 2**).

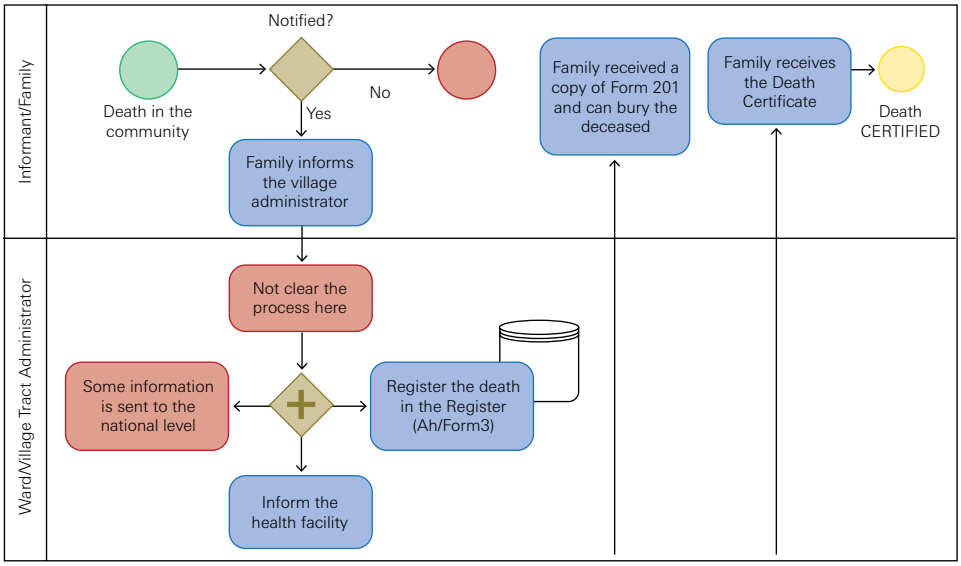
3 AbouZahr C, de Savigny D, Mikkelsen L, et al. Civil registration and vital statistics: progress in the data revolution for counting and accountability. *The Lancet* 2015; 386:1373–1385.

4 de Savigny D, Riley I, Chandramohan D, et al. Integrating community based verbal autopsy into civil registration and vital statistics (CRVS): system-level considerations. *Global Health Action* 2017; 10:1272882.

5 International Organization for Standardization. ISO/IEC/IEEE42010: *Systems and software engineering – architecture description*. Geneva, Switzerland: ISO; 2013.

6 Davenport TH, Short JE. The new industrial-engineering: information technology and business process redesign. *Sloan Management Review* 1990; 31:11–27.

Figure 2 Example of a process map of a death in the community



Source: *Intervention: Improving CRVS system design*. CRVS summaries. The University of Melbourne, Civil Registration and Vital Statistics, Bloomberg Philanthropies Data for Health Initiative. Available at www.crvsgateway.info/library

Process maps can meaningfully capture the complexity of CRVS systems and display them visually.

Process maps make it easier to understand complex interactions and present them in a graphical format that helps policy makers, managers and implementers better understand their CRVS system. This is a prerequisite for innovative solutions. Process mapping is a new way of looking at CRVS system processes. It stimulates innovative thinking and pioneering solutions that will consider not only the technical aspects of a problem but also their causal roots and the systemic implications.

Using process maps has been shown to be very useful to help regulators understand what needs to be considered in the CRVS legal and regulatory environment and review.[7] Ideally, the entire process would be regulated, with different forms of laws and regulations describing roles and responsibilities.

What are the four core CRVS system processes?

It is helpful to create process maps for births and deaths separately, as well as those occurring in the community or in health facilities.

As part of strengthening CRVS systems, it is useful to develop four distinct process maps:

1. **births in the community**
2. **births in a health facility**
3. **deaths in the community, and**
4. **deaths in a health facility.**

This is because the processes for notifying, declaring and registering births and deaths differ; and because the processes also differ depending on if the event occurred in the community or in a health facility.

7 University of Melbourne. *Strengthening CRVS system through effective legislation*. CRVS Development Series. Melbourne, Australia: The University of Melbourne, Civil Registration and Vital Statistics Improvement, Bloomberg Philanthropies Data for Health Initiative; 2018.

The country team examining CRVS systems processes should aim to develop As-Is and As-Desired CRVS process maps. The As-Is CRVS process maps will assist countries and their technical partners assess whether current CRVS systems goals and objectives are aligned with current country operations. The As-Desired CRVS process maps will explore and map out what a country's desired CRVS system might look like.

What are the four phases in process mapping?

The entire process mapping and modelling exercise should preferably consist of four sequential phases.[8] These are described below.

Phase 1

A country team with the responsibility of overseeing the entire activity is assembled, and all the existing information about the current CRVS systems processes (and its goals) are compiled. Examples of documents to include in this compilation process are listed in **Box 1**.

Box 1: Examples of documents for Phase 1 analysis

- Reports from previous comprehensive assessments
- Reports from any previous process mapping activities
- Strategic documents containing vision and mission statements for, as well as aims and goals of, the CRVS system
- Relevant laws and regulations
- Standard operating procedures and workflow diagrams
- Operational guidelines, manuals and protocols
- Job descriptions of staff involved in the CRVS system
- Memorandums of understanding between different stakeholders
- Performance monitoring reports
- International standards for the process under analysis

As-Is maps show how the system currently functions

Phase 2

The current end-to-end flow of activities and stakeholders involved in a process are described using a process map. This results in the team developing an As-Is CRVS process map of the country's CRVS system.

8 Cobos Muñoz D, de Savigny D. Process mapping and modelling: a tool for visualizing system processes from end-to-end. In: de Savigny D, Blanchet K & Adam T (eds). *Applied systems thinking for health systems research.* Maidenhead, UK: Open University Press; 2017.

Phase 3

The team then brings the As-Is CRVS process map to either a regional workshop (with several countries participating) or a national workshop (with several government agencies participating). An analysis of the As-Is CRVS process map is conducted with relevant country stakeholders and partners to identify problems in the process maps, flaws in the design, and areas that could be streamlined to improve the performance of the whole system. Design flaws, inefficiencies and bottlenecks in CRVS processes are identified and documented, and potential solutions and new interventions discussed (**Box 2**).

Box 2: Examples of key questions to be asked at Phase 3 workshops

- Is the current CRVS system process aligned with the vision, mission, legal authority, and objectives of the system and the various actors within it?
- Is the current CRVS process producing what is expected? That is, high-quality and reliable data for population health policy and planning?
- Are there bottlenecks or dead ends in the current CRVS system?
- Are there duplications or parallel systems?
- Is there room for gains in efficiency in the current CRVS system – that is, room for savings in time, resources, technology and cost?

As-Desired process maps show what the system might look like with improvements

Phase 4

Together with the technical team, workshop attendees review the stakeholders involved, document the flow of activities and information, and ensure all key processes are addressed, as per the 'Ten CRVS Milestones' framework (**Box 3**).[9] In some country instances, a CRVS milestone event may not even exist, or milestones might exist but in a different order.

An As-Desired CRVS process map is then designed to capture the proposed changes, which identify gaps between the current (As-Is) and future (As-Desired) CRVS systems situation.

Following Phases 1-4, the next step would relate to formal adoption and sponsorship from the CRVS governance body, such as the national CRVS committee, of the As-Desired CRVS process map(s).

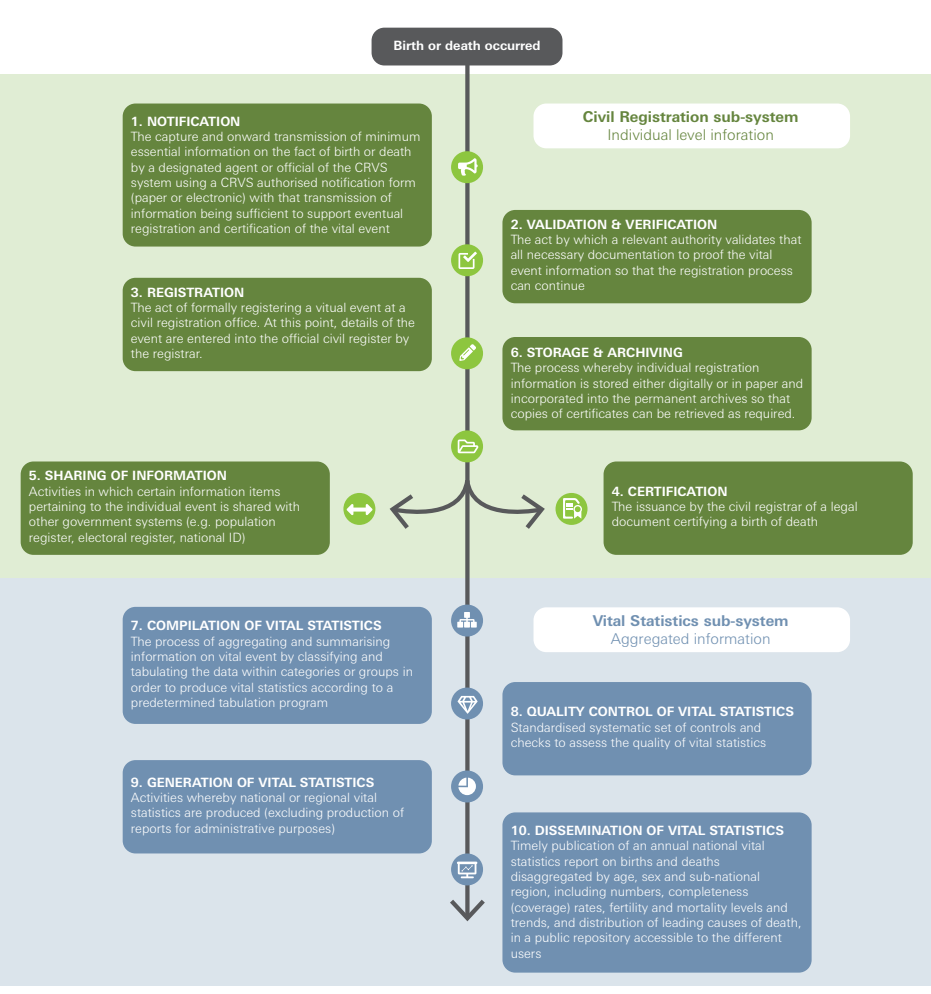
9 Cobos Muñoz D, AbouZahr C, de Savigny D. The 'Ten CRVS Milestones' framework for understanding Civil Registration and Vital Statistics systems. ***BMJ Global Health*** 2018; 3:e000673.

Box 3: The 'Ten CRVS Milestones' framework

The 'Ten CRVS Milestones' framework is designed to help CRVS stakeholders (policy-makers, managers and development partners) better understand how CRVS systems function as a whole, from end-to-end, by describing the key processes that must be accomplished in any CRVS system. The milestones depict the CRVS order and flow of information across the system, and provide a visual overview of CRVS processes.

Although the milestones are displayed sequentially in the diagram, they do not necessarily follow this sequence in all countries. For instance, there could be parallel channels where some milestones occur at the same time or milestones are repeated throughout the process (eg vital event information might be stored in multiple locations, and/or in multiple formats).

Figure 3 'Ten CRVS Milestones' framework with a working definition of each milestone



Source: Cobos Muñoz D, AbouZahr C, de Savigny D. The 'Ten CRVS Milestones' framework for understanding Civil Registration and Vital Statistics systems. *BMJ Global Health* 2018; 3:e000673.

The Bloomberg Philanthropies Data for Health Initiative experience

The BD4H Initiative has supported 16 countries to create CRVS process maps

For 16 countries, the Bloomberg Philanthropies Data for Health (BD4H) Initiative process mapping team has prepared draft As-Is process maps for each of the four CRVS processes (birth in the health facility, birth in the community, death in the health facility, and death in the community). These were shared with national CRVS stakeholders for an initial round of correction and improvement.

Countries then convened in regional workshops of five to six countries each, with representatives from the civil registry, vital statistics, and health sector from each country. In facilitated workshops, participants continued to edit, correct, improve and understand their process maps. Workshop attendees then returned to their respective countries and convened a larger group of national stakeholders to repeat the facilitated process and widen the buy-in and understanding of the end-to-end system. Countries were then challenged to respond to what they had learned by creating a new set of process maps for the As-Desired CRVS system, and approach BD4H for intervention support. **Figure 4** shows the variety of uses the process maps have been used in CRVS strengthening activities in the 16 countries.

Figure 4 CRVS process mapping applications in 16 BD4H Initiative countries

	Country															
Application	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
New insights after training	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Stakeholder management	✓	✓	✓	✓	✓			✓	✓	✓		✓	✓	✓	✓	✓
Verbal Autopsy intervention integration	✓	✓	✓	✓	✓	✓		✓	✓			✓	✓	✓		✓
Routine process analysis	✓	✓	✓		✓	✓						✓				✓
Managing standard operating procedures	✓	✓						✓		✓		✓				✓
Information technology & digitalising CRVS	✓		✓	✓											✓	
Direct health information system integration	✓		✓	✓		✓		✓								
Supporting legal review	✓			✓	✓	✓										
Sub-national analysis					✓					✓						✓
Performance analysis								✓				✓				
Cause of death certification					✓						✓	✓				
Iris integration										✓						
Comprehensive assessment			✓													
National Identification integration				✓												
Change management												✓				
Cause of death Coding intevention	✓			✓	✓						✓					

Summary

Country civil registration and vital statistics systems are complex, having evolved in unique ways in response to different political, legal, historical and administrative contexts. Despite the fact that all CRVS systems have the same output objectives, country systems have varied approaches to CRVS structures, governance, and policies. Accountability is also divided among multiple sectors and ministries such as justice, security, local government and health. Countries also differ in their CRVS organisation, implementation, processes, scale, partners, and capacities.

Almost all CRVS systems in low and middle-income countries are struggling to achieve adequate levels of coverage and quality. Technical approaches proven to work well in high-income countries do not always work elsewhere, particularly when applied in a fragmented way. This suggests systemic failure rather than technical failure.

Technical approaches alone cannot deliver sustained results in the absence of a good understanding of how the various elements of the CRVS system are connected to each other and how they need to work together within the whole. To date most attempts to improve CRVS systems have been aimed at the technical weaknesses, and have been slow to achieve results. A systems-thinking approach to CRVS has the potential to achieve high-leverage tipping points that could rapidly and sustainably improve overall performance of CRVS.

The cycle of describing and analysing current processes, and proposing future design, should be done routinely in CRVS systems

Process mapping has been shown to be an extremely useful tool to understand CRVS systems and strengthen their design. Process maps have been able to capture complexity and meaningfully display the multiple interactions (or lack of them) among different stakeholders in a system.

Process mapping can also help stakeholders share a common view of the system, identify problems and work collaboratively to find solutions. Usually, stakeholders within a system operate in their own silos, and therefore have a limited view of the different operations within the processes they participate in. Sometimes, they also differ in their vision and objectives for the system. Process mapping offers the opportunity to overcome the piecemeal treatment of CRVS systems across different government agencies so they can develop an aligned and end-to-end view of the system in its current operations. This is a key prerequisite to identify ideas to improve CRVS process performance and to consider how to integrate corrective interventions and manage the necessary changes.

Related resources and products

University of Melbourne, BD4H Initiative, CRVS Knowledge Gateway: Library
https://crvsgateway.info/library

Action guide on process mapping for CRVS system-strengthening. CRVS action guides.

Enhancing CRVS system performance through effective legislation. CRVS development series.

Improving registration: Best practice guidelines. CRVS summaries.

Intervention: Improving CRVS system design. CRVS summaries.

Intervention: Improving registration practices. CRVS summaries.

University of Melbourne, BD4H Initiative, CRVS Knowledge Gateway: Learning Centre
https://crvsgateway.info/learningcentre

Topic 1: Introduction to CRVS.

Topic 2: CRVS governance and architecture.

Topic 3: CRVS processes.

Topic 6: CRVS tools – CRVS system assessment tools; Legal review tools; Process mapping.

University of Melbourne, BD4H Initiative, CRVS Knowledge Gateway: Courses
https://crvsgateway.info/courses

Enterprise architecture/business process mapping for countries.

Further reading

Africa Programme for Accelerated Improvement of Civil Registration and Vital Statistics (APAI CRVS). ***CRVS digitisation guidebook***. Available at http://www.crvs-dgb.org/en/ (accessed 3 January 2018).

Cobos Muñoz D, AbouZahr C, de Savigny D. The 'Ten CRVS Milestones' framework for understanding Civil Registration and Vital Statistics systems. ***BMJ Global Health*** 2018; 3:e000673.

Cobos Muñoz D, de Savigny D. Process mapping and modelling: a tool for visualizing system processes from end-to-end. In: de Savigny D, Blanchet K & Adam T (eds). ***Applied systems thinking for health systems research.*** Maidenhead, UK: Open University Press; 2017.

Owen M, Raj J. BPMN and business process management: Introduction to the new business process modelling standard. 2004. Available at http://www.omg.org/bpmn/Documents/6AD5D16960.BPMN_and_BPM.pdf (accessed 3 January 2018).

United Nations Department of Economic and Social Affairs (Statistics Division). Handbook on Civil Registration and Vital Statistics Systems: Management, Operation and Maintenance, Revision 1. New York, USA: UNSD; 2017. Available at https://unstats.un.org/unsd/demographic/standmeth/handbooks/CRVS_Mgt_Draft-Third2.pdf (accessed 29 December 2017).

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Civil Registration and Vital Statistics partners:

Vital Strategies

CDC Foundation
Together our impact is greater

THE UNIVERSITY OF MELBOURNE

The University of Melbourne recognises the Swiss Tropical and Public Health Institute for their partnership and contribution

Swiss TPH

For more information contact:

CRVS-info@unimelb.edu.au
crvsgateway.info

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