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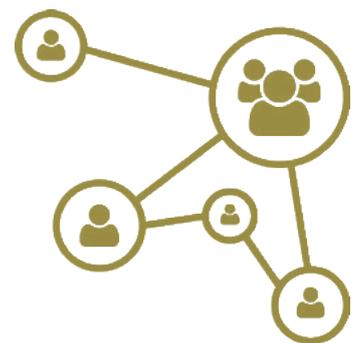


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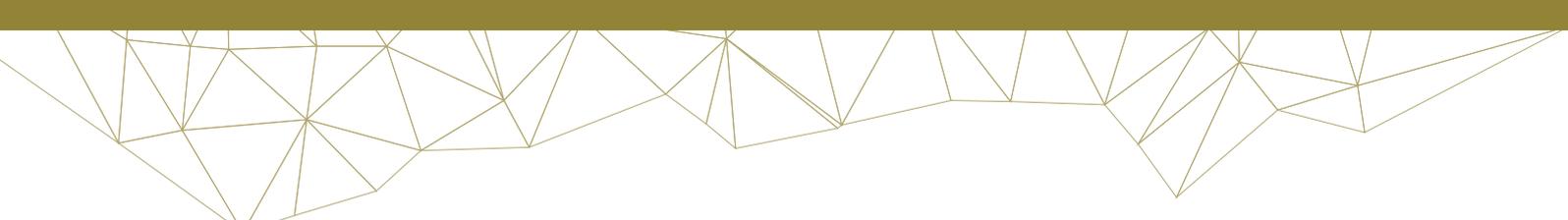
CRVS TECHNICAL OUTCOME SERIES

# CRVS innovations: Developing and testing a CRVS Costing Tool

March 2019



*Strengthening CRVS systems*



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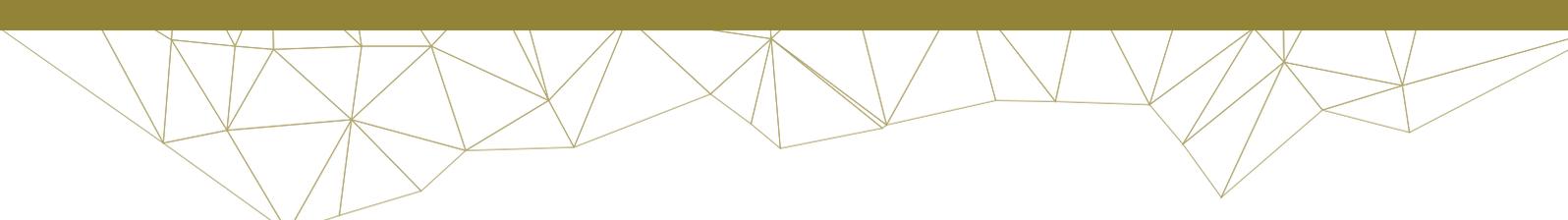
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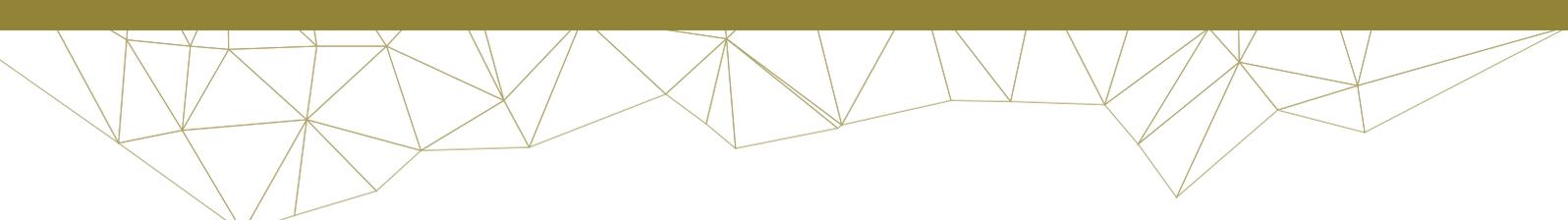
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# Contents

<b>Acronyms and abbreviations.....</b>	<b>ii</b>
<b>Section I – Background.....</b>	<b>2</b>
The need for CRVS costing data.....	2
Objectives.....	2
Methods.....	2
CRVS operations.....	3
Data collection.....	5
Analysis and outputs of the tool.....	8
Modelling CRVS implementation scenarios.....	9
<b>Section II – Preliminary results of the pilots.....</b>	<b>11</b>
Country 1.....	11
Country 2.....	14
Country 3.....	16
<b>Lessons learned and next steps.....</b>	<b>20</b>
<b>Annex 1 Overall methodological approach.....</b>	<b>21</b>
<b>Annex 2 CRVS Costing Tool development.....</b>	<b>20</b>
<b>Related resources and products.....</b>	<b>22</b>
University of Melbourne, D4H Initiative, CRVS Knowledge Gateway: Library.....	22
University of Melbourne, D4H Initiative, CRVS Knowledge Gateway: Learning Centre.....	22
University of Melbourne, D4H Initiative, CRVS Knowledge Gateway: Courses.....	22
Further reading.....	22



## Acronyms and abbreviations

BDR	birth and death registration
BPM	business process management
CDR	crude death rate
COD	cause of death
CR	civil registration
CRO	Civil Registration Office
CRVS	civil registration and vital statistics
CSMR	cause-specific mortality rates
D4H	Data for Health
EA	Enterprise Architecture
FTE	full-time employment/equivalent
HMN	Health Metrics Network
ICD	International Classification of Diseases
ID	identity
KPI	key performance indicators
LMIC	low to middle-income country
SDG	Sustainable Development Goal
SQL	structured query language
SwissTPH	Swiss Tropical and Public Health Institute
TAG	Technical Advisory Group
TOGAF	The Open Group Architecture Framework
UoM	University of Melbourne
VA	verbal autopsy
VBA	visual basic application
VE	vital event
VS	vital statistics
WG	working group

## Developing and testing a CRVS Costing Tool

Understanding the cost implications of public sector activities is essential for the efficient allocation of resources. Having accurate and timely information on the use of resources is also essential to choose cost-effective interventions for civil registration and vital statistics (CRVS) systems. Understanding the cost drivers of implementation reduces inefficiencies and improves resource allocation in decision-making processes. This *CRVS technical outcome series* paper describes the **CRVS Costing Tool** that has been developed as part of the Bloomberg Philanthropies Data for Health (D4H) Initiative by the Swiss Tropical and Public Health Institute and the University of Melbourne. The cost of CRVS systems in LMICs are not very well described in the literature and to the best of our knowledge, there were no tools to support countries in estimating the cost of their CRVS systems to inform decision making processes.

The CRVS Costing Tool builds on existing tools (VA costing tool) as well as the existing knowledge about the cost of CRVS systems to create a simple, user-friendly and methodologically sound tool. Countries are provided with three major resources. First, they receive a tool that allows them to estimate the costs of current CRVS activities and to identify inefficiencies in their systems. The idea is that countries use this tool routinely to review their operations and adjust them to reduce cost and to increase the efficiency of the system. Second, the tool allows countries to budget CRVS activities based on actual costs from previous years and third, the tool also allows countries to model the results of different interventions or implementation scenarios without having to pilot them in real life.

The results presented in this paper provide important evidence on the costs of core operations of CRVS systems and the cost implications of different interventions. As part of piloting the Tool, three countries were selected that represent a wide range of implementation strategies as well as CRVS system maturity. Country 1 was able to provide very detailed financial data, which showed the total financial and economic costs of CRVS operations. More importantly, the Tool was able to show the significant amount of money being saved using volunteers in the system. If the country would employ these volunteers, they could use the CRVS Costing Tool to estimate the expected personnel cost related to this strategy. Country 2 was interested in understanding the cost implications of a new intervention, to decide on whether to scale it up to other areas in the country or not. The Tool was able to show that, although the new intervention represented a substantial investment of resources, it seemed to be an efficient one given the tremendous success in increasing the number of registrations.

For Country 3, which had very limited financial data available, a budgeting exercise was instead done using the Tool. It provided an estimated total cost of running the CRVS system, which the country can use to help with identifying gaps in funding; finding strategies to reduce cost in implementation of CRVS activities; assess the efficiency of how resources are allocated; and evaluate the impact of new interventions in the system even before they are implemented.

## Section I – Background

### The need for CRVS costing data

The benefits of a robust and reliable CRVS system are well documented.<sup>1,2</sup> In addition to providing the best feeder document to establish unique identity at birth (a birth certificate),<sup>3</sup> CRVS systems are the best source of vital statistics in a country.<sup>4,5</sup> CRVS systems provide a reliable, continuous and universal flow of information about vital events that can be disaggregated to produce estimates at the local level. Indeed, 67 of the 232 indicators to monitor the Sustainable Development Goals (SDG) can be effectively measured with a functioning CRVS system.<sup>6</sup>

Whereas the effectiveness of interventions on CRVS systems could be assessed using existing metrics and current information systems, information about the cost of CRVS operations is scarce. The costs of running CRVS systems in LMICs are not well documented or known. Often perceived to be a costly service of the government, there have not been rigorous attempts to estimate the resources needed to implement CRVS processes. Resources allocated to CRVS systems are usually based on historical budgets and are spread across different ministries and agencies.

A review commissioned by the Health Metrics Network (HMN) concluded that the cost estimates of the different mortality surveillance systems were not systematically captured and thus, difficult to compare. One of the few attempts to estimate the cost of a CRVS system was done by Cambridge Economic Policy Associates in South Africa for the HMN in 2013. The study concluded that the total estimated annual costs for vital statistics were US\$2.9m and the direct costs of registering one birth were US\$3.70. After this exercise, the authors concluded: “An estimation of the costs of the CRVS system in a country is not straightforward and our study attempts to begin to capture some useful information.”<sup>7</sup>

One key step in the CRVS comprehensive assessment<sup>8</sup> is budgeting the various activities identified to strengthen and improve the CRVS system in a country. Although countries receive some guidance during the process, this exercise is not systematic and usually based on assumptions of resources needed and costs, and not based on actual expenditures in the previous years. This has resulted in unrealistic budgets difficult to absorb by the country or the donor community.

This innovation project aimed to create a CRVS costing and budgeting tool that could help countries to estimate the cost of running CRVS operations for births, deaths and causes of death; to model the cost of D4H interventions on CRVS in countries, and to produce budget estimates based on actual expenditures in previous years. For the first time, countries now have an approach supported by a tool that will provide a systematic and systemic analysis of the resources required for CRVS operations.

### Objectives

1. To develop a robust costing tool to assist countries to estimate and budget the resources needed to run the core CRVS processes for births, deaths and causes of deaths;
2. To use the tool to determine the total costs of implementing core CRVS processes in three countries; and
3. To identify the major cost drivers of running CRVS system and sources of inefficiencies.

### Methods

The CRVS Costing Tool (**Figure 1**) was developed using standard costing methodology. It provides a stepwise process to define costing assumptions, to collect all the information required, and finally provides the results of the analysis in different formats.

The tool assumes a systems perspective for the costing study where only costs incurred by the CRVS system are included and other costs such as household out-of-pocket expenses associated with death registration are excluded. Although choosing a more comprehensive approach with a societal perspective would be preferable, the objective of this study is to provide governments and other institutions with an estimate of the total cost of running their CRVS routine system as an input for future policy decisions. Consequently, this audience will be most interested in those costs that could fall under their budgets, rather than those incurred by households.

1 AbouZahr C, de Savigny D, Mikkelsen L, et al. Towards universal civil registration and vital statistics systems: the time is now. *The Lancet*. 2015; 386(10001):1407-18.

2 Schmider A. *Advocating for civil registration: guide to developing a business case for civil registration*. Herston: The University of Queensland; 2010.

3 Dunning C, Gelb A, Raghavan S. *Birth Registration, Legal Identity, and the Post-2015 Agenda*. Washington: Center for Global Development; 2014

4 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(10001):1373-85

5 Department of Economic and Social Affairs. *Principles and Recommendations for a Vital Statistics System*. New York: United Nations; 2014.

6 Mills S, AbouZahr C, Kim J, et al. *Civil Registration and Vital Statistics (CRVS) for monitoring the Sustainable Development Goals (SDGs)*. The World Bank; 2017.

7 Cambridge Economic Policy Associates. *Health Metrics Network: Estimating the cost of the civil registration and vital statistics system in South Africa*. London: Cambridge Economic Policy Associates; 2013.

8 Available at [https://www.who.int/healthinfo/tool\\_cod\\_2010.pdf?ua=1](https://www.who.int/healthinfo/tool_cod_2010.pdf?ua=1)

**Figure 1 CRVS Costing Tool (V1.0) main menu**



The detail of the methodological approach and assumption underlying the costing calculations are described in **Annex 1**. Briefly, the tool uses a combination of top-down and ingredients-based approaches to capture the value of all resources used in CRVS activities.<sup>9</sup> First, all activities involved in fulfilling CRVS objectives must be identified and described. CRVS process maps are the best source of CRVS operations in a country and they were used to define the scope and boundaries of the costing study.<sup>10</sup> These activities are then categorised into six broad groups of activities:

- Start up (e.g. development of a CRVS software)
- Governance (e.g. meetings of the national CRVS steering committee)
- Program management
- Supervision
- Refresher trainings
- Direct CRVS activities (e.g. registration of the vital event in the register book).

In a second step, all resources required to implement those activities are then identified. Resources are also categorised into recurrent and capital cost and further disaggregated into cost categories.

After entering all the information required, the CRVS Costing Tool generates costing estimates by aggregating

<sup>9</sup> Conteh L. Cost and unit cost calculations using step-down accounting. *Health Policy and Planning*. 2004; 19(2):127-35.

<sup>10</sup> A process map is a graphical representation of CRVS processes that indicates the different stakeholders and all activities from the occurrence of a vital event to their inclusion in national vital statistics.

the value of the different inputs.

Standard costing methodology was used to create a VBA<sup>11</sup> Excel-based costing and budgeting tool to collect cost data of CRVS operations, to analyse this information and to produce cost estimates that could be used for policymaking (see **Annex 2** for more information on tool development). The tool ensures that data are consistently collected across settings and countries (and thus comparable), analysed with the same analytical plan, and provides transparent information about the assumptions made during the costing study.

### CRVS operations

CRVS systems perform hundreds of activities daily to continuously register the occurrence of vital events, issue certificates, maintain registration archives, and produce vital statistics. Although in all settings they share the same objectives, pathways towards achieving them differ, reflecting varied historical, political and administrative conditions. The CRVS Costing Tool is flexible enough to accommodate vastly different CRVS systems in terms of governance, accountability to multiple ministries, institutional set-up, organization, implementation, processes, scale, partners, and capacities.

The civil registration (CR) subsystem refers to the entire administrative, legal and institutional framework for registering and certifying vital events, archiving vital events records and generating vital statistics.

<sup>11</sup> VBA = visual basic for applications programming language

This includes personnel, the registration infrastructure network, procedures, recordkeeping and retrieval, certificate issuance, outputs, services to other agencies, and all other activities pertaining to civil registration in a country. The CR system, therefore, includes both the registration method and all the institutional, technical and legal settings associated with it.

The vital statistics (VS) sub-system is usually represented by the national statistics office and their responsibilities are to compile and tabulate the VS of the country using standard definitions, classifications, coding, data entry and quality control procedures.

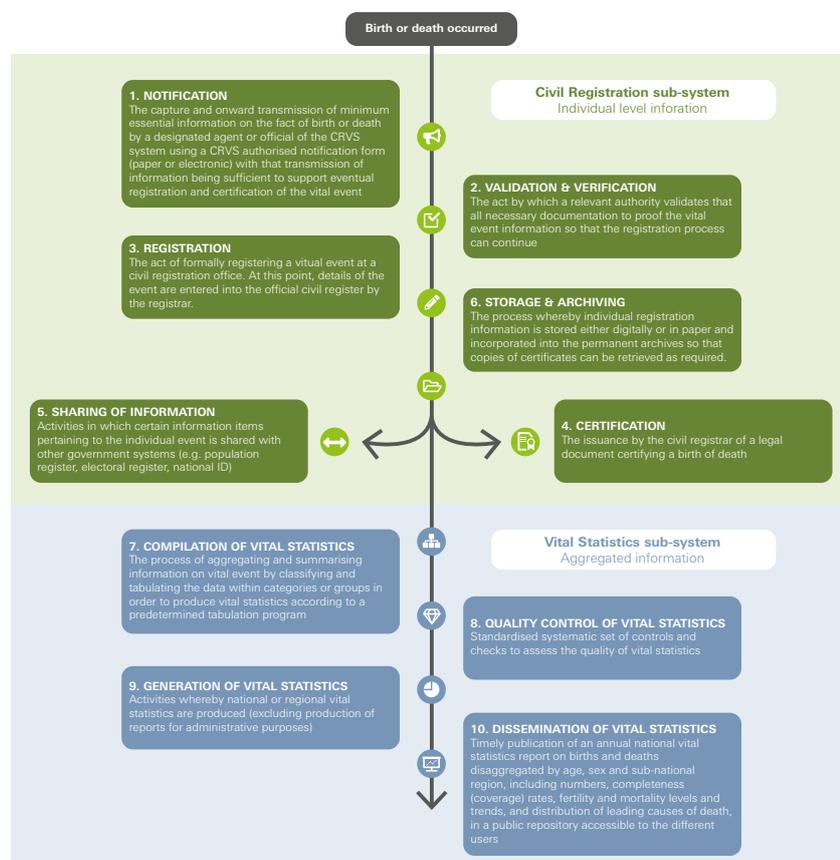
Most CRVS systems follow a sequence of “milestones” which are essential to fulfilling their objectives. They comprise activities from the occurrence of the vital event to its inclusion in the vital statistics; from the notification of the vital event until the dissemination of the vital statistics (**Figure 2**). We have used the “Ten CRVS Milestones” framework to define the scope of all activities to be included in the costing exercise.<sup>12</sup>

In most countries, different government agencies or departments are responsible for conducting the different functions of a CRVS system, and different administrative structures are possible. The three main partners in a CRVS system are the:

1. Civil registration agency, often within a ministry of justice, home affairs or interior.
2. Health department or ministry.
3. National statistics office, often within a ministry of finance.

Other sectors contribute to aspects of the CRVS system, including the ministry of foreign affairs (for registration of events to nationals occurring abroad), the police and judicial authorities (for the investigation of non-natural deaths). **Figure 3** shows a mapping of potential stakeholders to be included in the costing exercise.

**Figure 2 The Ten CRVS Milestones**



<sup>12</sup> Cobos Munoz D, Abouzahr C, de Savigny D. The “Ten CRVS Milestones” framework for understanding Civil Registration and Vital Statistics systems. *BMJ Global Health*. 2018; 3(2):e000673.

**Figure 3 Typical CRVS stakeholders to be considered in a costing exercise**



### Data collection

The CRVS Costing Tool serves as the data collection tool for the costing or budgeting exercise. All information required to generate the costing or budgeting estimates can be recorded using the tool. The process for data collection and the structure of the Tool is very similar for a costing or a budgeting exercise. We describe the data collection for a costing exercise in detail and highlight the differences with a budgeting exercise at the end of this section.

#### Costing CRVS systems

The costing exercise (and costing module) is divided into three sub-sections: "Preparatory steps", "Activities to be costed" and "Results" (**Figure 4**).

In the "Preparatory steps" sub-section the user must provide basic information about the country, administrative structure, currencies and exchange rates to be used during the costing exercise. Basic costing assumptions such as the discount rate or the lifespan of different capital goods (eg buildings, equipment) must also be entered.<sup>13</sup> Finally, the user must define the number and denomination of the sampling units for which the cost will be collected (eg districts or regions in a country).

Once the user has entered all the basic information, the real cost data collection starts. The data collection sequence has been defined as following the different groups of activities included in CRVS operations:

1. **Start-up activities:** which includes all activities that are needed to initiate a CRVS activity, but are only spent once (initial training, equipment, etc).
2. **Governance activities:** covers all governance-related activities, including the organization of meetings, workshops, etc.
3. **Program management:** includes the costs related to running the CRVS program, including communication, salaries of CRVS staff, etc.
4. **Supervision:** covers the costs related to the supervision of CRVS staff.
5. **Recurrent trainings and workshops:** includes the costs of recurrent training and capacity building. Initial costs are not included in this section.
6. **Direct CRVS activities:** the cost of delivering the civil registration services to the population at the local level.

<sup>13</sup> Walker D, Kumaranayake L. Allowing for differential timing in cost analyses: discounting and annualization. *Health Policy and Planning*. 2002; 17(1):112-8.

Figure 4 Structure and cost categories included in the Tool

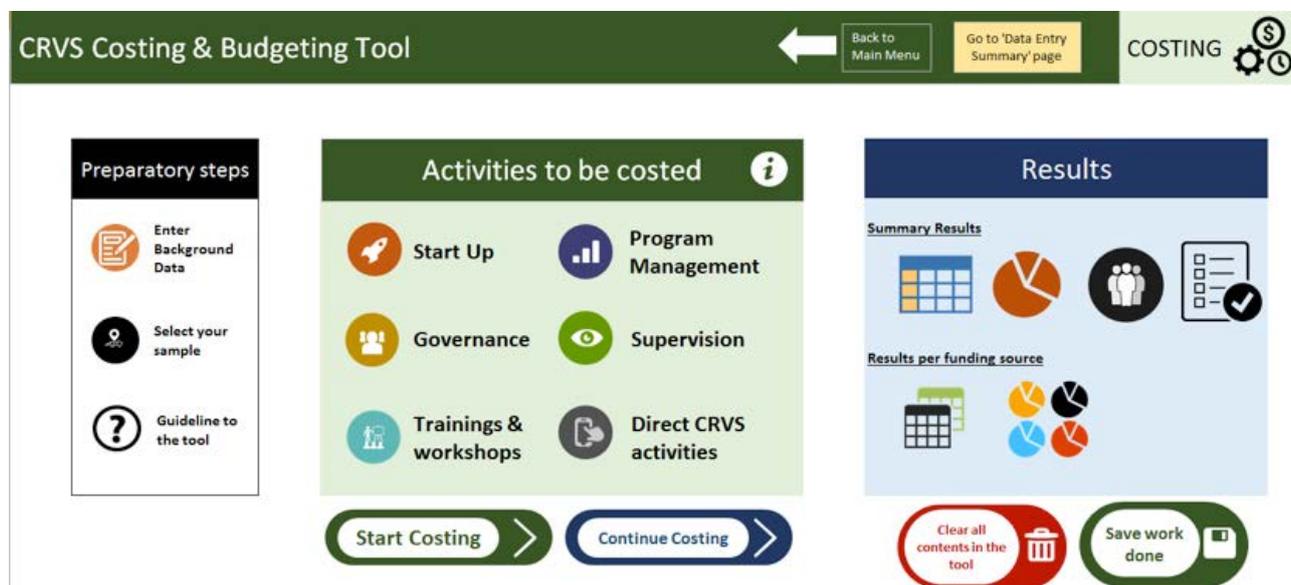
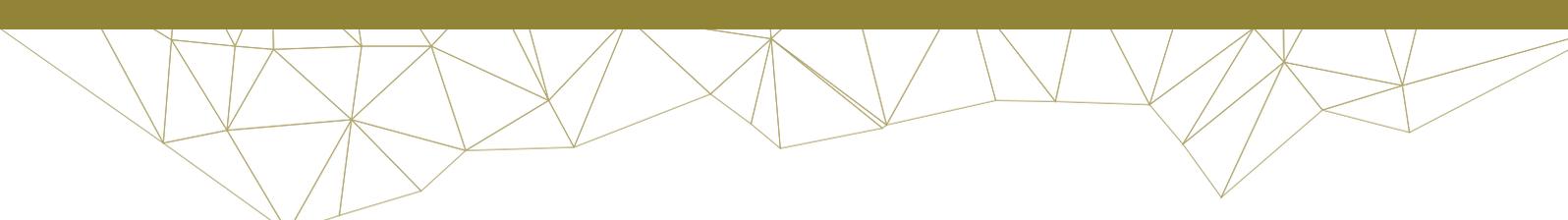


Figure 5 Cost categories included in each activity group

	Start Up	Governance	Trainings, workshops & meetings	Program Management	Supervision	Direct CRVS activities
Personnel	X	X	X	X	X	X
Refresher trainings & workshops		X	X	X	X	X
Communications	X	X	X	X	X	X
Per diems & Transport cost	X	X	X	X	X	X
Maintenance			X	X		X
Supplies & utilities						X
Other recurrent cost						X
Buildings	X					X
Vehicles						X
Equipment	X		X	X		X
Consultants	X		X			X
Other capital cost	X					X



In each activity group, the user must capture the resources used to implement each activity. For instance, each supervisory activity, the tool is ready to capture staff cost, transport cost, per diems, venue cost, etc., if they were part of the activity.

Although the proposed costing approach is comprehensive trying to capture all resources used in CRVS operations, we tried to balance the amount of information to be collected with the potential impact of each piece of information in the final cost estimation. This analysis resulted in a reduction of the list of categories of resources to be included in each activity group (see **Figure 5** for more information on which resources to capture).

Given that personnel cost usually represents the main cost driver of CRVS operations the tool has room to capture a detailed description of the time allocations done by different staff categories throughout the system (**Figure 6**). In addition, to capture the overall time allocated to CRVS activities, the user can define the proportion of time spent on each CRVS milestone according to the staff profile. This information is then used by the tool to estimate the total number of human resources involved and the full-time equivalents (FTE) of each position required to run the system. The tool can capture both staff receiving a salary as well as personnel performing activities in the system but not receiving a financial retribution (eg volunteers).

**Budgeting the implementation of CRVS activities**

The budgeting section of the tool is structured in a similar way as the one described in the costing section. The information for a budgeting exercise is also collected by activity group (start-up, governance, refresher training, program management, supervision and direct CRVS activities) and provides an estimate that can be used to model different scenarios.

There are several assumptions to be made by the user that the tool computes as inputs in its calculations. The most relevant assumptions are:

- Administrative structure in the country and number of each of them.
- Population included in the budget (will determine the number of events to be registered).
- Crude birth rate (CBR).
- Crude death rate (CDR).
- Per cent of births and deaths registered;
- Unit cost for some resources/activities (salaries, time allocations, transport cost, etc.).

The tool provides the total cost of CRVS implementation under the assumptions provided by the user as well as different disaggregation and analysis of these costs.

**Figure 6 Example of the detailed information needed under 'Personnel'**

Staff profile	Total % of time for CRVS activities	As a % of the time spent on CRVS activities							Check
		1. Notification	2. Validation, Registration and Certification	3. Other CR activities	4. Compilation of VS	5. Quality control	6. Generation and Dissemination of VS	7. Other VS activities	
									0.0%
									0.0%
									0.0%
									0.0%
									0.0%
									0.0%

## Analysis and outputs of the tool

Once all the information has been entered in the Tool, it automatically produces several outputs with costing estimates. The Tool provides the total financial and economic cost per major activity (Figure 7) and the total cost per cost input such as personnel, supplies or equipment (Figure 8). The cost estimates can also be disaggregated by funding source and per sampling unit.

In terms of human resources, the tool conducts a detailed analysis of the total number of staff and volunteers involved in the implementation of the different activities as well as the training requirements at the different levels of the system (Figure 9).

Figure 7 Output table with the total cost per major activity

	Total Financial Cost in months in ( )	Total Economic Cost in months in ( )
Start Up activities	-	-
Governance activities	-	-
Recurrent training & workshops	-	-
Program Management	-	-
Supervision	-	-
Direct CRVS activities	-	-
<b>TOTAL</b>		

Figure 8 Output table with total cost per cost input

Input	Total Financial Cost in months in ( )	% of financial costs	Total Economic Cost in months in ( )	% of economic costs
<b>Start-up costs</b>				
Trainings, workshops & meetings	-	0%	-	0%
Other start up	-	0%	-	0%
<b>Total start-up costs</b>	-	0%	-	0%
<b>Recurrent costs</b>				
Workshops, meetings, trainings and supervision visits	-	0%	-	0%
Personnel	-	0%	-	0%
Communications	-	0%	-	0%
Maintenance	-	0%	-	0%
Supplies & other recurrent	-	0%	-	0%
<b>Total recurrent costs</b>	-	0%	-	0%
<b>Capital costs</b>				
Buildings	-	0%	-	0%
Equipment	-	0%	-	0%
Vehicles	-	0%	-	0%
Consultants	-	0%	-	0%
<b>Total capital costs</b>	-	0%	-	0%
<b>Total Annual Costs</b>	-	0%	-	0%

**Figure 9 Output table for human resources**



**Modelling CRVS implementation scenarios**

The modelling module of the tool provides a five-year projection of the potential cost of the CRVS system given the assumptions and information provided in the modelling section.

The results of either a costing or a budgeting exercise can be modelled for different implementation scenarios and for time. Several factors can be modified to create different scenarios. These factors are:

- Administrative structure in the country and number of each of them.
- Population included in the budget (will determine the number of events to be registered).
- Crude birth rate (CBR).
- Crude death rate (CDR).
- Per cent of births and deaths registered.
- Inflation rate.

The Tool estimates the total cost per year of implementation, unit cost per CRVS activity and multiple disaggregation options (eg cost per activity group, cost per input, direct cost, etc.). Costs for each subsequent year are calculated by applying a weighting factor to each cost category (**Table 1**).



**Table 1 Weighting factor used to model cost according to activity group and type of resource**

	<b>Factor</b>
<b>Start-Up</b> Start-up training and workshops Other start-up cost	Expected number of staff to be trained
<b>Governance</b> Governance workshops and meetings Other governance cost	Incremental number of sampling units at each administrative level
<b>Program management</b> Personnel Communications Supplies, utilities and other recurrent cost Equipment Consultants	National and subnational level: Incremental number of sampling units in the administrative level below compared with previous year Local level: Incremental number of sampling units in the same level compared with previous year
<b>Supervision</b> Supervision workshops and meetings Personnel Communications Supplies, utilities and other recurrent cost Equipment Consultants	National and subnational level: Incremental number of sampling units at each administrative level compared with previous year Local level: Incremental number of sampling units in the same level compared with previous year
<b>Direct CRVS activities</b> Refresher training and workshops Personnel Communications Maintenance	Expected number of FTE required to conduct the expected number of registrations (births plus deaths) in a given year
Buildings Equipment Vehicles Consultants	Incremental number of units providing registration services

## Section II – Preliminary results of the pilots

The following section describes the results of the pilots during which the CRVS Costing Tool was tested. Three countries were selected to capture a wide range of implementation strategies as well as CRVS system maturity. Furthermore, the selected countries themselves indicated interest on their side to test such tools for better understanding of the resources used in CRVS operations.

A team from SwissTPH visited each country for a period of 7–14 days between January and June 2018. The mission in each country had the following basic structure:

- Presentation of the tool, data requirements and costing outputs to national level stakeholders.
- Data collection in at least two different areas in the country including relevant sub-national structures.
- Debriefing meeting with relevant stakeholders.

The results of the costing or budgeting exercise in each of the countries are not described extensively in this document. This section presents the different type results and analysis that countries could perform using the CRVS Costing Tool. Pilot countries have been de-identified as per their request.

### Country 1

#### *Total cost of CRVS operations and major cost drivers*

The costing exercise in Country 1 was very detailed and the team had access to the accounting systems of the different institutions involved in CRVS activities.

One of the first outputs from the CRVS costing tool that countries would want to review is production from the system in terms of total number of registrations completed, and the total and unit cost of producing these registrations. Also, countries will want to understand what the main cost drivers of their CRVS operations are.

With this information countries will be able to understand the resources used on CRVS (total cost), the funding sources, the main cost drivers (eg by type of activity) and how efficient the system is (unit cost). The CRVS Costing Tool provides this information in tables and graphs that can be easily used for reporting somewhere else.

In Country 1, a total of 12,317 registrations of births and deaths were conducted in sampled CR offices. The lowest number of registrations recorded in any one office was 1,539, while the highest was 6,469.

The total financial and economic costs of CRVS operations were US\$49,741 and US\$87,932 respectively (**Figure 10**). The average cost per registration was US\$4.0 for financial and US\$7.1 for economic cost. If we consider only direct CRVS cost, the cost per registration dropped to US\$2.41 and US\$5.28 for financial and economic costs, respectively (**Figure 11**).

**Figure 10 Financial and economic costs of CRVS activities in Country 1**

	<b>Total Financial Cost in 2017 (USD)</b>	<b>Total Economic Cost in 2017 (USD)</b>
<b>Start Up activities</b>	367	141
<b>Governance activities</b>	-	-
<b>Recurrent training &amp; workshops</b>	-	-
<b>Program Management</b>	16,412	19,452
<b>Supervision</b>	3,301	3,301
<b>Direct CRVS activities</b>	29,660	65,037
<b>TOTAL</b>	<b>49,741</b>	<b>87,932</b>

Figure 11 Average cost per registration by CRVS Milestone

Milestone	Financial cost per event (USD)	Economic cost per event (USD)
1. Notification	-	-
2. Validation, Registration and Certification	1.93	3.86
3. Other CR activities	0.32	0.65
4. Compilation of VS	1.12	1.27
6. Generation and Dissemination of VS	0.02	0.02
7. Other VS activities	0.04	0.05
8. Managerial activities	-	-

Figure 12 Staff requirements to implement CRVS activities

	Total number involved	FTEs*
Registrar	4	3.5
Registrar assistant	5	4.5
Other CR staff	2	2.0
Statistician	0	0.0
National manager & supervisor	68	20.6
Sub-national manager & supervisor	29	24.7
Health personnel	0	0.0
Consultant	0	0.0
Community key informants	0	0.0
Other	0	0.0

\*FTE: Full Time Equivalent

One striking finding of using the CRVS Costing Tool in Country 1 was the impact of volunteers in the final cost estimate. Generally, volunteers are accounted for in costing studies as being an economic cost (there is no financial transaction but there is time spent by volunteers that has an economic value). In the case of this CRVS system, most of the personnel working in CR offices were volunteers and thus economic cost were substantially higher than financial cost. **If the country would employ these volunteers, they could use the CRVS Costing Tool to estimate the expected personnel cost related to this strategy.**

Over half of the financial costs of CRVS activities were direct costs related to the provision of CR services at the local level (59.6%), followed by program management costs (33%) and supervisory activities (6.6%). Personnel costs accounted for the highest share of the cost of CRVS (81%), followed by supplies and other recurrent costs (10%) and Communications (3%).

When analysing these results per cost category it was surprising to find such high program management cost. Also, combining these two types of disaggregation, we can see that one third of the cost was program management and most of it was related to personnel

cost. In simple words, there was a high number of personnel employed at the national level managing the CR operations. In discussions of these results with key stakeholders in the country there was a consensus that the CR authority should look at the efficiency of having such a high number of staff at the national level. The total number of staff required from each category in the sampled areas can be seen in **Figure 12**.

Given the nature of CRVS processes, it is not surprising that the CR authority in the country is the main source of funding (96% for financial costs) followed by out of pocket expenditures from CR personnel (1.7%) and the health system (1%).

#### *Cost per CRVS Milestone*

Another way to look at the results of the costing is to identify the resources used (and thus the cost) of fulfilling each of the CRVS Milestones.<sup>12</sup> For instance, what are the costs of registering all notifications that arrive to the CR office? If there is a milestone that is weak (eg notification), is the country putting enough attention (and resources) to achieve this milestone? The costing tool can provide this information in a meaningful way through tables and graphs.

If we disaggregate financial and economic costs in Country 1 by CRVS milestone, most resources were allocated to the validation, registration and certification of vital events. These costs in addition to those allocated to notification activities, represent the resources allocated to the CR offices throughout the

country (US\$27,815 [55.9%] and US\$59,924 [68.1%] for financial and economic costs respectively) (**Figure 13**). The compilation of vital statistics (VS) includes all resources used to digitize and collect all birth and death registrations to be included in the CR national database. Managerial activities at all levels of the system represented seven per cent of the total cost which is a reasonable share of overhead cost over the system.

It is clear from the distribution of resources described above that the CRVS system is paying a lot of attention to the basic operational functions of the CR system (validation, registration and certification). This is consistent with the fact that if one vital event reaches the CR office, it is likely to be registered and certified. On the other hand, one of the main challenges in Country 1 is related to the notification of vital events. There are several reasons why vital events are not notified in Country 1 including social, economic and educational factors.

The results of the costing exercise show that a very small proportion of the cost was allocated to making the notification of vital events work. It is likely that improving the performance of the system will require allocation more resources to this crucial step. The CRVS Costing Tool can support countries in creating several scenarios where the cost of different approaches is estimated.

**Figure 13 Financial and economic costs of CRVS activities by CRVS Milestone**

Milestone	Total Financial Cost in 2017 (USD)	Total Economic Cost in 2017 (USD)
<b>1. Notification</b>	4,038	12,431
<b>2. Validation, Registration and Certification</b>	23,777	47,493
<b>3. Other CR activities</b>	3,960	7,965
<b>4. Compilation of VS</b>	13,842	15,682
<b>6. Generation and Dissemination of VS</b>	255	265
<b>7. Other VS activities</b>	507	577
<b>8. Managerial activities</b>	3,283	3,388
<b>TOTAL</b>	<b>49,662</b>	<b>87,801</b>

## Country 2

### *Resource implications of the integration of a new intervention*

Given the momentum with CRVS in LMICs, it is likely that countries will implement new strategies or interventions to improve the performance of their CRVS system. It is not uncommon that the impact of an intervention is assessed based on the results in increasing registration of vital events, however the financial impact is often neglected. The CRVS costing tool provides a systematic way of assessing the financial impact of new interventions.

Country two piloted a new intervention to increase the notification (and thus the registration of vital events). At the time of the costing study they were interested in understanding the resource implications of this new intervention to decide on whether to scale it up to other areas in the country.

With that in mind the team decided to sample sub-districts in areas with and without the new intervention to be able to compare the cost. A total of 23,336 registrations of births and deaths were conducted in the sub-districts included in the costing exercise (including both areas).

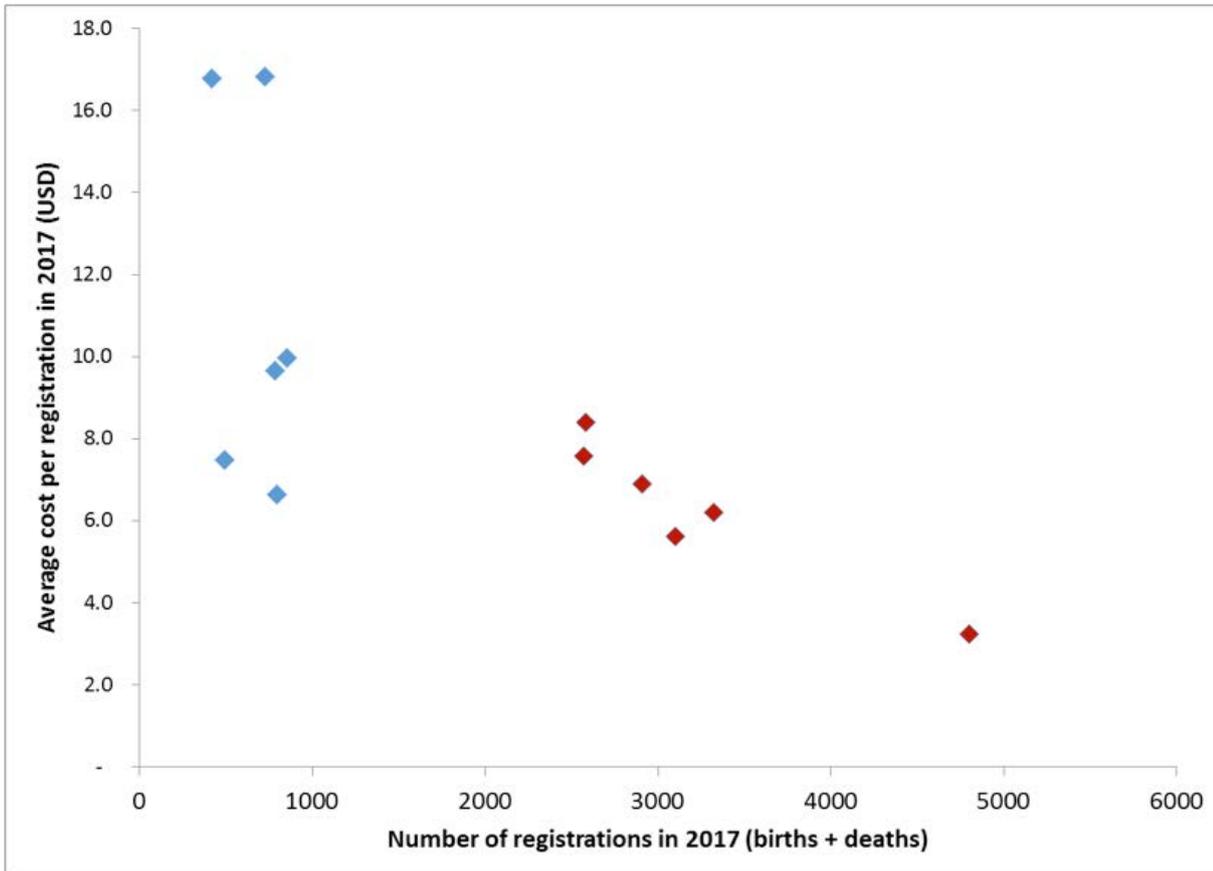
The total financial and economic costs of CRVS operations in the sampled area were US\$156,310 and US\$161,949 respectively (**Figure 14**). The average cost per registration was US\$6.7 for financial and US\$6.9 for economic cost.

Financial cost per registration varies widely among the different locations from US\$16.9 per registration to US\$3.2. **Figure 15** shows that for most of the regions, the higher the number of registrations, the lower the average cost per registration what indicates a certain degree of economies of scale.

**Figure 14 Distribution of financial and economic costs by activity, Country 2**

	<b>Total Financial Cost in 2017 (USD)</b>	<b>Total Economic Cost in 2017 (USD)</b>
<b>Start Up activities</b>	246	2,921
<b>Governance activities</b>	1	1
<b>Recurrent training &amp; workshops</b>	-	-
<b>Program Management</b>	223	231
<b>Supervision</b>	32,601	32,601
<b>Direct CRVS activities</b>	123,240	126,196
<b>TOTAL</b>	<b>156,310</b>	<b>161,949</b>

**Figure 15 Distribution of unit cost of registration by number of registrations, Country 2**



When we disaggregate financial and economic cost by CRVS Milestones, we see that overall most of the resources were allocated to the notification of vital events. Since this was one of the objectives of the costing exercise the team decided to conduct further analysis (all included in the CRVS Costing Tool).

First, a significant amount of resources for notification were spent at the national and sub-national level (US\$32,848). These resources represented the program management cost at national level (primarily staff cost for the different institutions at the national level). When we disaggregate the cost by location where the expense was incurred, the picture varies widely among the two sampled districts (with and without intervention) (Figure 16).

In District 1 (where the new intervention was being piloted), the highest share of the cost was related to notification activities (57.2% of the total cost) followed by other CR activities. These resources accounted for the time spent by health staff to capture vital events and to support the families in the registration process.

The opposite picture can be seen in District 2 (no intervention) where just 0.8% of the cost were spend on notification of vital events whereas other CR activities had a similar cost.

It is clear from the results of the costing that District 1 used more resources than District 2 to increase notification of vital events (US\$54,550 versus US\$221 respectively). This was seen as a significant investment by most CRVS stakeholders in Country 2 and they wanted to assess whether it was an efficient use of resources. The **CRVS Costing Tool can also provide unit cost calculations that are useful to look at efficiency.** In this case, the cost per vital event registered was US\$5.96 in District 1 (with new intervention) versus US\$10.88 in District 2 (standard practice). Thus, although the new intervention represented a substantial investment of resources, it seemed to be an efficient one given the tremendous success in increasing the number of registrations (bringing the cost per registration below the standard practice [District 2]).

**Figure 16 Distribution of financial and economic cost per activity and per sampled district, Country 2**

	Total Cost in 2017 (USD)		Distribution of financial cost in 2017 (USD)		
	Total Financial Cost in 2017 (USD)	Total Economic Cost in 2017 (USD)	National & sub-national	District 1	District 2
1. Notification	87,019	87,404	32,848	54,550	221
2. Validation, Registration and Certification	18,088	21,051	52	12,376	5,659
3. Other CR activities	49,441	49,441	16	28,512	20,913
4. Compilation of VS	-	-	-	-	-
5. Quality control	-	-	-	-	-
6. Generation and Dissemination of VS	19	2,849	19	-	-
7. Other VS activities	1,009	1,009	-	-	1,009
8. Managerial activities	135	135	135	-	-
<b>TOTAL</b>	<b>156,310</b>	<b>161,949</b>	<b>33,070</b>	<b>95,438</b>	<b>27,802</b>

The CRVS Costing Tool was extremely useful to answer some of the questions raised by CRVS stakeholders and the **results have already been included in decision making processes in the country.** Although the tool has some fixed analysis and visualizations, these can be adapted to the user needs with some Microsoft Excel skills.

### Country 3

#### Budgeting CRVS activities

For countries with limited access to accounting information about CRVS activities or lack of resources (or time) to conduct a full costing study, the CRVS Costing Tool provides a **budgeting module.** This module will help countries estimate resources needed in different scenarios based on assumptions made by the user in terms of the value of the different goods and services (in a costing exercise we would capture the actual value and not an estimation by the user).

The availability of financial data for the costing exercise in country three was limited. Whereas the information about the outputs of the process (eg number of registrations, number of certificates, etc.) was easily accessible, financial information for the resources used when providing registration services was not fully available. Given the information available, we decided to conduct a budgeting exercise with a national scope.

The objective of this analysis was to estimate the total costs of running the CRVS system in the whole country. The team identified the total cost of the CRVS system in one region based on the data collected during a field visit and then inferred the cost for the whole country using the CRVS Costing Tool.

Some of the assumptions that the team had to do at the beginning of the exercise were the discount rate (5%), the lifespan for training (three years) and the useful life for equipment, vehicles and buildings (five, 10 and

20 years of respectively). The team had also to make assumptions about the estimated number of events that will be registered in one year. The CRVS Costing Tool provides a system to calculate this number based on the total population in the country, the crude birth rate, the crude death rate, and registration completeness (births and deaths separately).

As a result, the CRVS Costing Tool estimated 517,219 births and 97,929 deaths captured by the system in one year. This will have implications for the system since personnel costs are significantly influenced by the number of registrations to be completed in one year.

We assumed that some of the start-up and governance activities conducted in 2017, as part of the D4H Initiative were going to be maintained and they would become routine activities. We considered salaries funded by D4H as a start-up cost rather than recurrent cost in program management activities (as D4H is an addition to the existing system with a limited time span). Finally, we found one supervisory activity conducted in 2017 but one would expect more supervisory activities in the future.

In terms of regional costs, we assumed that the different resources were equally distributed across the country. Although we are aware of the differences among regions or even inside the region, we do not expect this to have an impact on the final calculation since we are estimating the total budget for the country at the national level. Inefficiencies and transaction costs related to the unequal distribution of resources could be explored in a future costing exercise.

Once the team entered these assumptions in the CRVS Costing Tool and completed the expected cost for the different activities, the tool estimated a total financial costs estimated for one year of US\$11,445,544 (**Figure 17**). This yielded an average cost of around US\$18 per vital event registered.

**Figure 17 Financial costs of budgeted CRVS activities, Country 3**

	Total Financial Cost in 2017 (USD)
A. Start Up	188,220
B. Governance	6,929
C. Recurrent trainings & workshops	-
D. Program Management	60,683
E. Supervision	15,000
F. Direct CRVS activities	11,174,713
<b>TOTAL</b>	<b>11,445,544</b>

The highest share of the cost was related to the resources used for direct CRVS activities (97.6%) followed by start-up cost (1.6%) (Figure 18). Given that we have assumed that this is the first year of implementation, financial cost for start-up activities are significantly higher than economic cost. Interestingly, program management costs were observed to be less than one per cent of the total cost which is extremely low. However, this estimate is significantly influenced by the unavailability of financial information from one of the CRVS partners, who bears the bulk of program management activities related to registration and certification of vital events.

Personnel cost accounted for 81 per cent and 83 per cent of the total financial and economic cost of CRVS operations respectively. The system was expected to spend US\$1,420,301 on supplies and other recurrent costs (12% of the total financial cost) and US\$554,979 in capital investments in one year.

**Country three has now information on the estimated cost of running their CRVS system.** They can now identify gaps in funding that can be covered by the government, private sector or external donors; find strategies to reduce cost in implementation of CRVS activities; assess the efficiency of how resources are allocated; and evaluate the impact of new interventions in the system even before they are implemented. The CRVS Costing Tool can be used to answer these questions in a user friendly and simple manner.

**Figure 18 Distribution of financial and economic cost by activity, Country 3**

Input	Financial cost in 2017 (USD)	% of financial costs	Economic cost in 2017 (USD)	% of economic costs
<b>Start-up costs</b>				
Trainings, workshops & meetings	45,000	0%	10,394	0%
Other start up	143,220	1%	11,548	0%
<b>Total start-up costs</b>	<b>188,220</b>	<b>2%</b>	<b>21,942</b>	<b>0%</b>
<b>Recurrent costs</b>				
Refresher trainings & meetings	21,929	0%	21,929	0%
Personnel	9,260,110	81%	9,260,110	83%
Communications	-	0%	-	0%
Maintenance	-	0%	-	0%
Supplies & other recurrent	1,420,307	12%	1,420,307	13%
<b>Total recurrent costs</b>	<b>10,702,345</b>	<b>94%</b>	<b>10,702,345</b>	<b>96%</b>
<b>Capital costs</b>				
Buildings	351,432	3%	351,432	3%
Equipment	203,547	2%	47,014	0%
Vehicles	-	0%	-	0%
Consultants	-	0%	-	0%
<b>Total capital costs</b>	<b>554,979</b>	<b>5%</b>	<b>398,447</b>	<b>4%</b>
<b>Total Annual Costs</b>	<b>11,445,544</b>	<b>100%</b>	<b>11,122,734</b>	<b>100%</b>

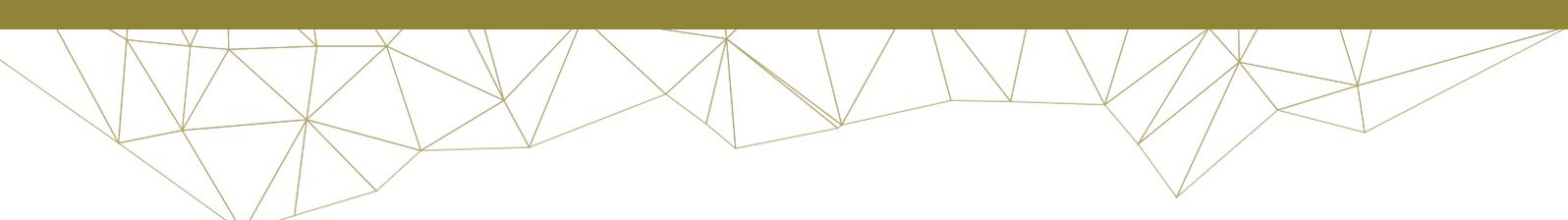
## Lessons learned and next steps

The cost of civil registration and vital statistics systems in low- to middle-income countries are not very well described in the literature and to the best of our knowledge, there are no tools to support countries in estimating the cost of their CRVS systems to inform decision making processes. As part of this innovation project we have developed a CRVS Costing Tool that can be used by countries in the data collection and analysis costing exercises.

The pilot of the tool showed its potential and exposed some of the limitations in terms of data availability in countries. The pilot also showed the benefits of having a detailed description of all activities implemented and all stakeholders involved in the CRVS system in the form of a process map. There are some limitations with the current version of the tool and its application. Firstly, the representativeness of sub-national samples used in the costing or budgeting exercise will have an impact on the representativeness of overall results, and so care should be taken when interpreting results at the national level. Also, given the generally limited availability of country-specific costing data, expert opinion and proxy estimates for the value of goods is often required. Even though this is not uncommon for many public sector accounting systems in LMICs, it will have an impact on results. Further analysis including sensitivity analysis could be performed to understand the impact of these assumptions. The CRVS Costing Tool is expected to include this functionality in future versions.

For countries willing to estimate the cost of their CRVS system there are several activities or steps that would facilitate the exercise:

- Develop a detailed process maps including all activities and stakeholders involved in the process to be costed.
- Include in the team someone with an economics background and/or with experience in costing of government services.
- Engage at least one representative of each key institution in the data collection and analysis.
- Seek support from experts with experience on the use of the CRVS costing tool.
- Prepare a debriefing session with all the relevant institutions to present the results of the costing exercise and discuss the implications in terms of resource allocations.



## Annex 1 Overall methodological approach

A combination of top-down and ingredient-based methodologies was used to estimate the total costs of CRVS operations. The top-down costing approach involves allocating overhead and shared costs of the system to CRVS operations, where applicable, using appropriate allocation rules.<sup>14</sup> The ingredient based costing approach is generally defined as a valuation technique which starts with a detailed identification and measurement of all the inputs required for an intervention, followed by conversion into value terms to produce a total cost estimate. In this study, the ingredients-based approach was used to estimate the total costs for all CRVS activities by listing all the possible inputs, measuring quantities and valuing all inputs required for a functioning CRVS system.<sup>15</sup> CRVS process maps were used to define the scope and boundaries of the costing study.<sup>16</sup>

The tool assumes a systems perspective for the costing study where only costs incurred by the CRVS system are included and other costs such as household out-of-pocket expenses associated with death registration are excluded. Although choosing a more comprehensive approach with a societal perspective would be preferable, the objective of this study is to provide governments and other institutions with an estimate of the total cost of running their CRVS routine system as an input for future policy decisions. Consequently, this audience will be most interested in those costs that could fall under their budgets, rather than those incurred by households.

The CRVS Costing Tool estimates total costs of CRVS by aggregating the costs of the different inputs. Average/unit costs are then estimated by dividing the total costs by the units of outputs (ie number of deaths registered) produced. It can be customized to the country's context and covers all aspects of a CRVS system, including start-up costs, training costs, community-level service delivery costs, as well as governance, supervision, and management costs at all administrative levels.

This tool considers both financial and economic costs. Financial costs represent the accounting cost of developing and implementing an intervention, whereas the broader notion of economic costs captures the opportunity cost of the resources used in the intervention, whether or not a financial cost was incurred (ie even if they did not involve a monetary payment). Differences arise between financial and economic costs for goods or services for which there are no financial transactions, and where the price of the good does not represent its actual value. This is particularly important in programs with donated goods, working with volunteers or when valuing capital costs. The economic cost or value of donated goods and services are estimated by taking their equivalent market prices.

<sup>14</sup> Conteh L. Cost and unit cost calculations using step-down accounting. *Health Policy and Planning*. 2004; 19(2):127-35.

<sup>15</sup> Drummond M, Sculpher M, Torrance G, et al. *Methods for the economic evaluation of health care programmes*. 2nd Edition ed. New York: Oxford University Press; 2005.

<sup>16</sup> A process map is a graphical representation of CRVS processes that indicates the different stakeholders and all activities from the occurrence of a vital event to their inclusion in national vital statistics.

## Annex 2 CRVS Costing Tool development

The first prototype was built based on the work that was already done with the VA costing tool. We extended the functionality of that tool to capture the wider costs and all stakeholders of the CRVS systems. The developed tool was tested in three countries and some modifications were made after each test based on the feedback received.

We used standard costing methodology<sup>17</sup> to create a VBA Excel-based costing and budgeting tool to collect cost data of CRVS operations, to analyse this information and to produce cost estimates that could be used for policymaking. The tool ensures that data are consistently collected across settings and countries (and thus comparable), analysed with the same analytical plan, and provides transparent information about the assumptions made during the costing study.

The scope of costs to be captured by the “CRVS Costing Tool” was identified using two main sources of information. First, we reviewed published literature as well as grey literature on the costs of implementing CRVS, either as part of a routine system or in a research environment.<sup>7,18,19,20</sup> We identified activities involved in the implementation of CRVS, resources used in different settings and major cost drivers in existing examples of CRVS systems.

Second, we used the process maps developed in D4H countries as the starting point to identify all activities required to register and certify vital events as well as to produce vital statistics. The process maps provided a detailed description of the sequence of activities performed in a CRVS system. They also provided the core list of stakeholders that are involved in CRVS processes. We used this information to build the first version of the D4H CRVS Costing Tool.

In a second step, we field tested the tool in three countries to identify additional resources used for the implementation of CRVS activities and to assess the user experience in using the tool and understanding the results. We aimed to capture the maximum variation of inputs needed in the different implementation strategies through the selection of country case studies with different implementation approaches. Finally, we developed a “Modelling Module” in the tool to estimate the cost of different implementation scenarios or different CRVS interventions.

### Products developed

#### *VBA Excel-based tool*

The tool has three main functionalities: costing, budgeting and modelling CRVS operations. All of them are accessible from the first screen that pops up after running the Excel file. We describe in this section the basic structure of each module.

#### *User guide*

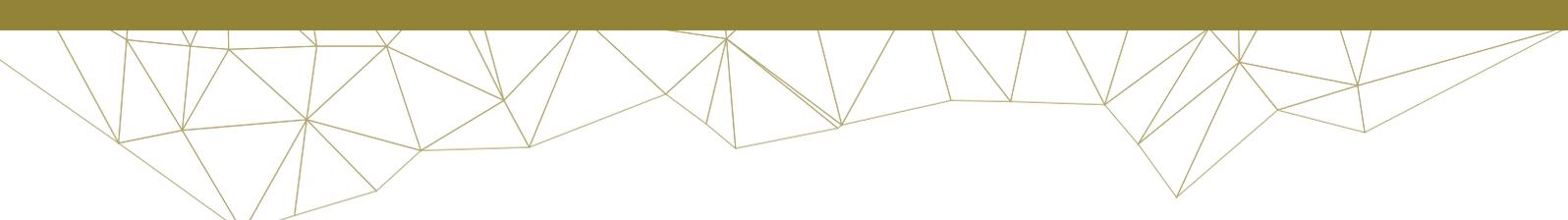
The CRVS Costing Tool was developed with a user guide to facilitate the use of the tool. The user guide includes some background information and mainly describes the details to enter costing and budgeting data as well, as for how to view the results.

<sup>17</sup> VBA = visual basic for applications programming language.

<sup>18</sup> Joshi R, Praveen D, Jan S, Raju K, Maulik P, Jha V, et al. How much does a verbal autopsy based mortality surveillance system cost in rural India? *PLoS One*. 2015; 10(5):e0126410.

<sup>19</sup> Van der Straaten J. *The High Cost of Legal Identity in Africa*. The Hague Colloquium on the Future of Legal Identity; 2015.

<sup>20</sup> World Bank Group's Identification for Development (ID4D) initiative. *Cost Drivers of Foundational Identification Systems*. World Bank; 2017.



## Related resources and products

### **University of Melbourne, D4H Initiative, CRVS Knowledge Gateway: Library** [crvsgateway.info/library](http://crvsgateway.info/library)

*CRVS performance metrics: Data collection tool.* CRVS resources and tools.

*CRVS performance metrics: Indicator guideline.* CRVS resources and tools.

*CRVS performance metrics: User guide.* CRVS resources and tools.

*Developing a verbal autopsy costing and budgeting tool.* CRVS technical outcome series.

*Understanding CRVS systems: The importance of process mapping.* CRVS development series.

*Where there is no physician: Improving the notification of community deaths.* CRVS development series.

### **University of Melbourne, D4H Initiative, CRVS Knowledge Gateway: Learning Centre** [crvsgateway.info/learningcentre](http://crvsgateway.info/learningcentre)

Topic 2: CRVS stakeholders, structure and coordination.

Topic 6: CRVS tools.

### **University of Melbourne, D4H Initiative, CRVS Knowledge Gateway: Courses** [crvsgateway.info/courses](http://crvsgateway.info/courses)

Enterprise architecture / Business process mapping for countries.

Verbal autopsy costing and budgeting tool.

## Further reading

Cobos Munoz D, Abouzahr C, de Savigny D. The 'Ten CRVS Milestones' framework for understanding Civil Registration and Vital Statistics systems. *BMJ Global Health*. 2018; 3(2):e000673.

The program partners on this initiative include: The University of Melbourne, Australia; CDC Foundation, USA; Vital Strategies, USA; Johns Hopkins Bloomberg School of Public Health, USA; World Health Organization, Switzerland.

Civil Registration and Vital Statistics partners:



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



## **For more information contact:**

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