CRVS analyses and evaluations
Developing a verbal autopsy costing and budgeting tool

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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.

CRVS analyses and evaluations
These analytical and evaluative resources, generated through the Initiative, form a concise and accessible knowledge-base of outcomes and lessons learnt from CRVS initiatives and interventions. They report on works in progress, particularly for large or complex technical initiatives, and on specific components of projects that may be of more immediate relevance to stakeholders. These resources have a strong empirical focus, and are intended to provide evidence to assist planning and monitoring of in-country CRVS technical initiatives and other projects

CRVS best-practice and advocacy
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.

CRVS country reports
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.

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Contents

Abbreviations

CHW   community health worker

COD   cause of death

CRVS   civil registration and vital statistics

D4H   Data for Health

FTE   full-time equivalent

HBCP   home-based care practitioner

VA   verbal autopsy

Developing a verbal autopsy costing and budgeting tool

This paper describes the Verbal Autopsy Costing and Budgeting 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 tool estimates the resources needed to implement verbal autopsy (VA) as part of a routine civil registration and vital statistics (CRVS) system. Information on the cost of performing VA, from data collection to analysis, is a critical part of planning and implementing VA systems that can supplement existing data collection methods. Although VA has been used for research purposes in many low and middle-income countries, it has not yet been widely adopted as an answer to the challenges that exist in collecting CRVS in such countries, especially in rural areas.

The tool is Microsoft Excel® based and uses standard costing methodology to produce reliable estimates on the incremental financial and economic cost of VA implementation, and the unit cost per VA. The tool also produces analyses relevant to different audiences such as:

- Disaggregation of the cost per type of resource (for example, personnel, equipment, supplies)
- Detail of costs per activity group (for example, start-up activities, governance activities, program management, supervision, refresher training, and VA delivery and analysis)
- The cost per funding source.

The tool includes a section to model the cost of different VA implementation scenarios under specific conditions. The user can modify the assumptions of the model, which will produce different cost estimates such as year estimates for recurrent cost or cost directly related to VA activities.

The tool has been piloted in four different countries, representing different stages of the implementation of VA activities. They also represent different levels of CRVS development and thus different uses of VA. Country 1, for example, uses VAs to record a small number of deaths that are not captured in the existing CRVS system, making VA a rare and relatively costly activity for most of the country (at approximately US$263 per VA, economic cost). This is in comparison to the other three countries, which capture less than 20 per cent of all deaths in their current system, making VA a widespread and common activity (and also relatively less costly – between US$106 and $199 per VA, economic cost).

The tool was also used to model the costs associated with a planned national scale up in Country 2. It was able to show a dramatic decrease in financial cost per VA over time (from US$229 in the pilot phase, to $44 in phase 1, and then $18 for years two and later). This highlights the large amount of resources required when initially implementing a system of VA, especially for start-up activities such as training interviewers and supervisors, purchasing equipment and hiring consultants. However, the tool was also able to show the relatively small amount of time required by staff to conduct and analyse the VA questionnaires and, as such, its strong potential to be integrated into existing roles and responsibilities of health workers.

Overall, the tool is able to reliably capture and predict, for the first time, the cost of routine VA in CRVS systems. This is a critical issue for policy-makers and managers, and will help in budgeting, recording actual costs and modelling potential costs in alternative implementation scenarios. The tool was also able to demonstrate the relatively low ongoing cost of conducting routine VA (as little as US$18 per VA) when integrated within the CRVS system.

Background

Good-quality cause of death data

Reliable information on leading causes of death (CODs) is needed to support health policy development, efficient planning, program evaluation and resource allocation. In low-income countries, civil registration and vital statistics (CRVS) systems to monitor births, deaths and CODs often produce low-coverage and poor-quality data. According to the World Health Organization (WHO), two-thirds (38 million) of the global annual deaths are still not registered.

The best way to obtain good-quality mortality statistics is to have the COD medically certified by a physician, in line with international standards developed by WHO. However, many deaths in low and middle-income countries occur in settings where physicians are not present or easily accessible to certify the COD. CODs recorded in such systems are often biased, because they are derived mainly from hospital attendees in urban settings. They do not represent the health status of the general population and are not useful for public health policies. This is particularly troublesome, as the demographic and health transitions are rapidly changing the mortality rates and COD profiles in such countries.

Despite increasing support to strengthen CRVS systems in recent years, it will still be some time before conventional CRVS systems in these countries will register most of the deaths in rural communities.

Verbal autopsy

Verbal autopsy (VA) is an indirect method of estimating COD, and uses information about the signs, symptoms and circumstances before the death of an individual. Such information is gathered by interviewing families and caretakers of the deceased to generate a probable underlying COD. VA is an epidemiological tool that has been used to estimate cause-specific mortality fractions in settings where medical certification of COD is not feasible. Although an imperfect tool, VA is still the best alternative in the absence of physicians.

In many low and middle-income countries, VA has been used in research projects to determine the COD in urban and rural settings. However, research-generated VA data are not normally made available to, or used in, CRVS systems. There is now growing interest in the idea of

taking mobile VA beyond the research scene and making it a routine part of CRVS operations at the community level. Mobile VA may also prove useful in hospital settings to establish COD for individuals that are dead on arrival, or who may die in health facilities of ill-defined causes.

Recent advances in VA questionnaire design, data capture on mobile devices, and the use of computer algorithms for determining and coding the COD make mobile community-based VA an increasingly available and effective means to determine probable COD when medical certification is not available.

Understanding the cost of routine verbal autopsy

Integrating VA into existing CRVS systems should improve COD data collection, which can be used to support health planning, priority setting and monitoring and evaluation in countries with incomplete CRVS systems. But such integration will be a complex undertaking and poses many design issues for CRVS stewards.

Despite increasing interest in integrating VA methods into routine CRVS data collection systems at the country level, the full extension of VA is yet to be incorporated in CRVS systems anywhere (except in Brazil). This is attributed, in part, to the dearth of information on the costs of adopting VA-based surveillance systems.

The cost of routine VA in CRVS systems is unknown. To date, few studies have attempted to estimate the costs of the different components of VA-based surveillance in low and middle-income countries. This is a critical issue for policy-makers and managers.

There is therefore a pressing need for a tool that can help forecast costs for budget and planning purposes, and for monitoring and analysing costs associated with scale up of pilot projects. Additionally, any tool developed should be able to:

- Assist those making VA budgets by providing detailed frames and items to include
- Determine actual financial and economic costs per VA obtained, once countries start implementing VA
- Model costs in alternative implementation scenarios, including changes in economic costs.

Verbal Autopsy Costing and Budgeting Tool

Aims and capacity

The Bloomberg Philanthropies Data for Health (D4H) Initiative is working with 16 countries and two cities to:

- Increase the registration of births and deaths
- Improve the quality of COD information at hospitals
- Apply VA to better understand mortality trends in communities
- Produce high-quality datasets and data-analysis skills for policy and program analysis.

A major component of the D4H Initiative is to provide technical support to countries as they implement mobile VA as part of their routine CRVS system.

As part of the D4H Initiative, the Swiss Tropical and Public Health Institute, University of Basel, with support of the University of Melbourne, developed a VA Costing and Budgeting Tool (referred to as the VA Costing Tool throughout this document). This tool aims to provide empirical evidence on the incremental costs of integrating VA into routine CRVS systems by helping countries to estimate resources required, and capture actual costs during implementation.

The VA Costing Tool can be customised to the country context and covers all aspects of a VA system. The collection and analysis of VA cost are based on six activity groups:

1. Start-up activities
2. Governance activities
3. Program management
4. Supervision
5. Refresher training
6. VA delivery and analysis.

The VA Costing Tool also has a budgeting element that can be used to estimate budgets for VA systems.

The VA Costing Tool automatically produces the following outputs:

- Total program costs for baseline year by activity and input type
- Average costs per VA
- Key costs drivers.

The information collected can be used to strengthen budget preparation and justification, and to assist in VA system implementation – measuring efficiency while identifying inefficiencies.

The VA Costing Tool is a single Microsoft Excel® file (.xlsx). Users can define their assumptions for the costing exercise and collect general information about the country and cost information. Users can then access the results of the analysis. It is organised in three main sections: costing, budgeting and modelling (**Figure 1**).

Figure 1 Splash screen with the three sections of the Verbal Autopsy Costing and Budgeting Tool
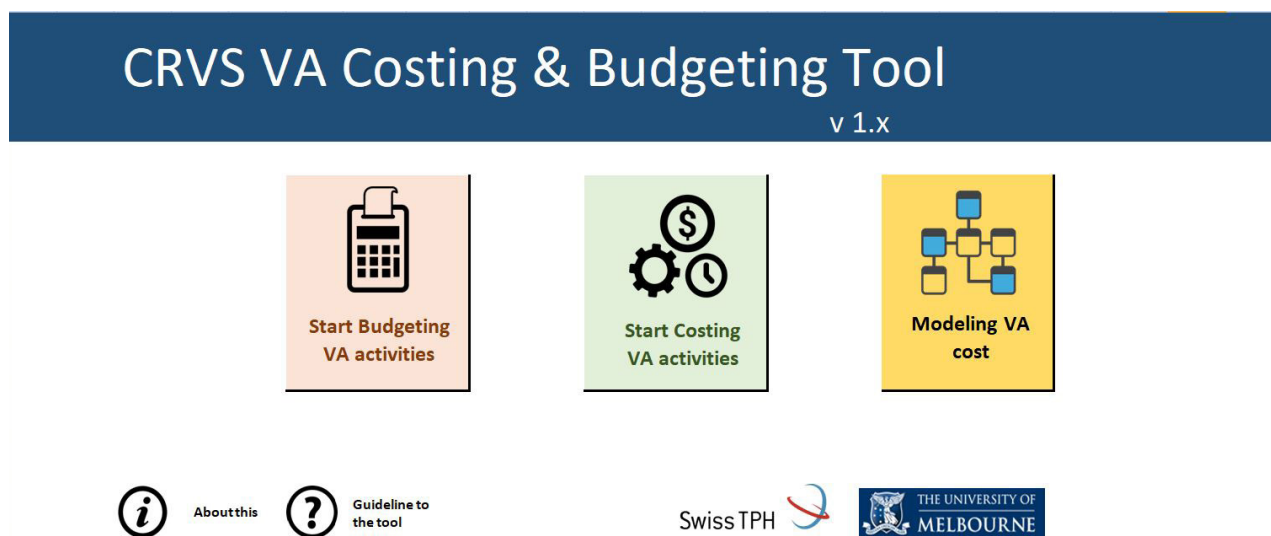
Figure 2 Front screen of the costing section of the Verbal Autopsy Costing and Budgeting Tool
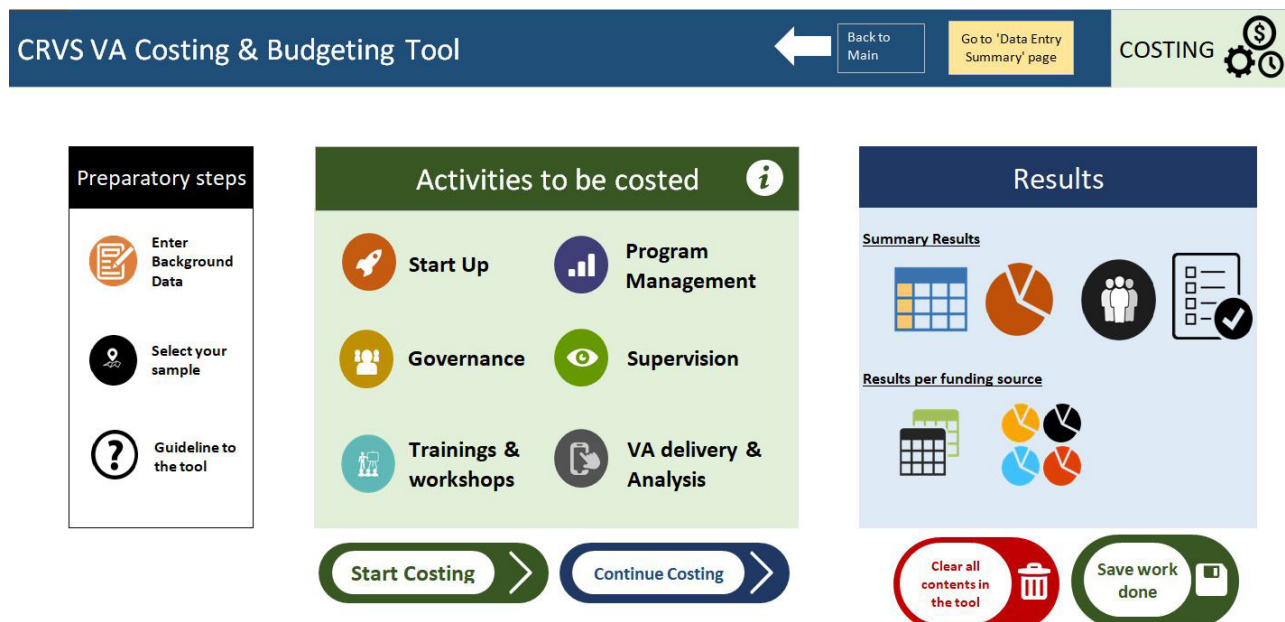
Budgeting and costing sections (orange and green buttons in Figure 1) are structured in a similar way and include three sub-sections. First, the VA Costing Tool collects general information about the country and defines assumptions for the analysis (for example, the discount rate, exchange rate and life span of different resources). Once this information is entered, the user moves to the second sub-section, where all the cost data are entered (green box in **Figure 2**).

In the VA Costing Tool, Finally, a third sub-section displays the results of the analysis based on the information entered in the previous steps (blue box in **Figure 2**).

Development

The VA Costing Tool has been developed to ensure that data collected across settings and countries are comparable. Two sources of information were used during the development of the first prototype of the tool to determine the scope of costs to be captured:

- A comprehensive literature review was undertaken on the costs of implementing VA, either as part of a routine system or in a research environment.
- Literature was also used to identify activities involved in the implementation of VA, resources used in different settings and major cost drivers in existing examples of VA implementation.

This information was used to build the first version of the VA Costing Tool. The tool was then piloted in four countries to identify additional resources used for the implementation of VA, and to assess user experiences in using the tool and understanding the results. By selecting varied country case studies (Annexes 1–4) with different implementation approaches, it was hoped that the VA Costing Tool would be used for the largest variety of scenarios as possible.

Identifying verbal autopsy–related activities

VA implementation as part of the CRVS system is not a simple endeavour. It involves multiple stakeholders and multiple activities running in parallel. The generic steps in a VA are (**Figure 3**):

1. Previous identification of deaths in the community

2. Notification of death to the CRVS system, through a choice of case-finding methods that may include community key informants, village volunteers, community outreach workers or family declarations

3. Dispatch of a trained and equipped VA interviewer to the deceased's household with identifying information on the decedent after a suitable bereavement interval

4. Conduct of VA interview on a mobile device and transmission of results securely to a dedicated server linked to the CRVS database and underlying COD and associated *International Classification of Diseases*, 10th revision code imputed

Figure 3 Generic verbal autopsy processes in a CRVS system
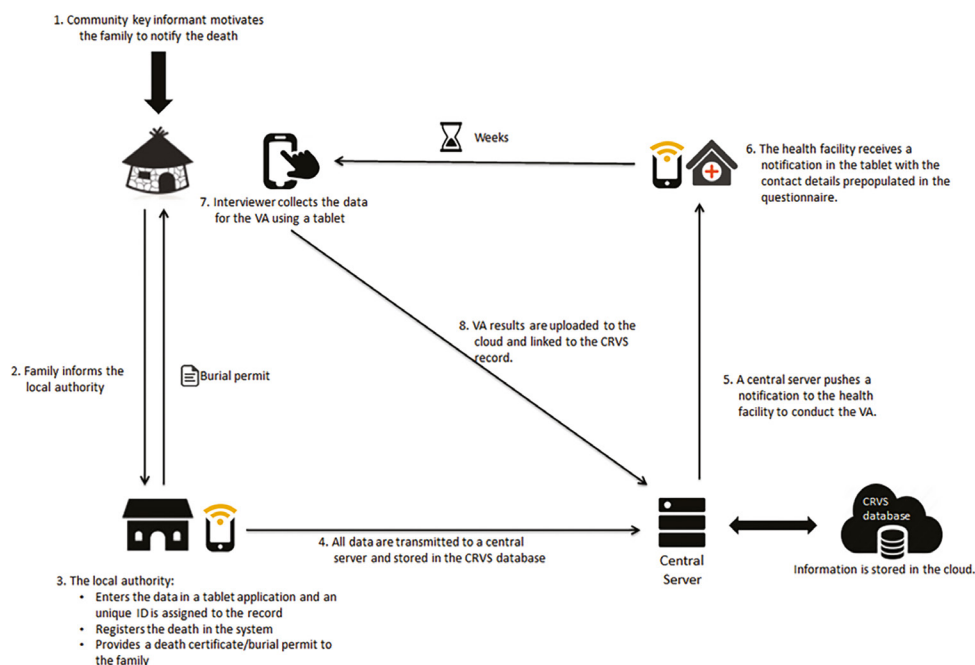
CRVS = civil registration and vital statistics; ID = identification; VA = verbal autopsy

5. Validation of the COD, as appropriate

6. Linkage of the coded COD to the registered death record.

In addition to the activities described above that are directly related to VA, there are several indirect activities such as supervision, training or program management that must also be captured in a costing. **Table 1** shows the different resources captured by the VA Costing Tool for each activity group.

Costing verbal autopsy implementation

The VA Costing 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, regardless of whether a financial cost was incurred. That is, the costs incurred even if a VA interviewer does not receive a monetary payment.

Table 1: Type of resource captured for each activity group

	Startup	Governance	Training workshops & meetings	Program Management	Supervision	VA delivery & Analysis
Personal	x	x	x	x	x	x
Refresher trainings & workshop		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	x
Consultants	x		x			x
Other capital cost	x		x			x

VA = verbal autopsy

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 or volunteers, or when valuing capital costs.

The VA Costing Tool estimates the incremental financial and economic cost of VA implementation in a country. It produces several cost estimates, including total incremental cost, cost per VA and further analyses and disaggregation. Examples include cost per funding source, cost per activity group and cost per type of resource used.

The VA Costing 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 tool aims to provide governments and other institutions with an estimate of the incremental cost of integrating VA into their routine CRVS system as an input for future policy decisions. Consequently, this audience will be most interested in the costs that could fall under their budgets, rather than those incurred by households.

The VA Costing Tool estimates the incremental cost of implementing VA. An incremental analysis looks at the cost of adding or implementing the additional program to existing services. It does not attempt to provide cost estimates for existing services. For example, health professionals responsible for conducting the VA interview usually have other responsibilities as part of their job description. As such, the VA costing only includes the proportion of time spent directly on VA activities (calculated as a proportion of their salary).

A combination of top-down and ingredient-based methods is used to estimate the incremental costs of integrating VA into routine CRVS systems. The top-down costing approach involves allocating overhead and shared costs of the CRVS system to the VA, where applicable, using appropriate allocation rules. The ingredient-based costing approach is defined as a valuation technique that 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 tool, the ingredients-based approach is used to estimate the incremental costs for all VA-related activities by listing all the possible inputs, measuring the quantities and then valuing all inputs required for a functioning VA system.

Activities related to the identification of the death event, notification to the system, data collection using the VA questionnaire on a mobile tablet and ascertainment of the COD are included in the cost of conducting VA. Start-up activities, such as training, are also captured. The main resources needed for VA relate to:

- Training non-physician healthcare workers in data collection using a VA tool
- Human resources for data collection, program management and infrastructure – that is, fixed costs in terms of buildings, computers, tablets and maintenance of server, and variable running costs of the offices.

The following human resource categories are considered and valued depending on the setting:

- Community volunteers
- Community outreach workers
- VA surveyors (interviewers)
- VA supervisors
- VA physician coders or signers
- VA information technology, logistics and help desk
- VA analyst
- VA national coordinator.

Total costs for the VA are estimated by aggregating the costs of the different inputs. Average or unit costs are estimated by dividing the total incremental costs by the units of outputs (that is, the number of VAs) produced. Unit cost estimates produced from this tool will be used to model costs at full national or sample scale. Note that the same tool can be used for modelling estimated costs of alternative delivery scenarios.

Budgeting the implementation of verbal autopsy

The structure of the VA Costing Tool's budgeting section is similar to the costing section. The information for budgeting is also collected by activity group (start-up, governance, refresher training, program management, supervision, and VA delivery and analysis) and provides an estimate that can be used to model different scenarios (see **Table 1**).

The user makes several assumptions that the VA Costing Tool computes as inputs in its calculations. The most relevant assumptions are:

- Administrative structure in the country
- Population included in the budgeting exercise
- Crude death rate
- Proportion of deaths outside of health facilities

- Proportion of time allocated to VA by different staff
- Number the different staff categories in a standard location
- Unit cost for some resources or activities, such as fees for personnel and cost of a domestic flight.

The VA Costing Tool provides the total cost of VA implementation under the user-provided assumptions, as well as different disaggregation and analysis of these costs.

Modelling verbal autopsy implementation scenarios

The results of either a costing or budgeting exercise can be modelled for different implementation scenarios and different timeframes (up to five years into the future). A few factors can be modified to create different scenarios:

- Number of administrative units included in the model
- Population included in the sample
- Crude death rate
- Proportion of deaths registered
- Proportion of deaths outside the health facility
- Inflation rate.

Cost for each subsequent year are calculated applying a weighting factor to each cost category (see **Table 2**).

Supplementary materials

Verbal autopsy costing and budgeting user guide

A user guide has been developed to instruct program planners and managers who are using the VA Costing Tool. It is a step-by-step description of how to enter the data in the VA Costing Tool and to understand the results provided at the end of the exercise. The guide also describes basic economic concepts used to develop the tool and the underlying assumptions in the calculations.

Data collection tools

A set of tools have been developed to facilitate collection of the information required in the VA Costing Tool.

Although these data collection tools are not essential to use the VA Costing Tool, they support the systematic collection of all inputs required to get accurate estimates on the cost of VA as part of the routine CRVS system. The data collection tools will be particularly useful in settings where the data cannot be entered directly to the digital version of the VA Costing Tool or when several data collectors will work in parallel.

Table 2: Weighting factor used to model cost according to activity group and type of resource

Cost type	Factor
Start-up Start-up trainings and workshops Other start-up costs	Expected number of staff to be trained
Governance Governance workshops and meetings Other governance costs	Incremental number of sampling units at each administrative level
Program management Personnel Communications Supplies, utilities and other recurrent cost Equipment Consultants	National and sub-national 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
Supervision Supervision workshops and meetings Personnel Communications Supplies, utilities and other recurrent cost Equipment Consultants	National and sub-national 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
Verbal autopsy delivery and analysis Refresher training and workshops Personnel Communications Maintenance Supplies, utilities and other recurrent costs	Expected number of full-time equivalent personnel needed to conduct the expected number of verbal autopsies in a given year
Buildings Equipment Vehicles Consultants	Incremental number of units delivering verbal autopsies

The data collection tools have been structured in three modules:

- General data collection module
- Data collection tools for national and sub-national activities module
- Data collection tools for VA implementation activities module.

The general data collection module should be used at the beginning of the costing exercise. The information to be collected will include basic information about the country and VA system design, the assumptions that will be applied to the entire costing and the scope of activities during VA implementation.

The data collection tool for national and sub-national activities is relevant to collect information about administrative levels (institutions, agents or stakeholders) not directly involved in the implementation of VA activities. Examples are coordination, supervision and program management.

The data collection tool for VA implementation activities is relevant for those administrative levels where VA activities are implemented and managed (for example, conducting the interview and capturing the vital event). Bear in mind that at this level, in addition to VA activities, some institutions or stakeholders have other functions such as program management or supervisory functions.

Costing report template

After entering all the data in the VA Costing Tool, the results of the costing can be exported to a Microsoft Word® report, using the costing report template. The most relevant tables and graphs are exported automatically to the template after clicking a button in the VA Costing Tool. The template has built-in sections where the user can make notes or analyse the costing results.

Preliminary results of applying the Verbal Autopsy Costing and Budgeting Tool

Scope and country selection

The VA Costing Tool has been piloted and used to estimate the cost of VA implementation in four locations as part of the innovation project.

Country 1

This country was chosen because VA is already part of the routine CRVS system and it is ready for immediate application of the VA Costing Tool and costing. A retrospective costing analysis of the routine VA system over the past financial year was done to determine the financial and economic incremental costs of integrating VA into an existing routine CRVS system.

Country 2

This country was one of the first to use tablets to capture the responses to the VA interview at a significant scale as part of the D4H Initiative. The process, training and tools were piloted in three townships for two months. The operation was then scaled up to 10 townships for six months (around 5400 VAs). Two different versions of the VA Costing Tool were piloted in both phases for all townships.

Country 3

At the time of piloting the VA Costing Tool, the country was preparing for a nation-wide implementation of VA using tablets for data collection. A new cadre of community health workers responsible for conducting

Table 3: Financial and economic costs by cost type and country

Cost type	Country 1 (routine)		Country 2 (pilot phase)		Country 3 (pilot phase)		Country 4 (pilot phase)	
	Financial cost (2015, US$)	Economic cost (2015, US$)	Financial cost (2017, US$)	Economic cost (2017, US$)	Financial cost (2017, US$)	Economic cost (2017, US$)	Financial cost (2017, US$)	Economic cost (2017, US$)
Start-up activities	137	664	35,927	13,863	38,390	7,717	95,595	19,622
Governance activities	0	0	16,773	6,472	681	715	1,298	1,298
Refresher training and workshops	3,312	3,312	0	0	2,216	2,216	0	0
Program management	592	587	12,747	9,738	9,474	7,145	23,826	27,805
Supervision	2,368	2,368	0	0	1,163	1,163	28,203	28,483
Verbal autopsy delivery and analysis	31,903	31,409	5,539	2,678	12,437	4,081	5,298	9,056
Total	38,312	38,340	70,986	32,751	64,361	23,036	154,221	86,265
Cost per verbal autopsy	**262**	**263**	**229**	**106**	**315**	**113**	**356**	**199**

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the VA interview were trained at the end of 2016 and deployed to the community in January 2017. The VA Costing Tool was used to estimate the cost of the early implementation of VA implementation in nine cells for six months.

Country 4

Similar to the previous country, at the time of piloting the VA Costing Tool, Country 4 had piloted VA in 10 wards and was in the very early stages of VA implementation. Although 600 VAs were expected to happen over six months and be used in testing the VA Costing Tool, only 433 were conducted. These were used to estimate costs using the VA Costing Tool.

Country experiences

The number of VAs conducted in these countries ranged from as few as 146 interviews to more than 5400. This difference in scale resulted in a wide range of total financial cost (from approximately US$38,300 to US$238,000) (**Table 3**).

The four countries selected differ in their stage of VA implementation and in data availability. The sample of countries includes distinct VA implementation approaches and different levels of maturity in their implementation.

Country 1 uses VAs to capture a small number of deaths that are not captured in the existing civil registration system, making VA a rare activity for most of the country. The other countries are capturing less than 20 per cent of deaths with their current system, meaning VA will likely be a widespread activity in most of the regions.

These differences affect the distribution of cost and the unit cost per VA. It is common that programs that are in early stages of implementation incur a higher cost than the same programs once activities are routinely implemented. High start-up costs and program management cost are progressively reduced as the program evolves. The results of the costing in these countries support this, with start-up cost accounting for more than 70 per cent in Countries 2–4, while being almost negligible in Country 1 (**Figures 4 & 5**).

Some degree of economies of scale is expected if start-up costs are high. Our estimates show a significant potential for economies of scale in all four countries. This was particularly relevant in Country 2, where the cost per VA ranged from US$33 to US$85 (during phase 1) and cost was mainly driven by the number of VAs completed per interviewer.

This pattern was also observed in Country 4 **(Figure 6)**. When looking at the total number of VA interviews
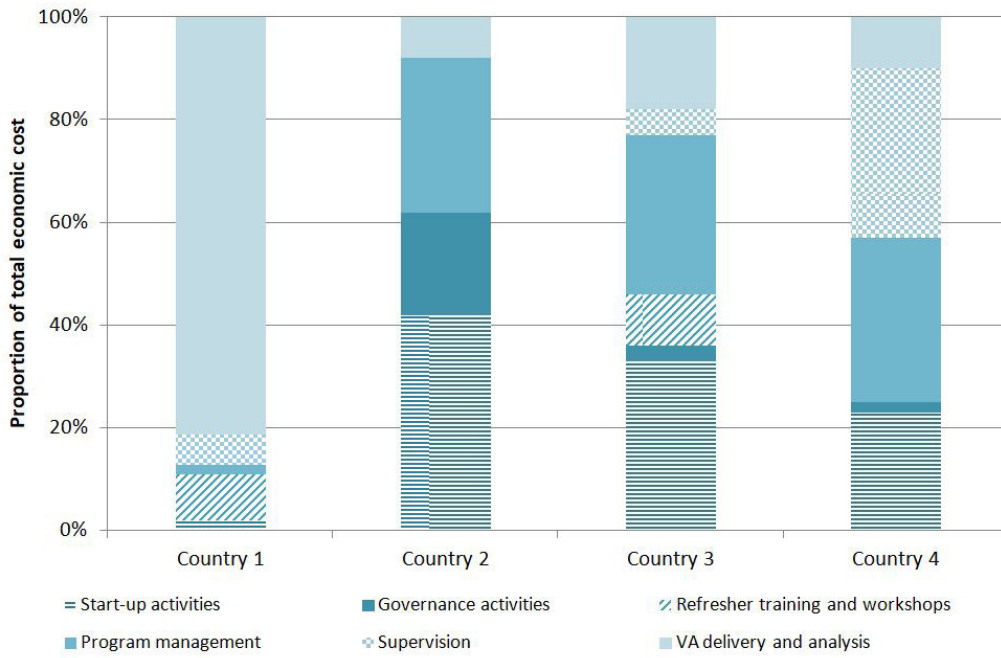
Figure 4 Proportion of total financial cost by activity type and country
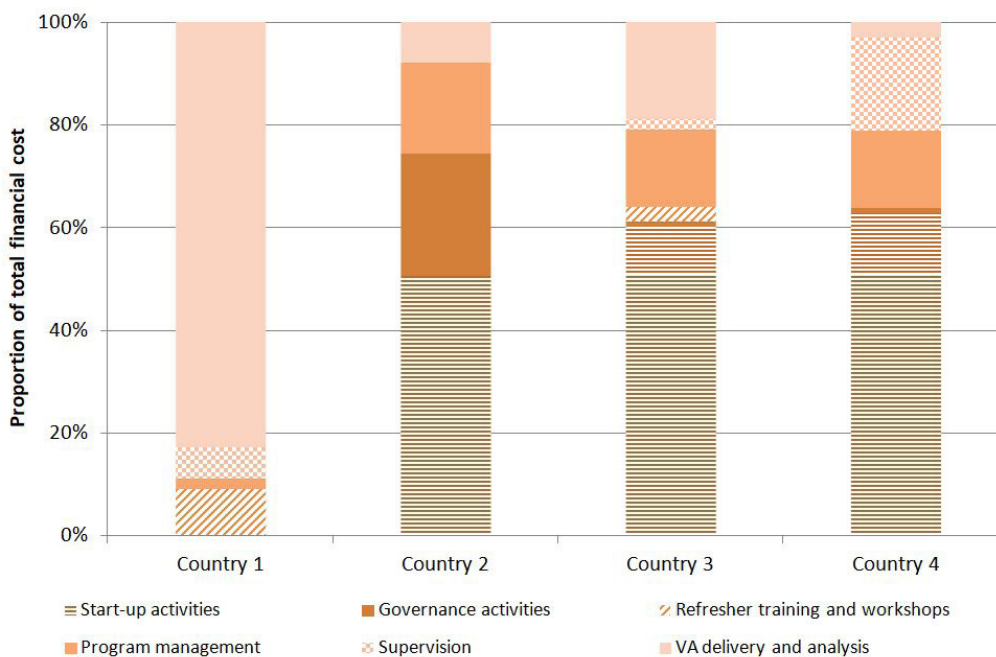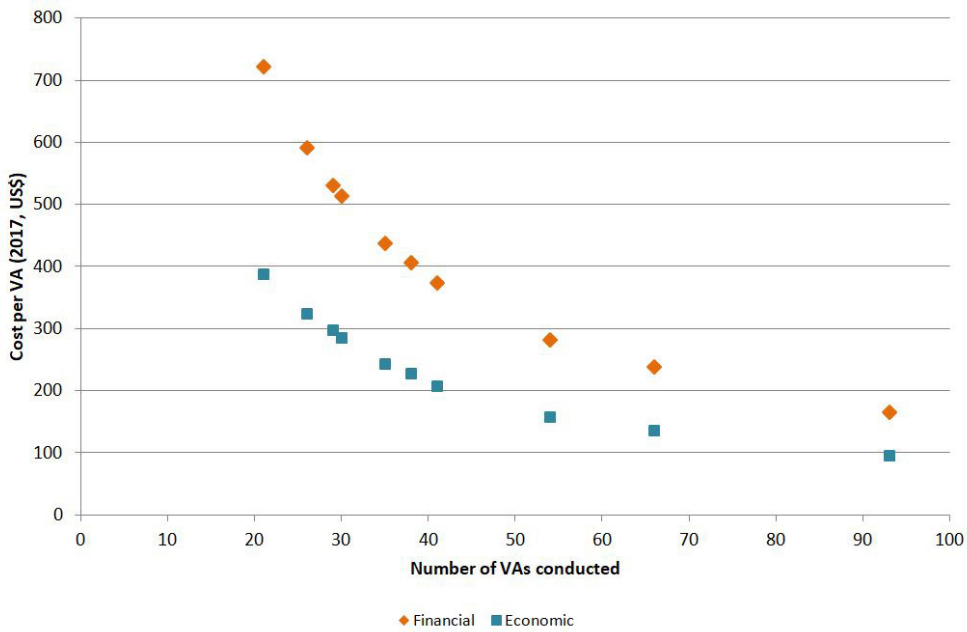

VA = verbal autopsy

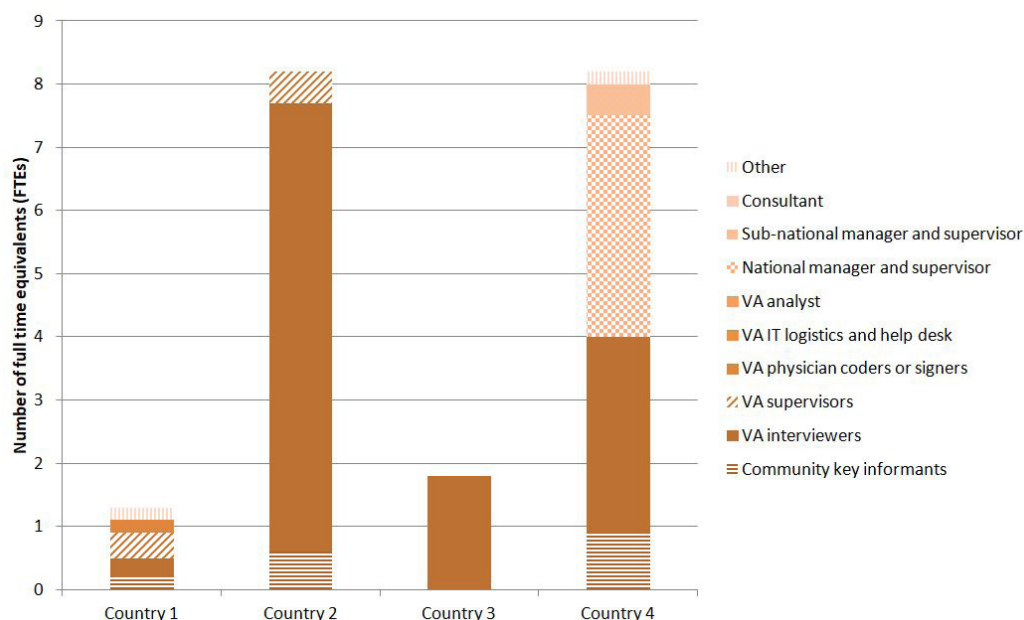**Figure 5 Proportion of total economic cost by activity type and country**

VA = verbal autopsy

Figure 6 Financial and economic cost per VA by number of VA interviews conducted per sub-national area, Country 4

VA = verbal autopsy

CRVS analyses and evaluations

Figure 7 Number of full time equivalent (FTE) personnel required during VA implementation by role and country

VA = verbal autopsy

conducted over six months by sub-national area, financial costs ranged from US$166 to US$723, with an average cost of US$356 per VA. The average economic cost was lower, US$199, and ranged from US$96 to US$389. As the graph demonstrates, this relationship is not linear, and indicates that some geographic areas may have a certain amount of fixed costs due to reasons such as accessibility, and human resource availability.

Overall, the results of the costing show that VA is a human-resource-intensive activity. However, although the number of staff involved in the different VA activities is relatively high, they only use a small fraction of their time for these activities (**Figure 7**). This fact supports the idea

of integrating VA in the job description of existing staff as opposed to creating cadres with the sole responsibility of doing VAs. However, a careful analysis of the workload of existing staff or the feasibility of adding new responsibilities to their current activities is required.

A scale-up plan for Country 2 was also modelled (**Table 4**). The model estimated that 36,550 VAs will be conducted with the new scale with an economic cost per VA of US$18 (reduced from US$229 as in the pilot phase). According to the model, the country will require approximately an additional $US500,000 to scale up if the current expenditure levels are maintained.

Table 4: Financial cost per verbal autopsy, pilot and phase one, and modelled estimates, Country 2

Cost type	Pilot (US$)	Phase 1 (US$)	Phase 1 (extended) (US$)	Year 1 (US$)	Years 2–5 (US$)
Start-up activities	35,927	161,735	161,735	168,907	0
Governance activities	16,773	586	1,172	1,172	1,172
Refresher training and workshops	0	0	0	0	0
Program management	12,747	30,881	61,762	349,987	349,987
Supervision	0	10,240	20,480	48,618	48,618
Verbal autopsy delivery and analysis	5,539	34,799	48,917	241,206	241,206
Total	70,986	238,240	294,066	809,890	640,983
Cost per verbal autopsy	**229**	**44**	**28**	**22**	**18**

Related resources and products

University of Melbourne, D4H Initiative, CRVS Knowledge Gateway: Library
crvsgateway.info/library

Integrating community-based verbal autopsy into CRVS: System level considerations. CRVS technical outcome series.

Intervention: Automated verbal autopsy. CRVS summaries.

SmartVA: Interviewer's manual. CRVS resources and tools.

SmartVA: Technical user guide (V1.0). CRVS resources and tools.

University of Melbourne, D4H Initiative, CRVS Knowledge Gateway: Learning Centre
crvsgateway.info/learningcentre

Topic 4: Cause of death in CRVS – Automated verbal autopsy; Incorporating verbal autopsy into the civil registration and vital statistics system.

Topic 6: CRVS tools – Automated verbal autopsy tools.

University of Melbourne, D4H Initiative, CRVS Knowledge Gateway: Courses
crvsgateway.info/courses

SmartVA.

Verbal autopsy costing tool.

Further reading

Byass P, Chandramohan D, Clark SJ, et al. Strengthening standardised interpretation of verbal autopsy data: the new InterVA-4 tool. *Global Health Action* 2012; 5:1–8.

Liu L, Li M, Cummings S, Black RE. Deriving causes of child mortality by re-analyzing national verbal autopsy data applying a standardized computer algorithm in Uganda, Rwanda and Ghana. *Journal of Global Health* 2015; 5(1):010414

Murray CJ, Lopez AD, Feehan DM, et al. Validation of the symptom pattern method for analyzing verbal autopsy data. *PLoS Medicine* 2007; 4(11):e327.

Serina P, Riley I, Stewart A, et al. Improving performance of the Tariff Method for assigning causes of death to verbal autopsies. *BMC Medicine* 2015; 13:291.

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:

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