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CRVS Fellowship report

Implementing verbal autopsy in Ghana

February 2019





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Fellowship report: Implementing verbal autopsy in Ghana

Between January and March 2018, Mr Francis Yeji, from the Policy, Monitoring and Evaluation Division of the Ghana Health Service, spent time at the Swiss Tropical and Public Health Institute, University of Basel, and Melbourne School of Global and Population Health, University of Melbourne, to analyse results from the verbal autopsy pre-test conducted in Ghana in 2017. This *CRVS fellowship report* describes the approach to verbal autopsy implementation used by Ghana, results from the pre-test in the Bongo District and implications this has for future phases, and how the results were used to inform the sampling strategy for Ghana, as part of national scale-up.

Background

The CRVS system in Ghana
Death registration processes
Implementing verbal autopsy

Fellowship project

Part 1: Analysing verbal autopsy data
Part 2: Developing a national sampling strategy

Related resources and readings

Background

There are several key stakeholders in Ghana's CRVS system.

The civil registration and vital statistics system in Ghana

The Births and Deaths Registry (BDR), an agency within the Ministry of Local Government and Rural Development (MLGRD), oversees the registration of births and deaths. However, the Ghana Statistical Service (GSS), an autonomous agency reporting to the President, has a strong oversight and coordination function for civil registration activities of the BDR, and there are other significant government CRVS stakeholders, including the Ghana Health Service (GHS), of the Ministry of Health, with responsibilities to record essential data on births, deaths and causes of deaths (**Figure 1**).¹

Figure 1 Civil registration and vital statistics stakeholders



¹ Ghana Statistical Service. *Civil registration and vital statistics system in Ghana. Report on the comprehensive assessment*. Accra, Ghana: Government of Ghana; 2015.



Performance of Ghana’s Civil Registration and Vital Statistics (CRVS) system improved in 2004 but since then, progress has stalled. A key goal of the country’s Medium-Term National Development Policy Framework, prepared by the National Development and Planning Commission, is to improve the availability of accurate vital statistics over the 2014–2018 period. In response, stakeholders completed a comprehensive assessment of the CRVS system in late 2014 and a costed strategic CRVS improvement plan in November 2015. One of the findings of the assessment was that,

Previous efforts on strengthening the CRVS system focused on birth registration, with little emphasis on deaths.

‘...after several decades of existence and several attempts at modernisation, the country still faces a significantly insufficient and inefficient system both in terms of geographical coverage and completeness of events registration’.²

The assessment also remarked that previous initiatives aimed at improving the CRVS system had primarily targeted birth registration, with little focus on the registration of other vital events.

Death registration processes

Many deaths are never officially registered as there is confusion over the hospital medical certificate and official death certificate.

The law states that a medical certificate specifying the cause of death should be issued by the medical practitioner who was in last attendance during the illness of the deceased, and that this certificate should be delivered to the registrar for registration.³ However, in practice, many medical certificates do not have the cause of death specified, often attributed to there not being a physician available to complete the details. In addition, many families do not take the medical certificate to the BDR to officially register the death, as many do not realise the distinction between the medical certificate (provided by the hospital) and the official death certificate (provided through civil registration) or the burial permit issued by local authorities.

There is low demand for death registration among the community.

As with most countries, the registration of deaths that occur in the community presents a major challenge to the CRVS system of Ghana. While official procedures state that the police should be notified when a death occurs at home, and a coroner engaged to ascertain the cause of death and issue a medical certificate, this process is usually not followed. Many families are able to bury their dead without a death certificate or burial permit, despite both being legally required. There are a number of uncontrolled cemeteries where people can bury family members without a burial permit, with correspondingly low demand for death registration among the community.

These challenges have resulted in low death registration completeness (estimated at around 19 percent in 2014, with significant regional variations) and poor quality of mortality and cause of death statistics.⁴ **Figure 2** provides a graphical representation of the compounding effect of low registration and poor practices: of the approximately 223,000 expected deaths in Ghana in 2016, just over 11,000 had a medically certified underlying cause of death of suitable quality for use in policy and planning: some five percent of the total.⁵

² Ghana Statistical Service, *Civil registration and vital statistics system in Ghana. Report on the comprehensive assessment*. Accra, Ghana: Government of Ghana; 2015.

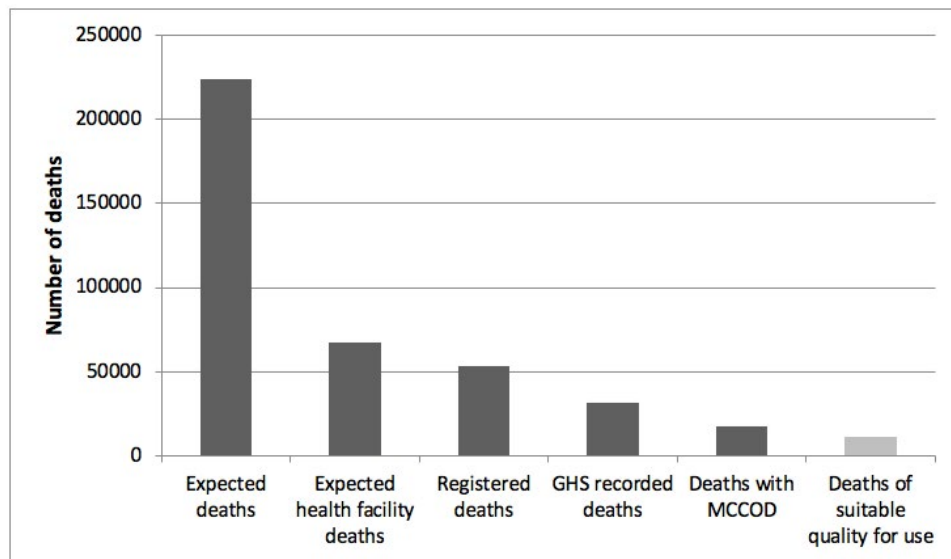
³ Ibid

⁴ Ibid

⁵ Numbers of expected and registered deaths were calculated using data available from the Ghana Statistical Service and Ghana Health Service (Health and Demographic Surveillance Sites, and the District Health Information Management System). Data quality was assessed via the ANACONDA mortality data analysis tool.



Figure 2 Visual representation of deaths 'lost' in the CRVS system, Ghana



GHS = Ghana Health Service; MCCOD = medical certification of cause of death

Implementing verbal autopsy in Ghana

Given the significant proportion of deaths occurring outside of health facilities (>70%), the low level of registration completeness, and even lower number of deaths with an underlying cause of death of suitable quality, the Government of Ghana, as part of the Bloomberg Philanthropies Data for Health (D4H) Initiative, is implementing automated verbal autopsy (VA) (**Box 1**). This intervention should produce a scientifically sound evidence-base to inform the decision to move to a national system of community-based death notification and VA. Following this, it is expected that death registration completeness will increase significantly, and the quality and representativeness of cause of death data in Ghana should dramatically improve, making better vital statistics available for policy and decision-making.



Box 1. What is verbal autopsy?

Verbal autopsy is a method for collecting information about a deceased individual's signs and symptoms prior to their death from their family or next of kin and interpreting these to diagnose the likely or most probable cause of death.⁶ The principal purpose of a VA is to describe the cause composition of mortality through the estimation of cause-specific mortality fractions (CSMFs). Verbal autopsy also serves as a cost-effective tool for filling the gaps in mortality data. Studies suggest that VA can provide population-level cause of death data similar in quality and reliability to medical certification by physicians in hospitals.⁷

The VA process consists of three main steps:

1. Setting up an interview by a trained VA staff member at the household (or another appropriate place).
2. Conducting a standardized and validated structured interview to collect information on signs and symptoms of illnesses, and events that the deceased suffered before death.
3. Interpreting the interview data to diagnose the most probable underlying cause of death (historically, this was done by physicians, however automated methods are now widely applied).

Administratively, Ghana is divided into ten Regions, 216 Districts and 4,751 Community-based Health Planning and Services (CHPS) Zones. The sample cluster unit for VA in Ghana is the CHPS Zone. On average, four communities and 3,500 people live in each zone, with an estimated 28 deaths per year (based on a crude death rate (CDR) of 7.9 deaths per 1,000 population). With one community health officer (CHO) per CHPS Zone, this represents a workload of 2.4 verbal autopsies per month.

This report is focused on results from the VA pre-testing that was conducted in the Bongo District in 2017.

Ghana's implementation of community-based VA has been planned to progress in three phases: 1) Bongo District pre-test; 2) Volta Region pilot; and 3) National scale-up. The pre-test for VA began in April 2017 in the Bongo District, located in the upper-East region of Northern Ghana (**Figure 3**).

This report is concerned with the Bongo Pre-Test. Bongo District is predominantly rural, sharing similar characteristics with most districts in Northern Ghana. Agriculture (mainly subsistence farming) is the most dominant sector of the local economy, engaging 96 per cent of households in the district.⁸ The Ghana 2010 Population and Housing Census estimated the population of Bongo to be 96,199 in 2016, with a CDR higher than the national average, at 13.2 deaths per 1,000 live births.⁹

Only 17% of deaths in the Bongo District are medically certified each year.

The District has one constituency, seven Area Councils and 51 Unit Committees. The District Health Management Team (DHMT) is responsible for the overall management of health services in the district, supported by six Sub-District Health Management Teams (SDHMT). There is one hospital, five health centres, 37 functional CHPS Zones, and over 60 outreach points. The 37 CHPS Zones cover 82 per cent (79,087) of the district population. However, only approximately 17 per cent of deaths are medically certified each year.

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

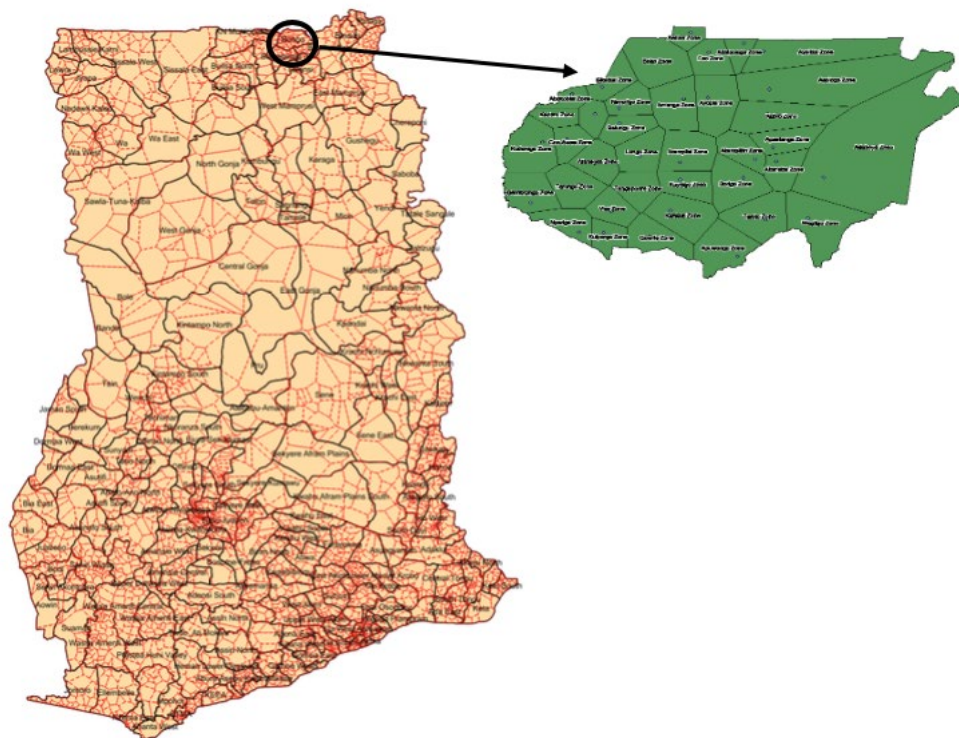
7 Hernández B, Ramírez-Villalobos D, Romero M, et al. Assessing quality of medical death certification: concordance between gold standard diagnosis and underlying cause of death in selected Mexican hospitals. *Population Health Metrics* 2011; 9:38.

8 Ghana Statistical Service. 2010 *Population and Housing Census. Summary report of final results*. Accra, Ghana: Sako Press Limited; 2012.

9 Ibid



Figure 3 Map of Ghana showing District borders (Bongo District emphasized)



All 37 CHPS Zones were included in the pre-test, and CHOs were trained and used as VA interviewers. Community deaths were identified through a notification system using existing local and traditional death notification structures. In Bongo District, like other communities in Northern Ghana, every death is first reported by the family to a local chief or traditional leader before burial. A simple community death notification form (**Annex 1**) was designed by the Ghana Births and Deaths Registry and placed in the households of all chiefs and leaders. The form was completed by community volunteers when a family reported a death, with a copy sent to the CHPS Zone compound for the CHO to collect and organise a VA interview, and to the district BDR office for registration.



Part 1: Analysing verbal autopsy data

Methods

99 VA interviews were conducted during the pre-test.

Using the WHO 2016 Questionnaire¹⁰ a total of 99 VA interviews were conducted in the Bongo District, representing 36 per cent of the total expected deaths during the pre-test phase.

VA interviews were analysed using the OpenVA package,¹¹ InSilicoVA¹² and InterVA¹³ algorithms. Concordance and plausibility analyses were done by comparing results from the methods to each other, and by comparing to Global Burden of Disease (GBD) modelled cause-specific mortality fractions (CSMFs) for Ghana.

The VA results were also compared with health facility deaths. A total of 16,751 deaths were recorded in the GHS District Health Information Management System (DHIMS-2), representing 490 hospitals through the country (excluding teaching and tertiary hospitals). Health facility deaths were analysed for quality using the ANACONDA cause of death data quality software analysis tool (**Box 2**).¹⁴

Box 2. What is ANACONDA?

ANACONDA is an electronic tool that assesses the accuracy and completeness of mortality and cause of death data. It checks for potential errors and inconsistencies in the data and provides users with an understanding of basic epidemiological and demographic concepts to interpret their data.

Results

Table 1 provides a detailed break-down of the age group of the deceased for the VA pre-test. Overall, and according to the pre-defined interview modules within the VA package, there were two neonatal deaths; seven child deaths; and 90 adult deaths. More male deaths (N=62) were captured than female deaths (N=33), with four deaths not having sex recorded.

10 Available at <http://www.who.int/healthinfo/statistics/verbalautopsystandards/en/>

11 Available at <https://cran.r-project.org/web/packages/openVA/index.html>

12 Available at <https://cran.r-project.org/web/packages/InSilicoVA/index.html>

13 Available at <http://www.interva.net/>

14 Mikkelsen L, Lopez AD. *Guidance for assessing and interpreting the quality of mortality data using ANACONDA*. CRVS Resources and tools. Melbourne, Australia; Bloomberg Philanthropies Data for Health Initiative, Civil Registration and Vital Statistics Improvement, University of Melbourne; 2017.



Table 1 Age group of the deceased, VA pre-test, Ghana

Age group (years)	Frequency (N)	Per cent (%)
0-4	8	8.1
5-9	1	1.0
10-14	2	2.0
15-19	7	7.1
20-24	2	2.0
25-29	2	2.0
30-34	3	3.0
35-39	3	3.0
40-44	3	3.0
45-49	6	6.1
50-54	7	7.1
55-59	4	4.0
60-64	4	4.0
65-69	6	6.1
70-74	8	8.1
75-79	7	7.1
80-84	10	10.1
80+	16	16.2
TOTAL	99	100.0

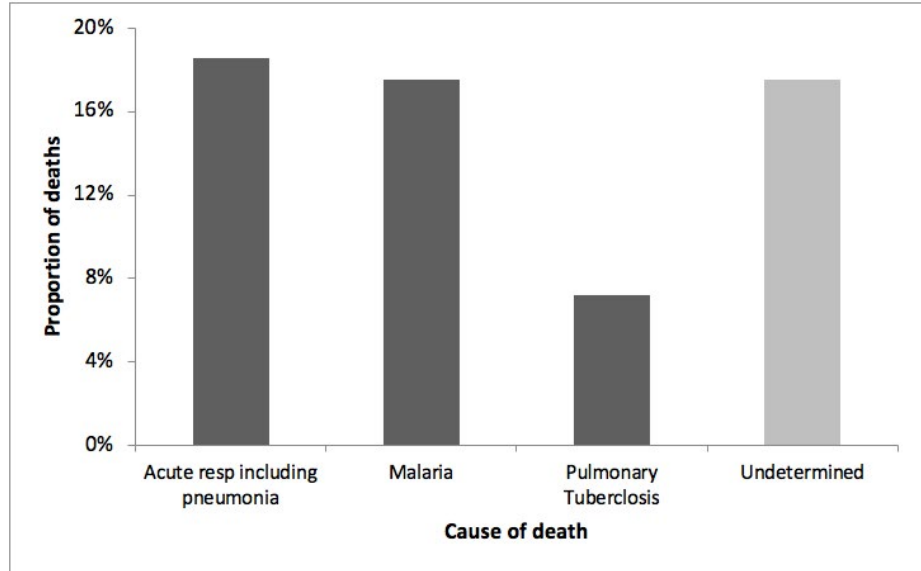
The leading cause of death was acute respiratory infections, including pneumonia.

Detailed CSMFs on the top 20 causes of death for males and females are provided in **Annex 2**. The top three causes of death for all ages and both sexes were acute respiratory infections (including pneumonia) (18%); malaria (18%); and pulmonary tuberculosis (7%) (**Figure 4**). The top 20 causes of death are provided in **Annex 3**.

Overall, 18 per cent of VA interviews resulted in an undetermined cause of death, with more female deaths allocated to an undetermined cause (23%) than males (15%) (**Figure 5**).

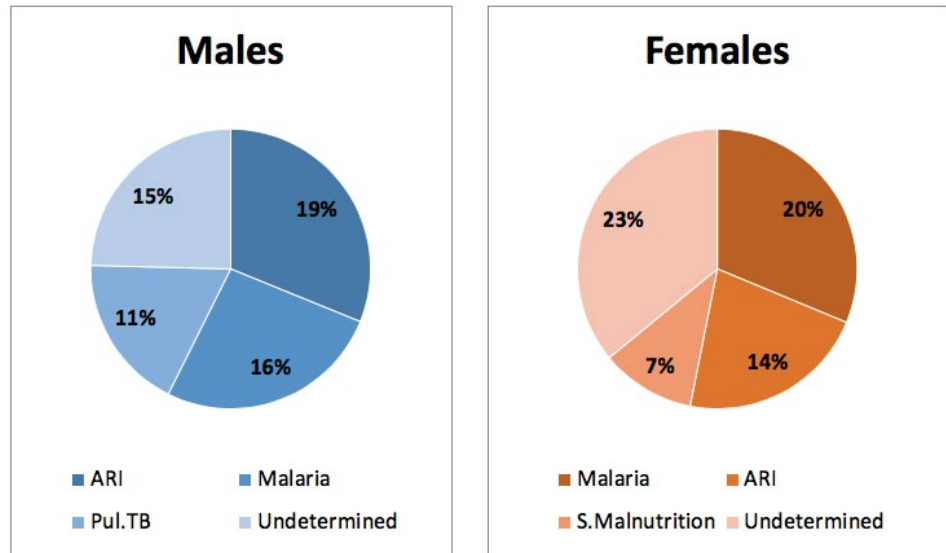


Figure 4 Top three causes of death, VA pre-test analysed by InterVA, Ghana 2017



Acute resp = acute respiratory infections

Figure 5 Top three causes of death by sex, VA pre-test analysed by InterVA, Ghana 2017



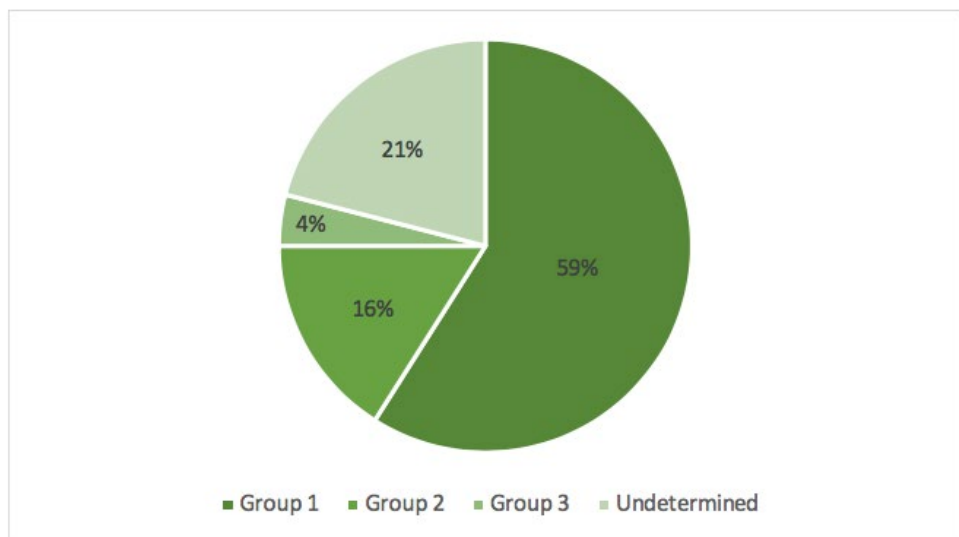
ARI: acute respiratory infection (including pneumonia); Pul.TB: pulmonary tuberculosis; S.Malnutrition: severe malnutrition

To assist in assessing patterns and trends in global mortality, the Global Burden of Disease (GBD) Study allocates causes of death into three broad groups:

- Group 1: Communicable, maternal, neonatal, and nutritional diseases
- Group 2: Non communicable diseases
- Group 3: External causes and injuries.¹⁵

Based on analysis of the VA interviews, approximately 59 per cent of deaths were from Group 1; 16 per cent Group 2; and four per cent Group 3 (**Figure 6**).

Figure 6 Cause of death according to broad group, VA pre-test analysed by InterVA, Ghana 2017



The top 20 CSMFs from the pre-test were compared with facility deaths (coded to both ICD-10 and the GBD), which had been assessed for quality using ANACONDA. The ANACONDA distribution by GBD broad grouping is presented in **Figure 7**.

As shown in **Figures 8 & 9**, comparing results from the VA pre-test with facility deaths coded to the GBD shows a high level of concordance,¹⁶ with nine matching causes of death for males, and 10 for females. Results from the comparison of VA deaths with facility deaths coded to the ICD-10 are provided in **Annex 3**.

¹⁵ Murray CJL, Lopez AD (eds.). The Global Burden of Disease. A comprehensive assessment of mortality and disability from diseases, injuries, and risk factors in 1990 and projected to 2020. Boston, USA: Harvard School of Public Health on behalf of the World Health Organization and The World Bank; 1996.

¹⁶ Concordance refers to the level of agreement (ie. how similar or dissimilar the causes of death are for people dying in the community (as determined through VA) and in facilities (as determined through medical certification).



Figure 7 Cause of death according to broad group, health facility deaths analysed by ANACONDA, Ghana 2017

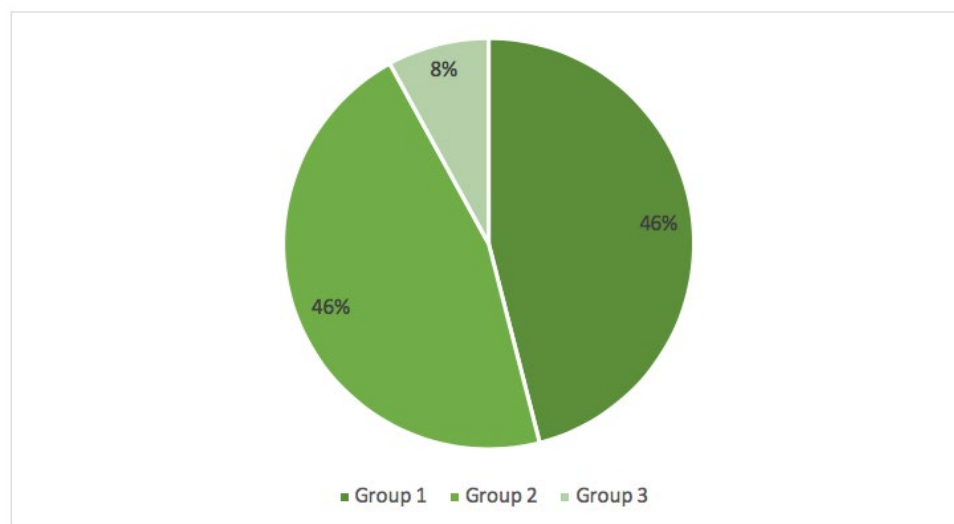


Figure 8 Comparison of the top 20 causes of death, males, VA pre-test analysed by InterVA and GBD adjusted facility deaths, Ghana 2017

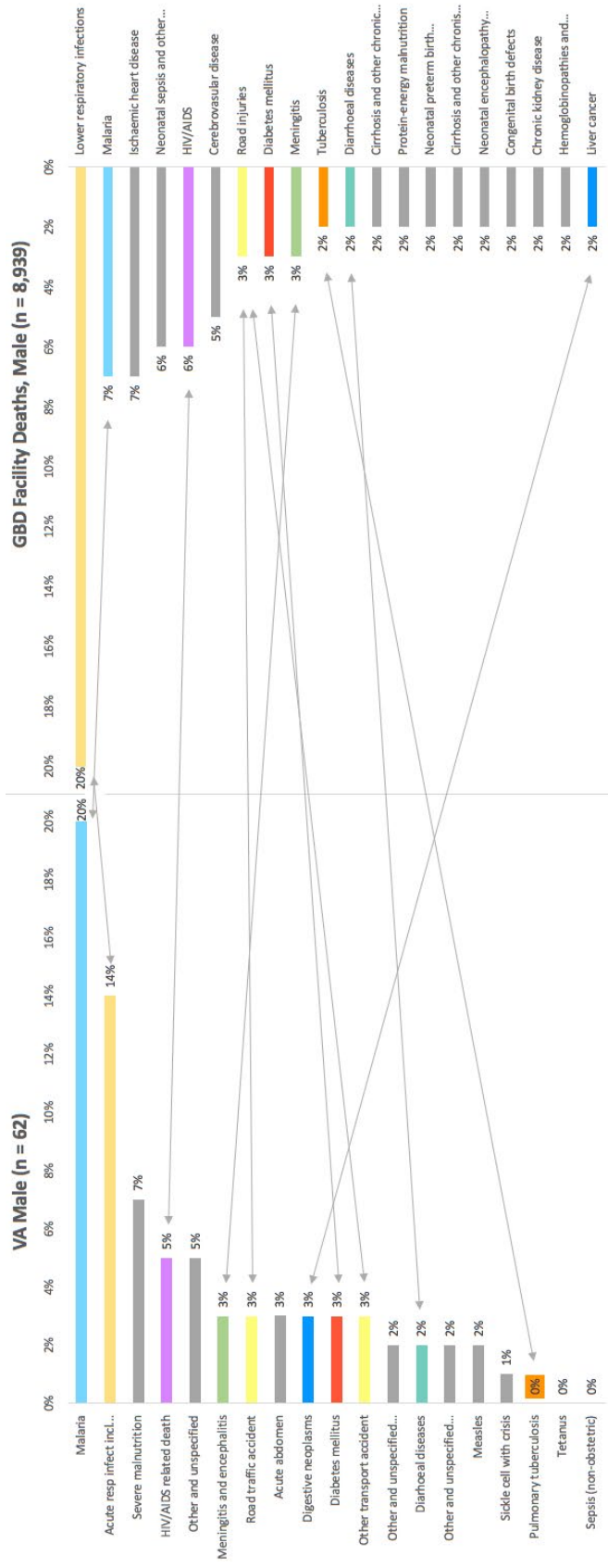
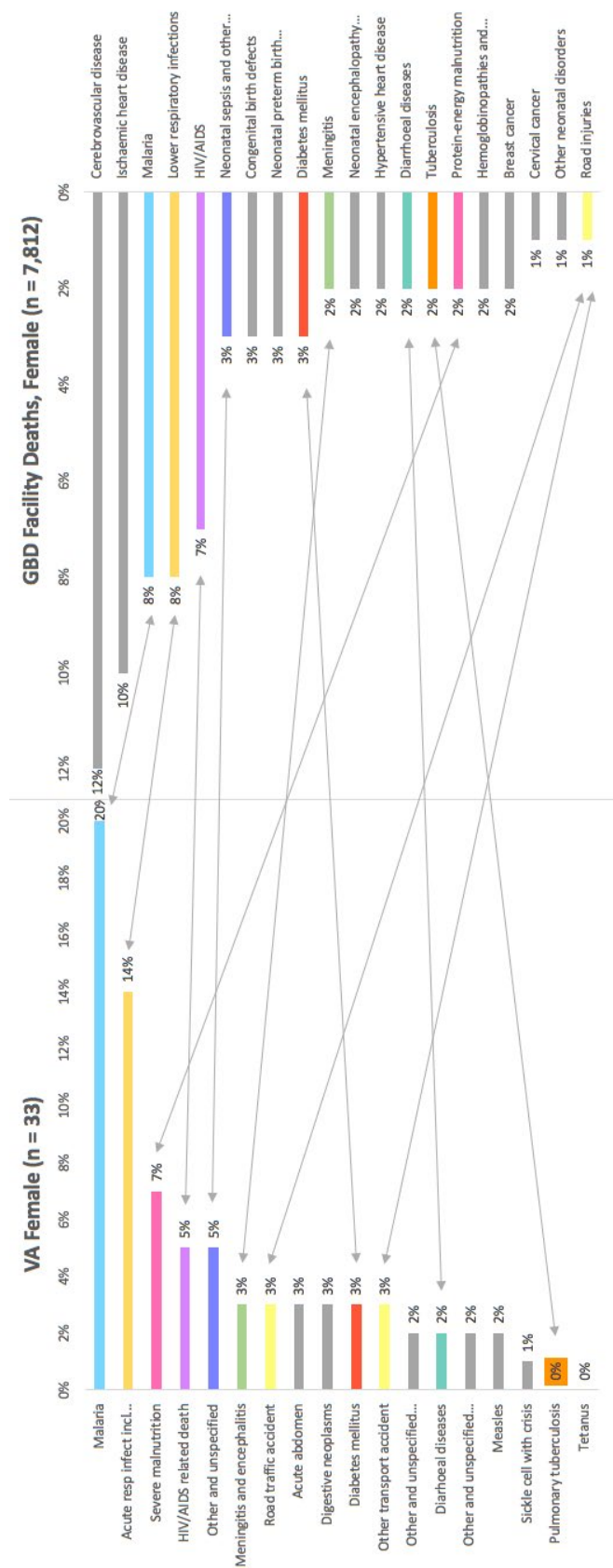


Figure 9 Comparison of the top 20 causes of death, females, VA pre-test analysed by InterVA and GBD adjusted facility deaths, Ghana 2017





Discussion

Only one-third of the expected number of deaths were captured during the VA pilot.

The total number of VA interviews conducted (99) represent only 36 per cent of the total expected during the pre-test, indicating potential issues with over-estimation of the crude death rate; under-notification; a loss of follow-up by CHOs; loss of VA data at some stage during the process; an insufficient number of tablets allocated per zone; or the negative affect of using of different versions of the WHO VA Questionnaire (which meant that some VA interviews were unable to be analysed).

The pattern of cause of death from VA interviews was similar to health facility deaths.

In terms of the quality of the VA data, undetermined causes of death accounted for 18 per cent of all interviews, it was however higher among female (23%) than male deaths (15%). Normally we expect an undetermined rate of no more than 10 per cent in VA practice in Ghana. This higher level of undetermined causes may be the result of poor interviewing practice, as this is the first time the interviewers were involved in conducting VA interviews and/or problems with the diagnostic algorithms. Also, the initial lack of a mechanism to track and validate the quality of interviews before uploading to the server may also be a factor.

When the VA results were compared with health facility deaths, they showed a high level of concordance. Given the very small sample-size of the pre-test, this is a promising outcome regarding the use of VA to determine probable cause of death.

Recommendations

The implementation and analysis of VA results from the Bongo pre-test demonstrates some issues to consider in the next phase:

- The VA process highlighted that as many as 60 per cent of community deaths were not being notified. This is a pressing barrier to the improvement of mortality data in the country. **Implementation of active universal digital death notification** should improve this.
- The sharing of tablets by clusters within the CHPS Zones may have resulted in a lower number of VA interviews taking place than expected, due to unavailability of tablets. There is a need to **avoid sharing of tablets** and for each cluster to have its own tablet in the Volta region pilot phase. This includes interviewer and facility unique identifiers being established.
- Decentralized supervision and monitoring at the lower level is critical to overcome the poor quality VA interviews, and thus, reduce the number of deaths with an undetermined cause. The **development of a VA Management Dashboard**¹⁷ will enable managers to monitor the activities and outcomes of VA interviews and interviewers.
- There is a need to **resolve data transmission issues** including a support system for data bundles and confirming a dedicated server instance.

¹⁷ See <https://crvsgateway.info/file/5171/1829>



Part 2: Development of a national sampling strategy

A sampling strategy was required to select the clusters to be used in the VA pilot.

As previously discussed, Ghana’s implementation of community-based VA has been planned to progress in three phases: 1) Bongo District pre-test; 2) Volta Region pilot; and 3) National scale-up.

A national sampling strategy for Ghana was applied to determine a sample of clusters for the Volta Region Pilot (**Figure 10**). The duration of the pilot is three years commencing April/May 2018. There were three main steps in the development of the sampling strategy:

1. identification of the cluster unit and mapping of the clusters,
2. computation of sub-national crude death rates and cluster populations to estimate the expected number of deaths, and
3. applying the VA Sampling Strategy and Sample Size Calculator tool¹⁸ to calculate and draw a representative cluster sample and applying it to the Volta Region.

Figure 10 Sampling frame for Volta Region, Ghana



¹⁸ Bloomberg Philanthropies Data for Health Initiative. Sampling strategies for representative national CRVS verbal autopsy planning: A guidance document and sample size calculator tool. Melbourne, Australia; Bloomberg Philanthropies Data for Health Initiative, Civil Registration and Vital Statistics Improvement, University of Melbourne; 2018.



Step 1

As with the pre-test, the CHPS Zone is the VA cluster unit for the pilot. Zones are the lowest level of primary health care delivery in Ghana, and were developed as part of a national strategy to ensure essential community-based health services are available. At least one formally trained Community Health Officer (CHO) paid by the government is posted by the GHS to each CHPS zone, where s/he lives and provides primary health care services to the people. One of the CHOs main responsibilities is regular community outreach and home visitation.

The CHPS Zone will be used as the cluster unit in the pilot.

The identification and adaptation of the CHPS Zone as the cluster unit is efficient, cost effective, and will ensure sustainability, as demonstrated in the Bongo pre-test. If the Volta Region pilot succeeds it will be easier to implement a national scale-up strategy using the CHPS zones across the country, given how wide-spread they are through the country.

Using QGIS software the coordinates from the GIS data were used to map the 5,751 CHPS Zones across sub-districts, Districts and Regions for Ghana. Similarly, the same strategy was used to map the Volta Region and its 25 administrative Districts, and 426 CHPS Zones.

Step 2

The crude death rate (CDR) for the Volta Region from the 2010 Census was adjusted by its inter-censal growth rates to 2018. This generated a CDR of 8.8 deaths per 1,000 population per year, or about 2.5 deaths per month, per CHPS Zone. The data parameters entered in the Sample Size Calculator included adjustments for both under-notification (as inferred from the Bongo pre-test) and for the likely percentage of deaths that have medical certification of cause of death (14%).

Step 3

For effective and efficient implementation and monitoring, the sample needs to contain the minimum number of CHPS Zones across the 25 Districts of the Volta Region, which will produce CSMFs within pre-determined maximum acceptable uncertainty ranges, so that changes in CSMFs over time can be measured with statistical significance. Using the CRVS VA Sample Size Calculator Tool and Guide developed by the Swiss Tropical and Public Health Institute for the Bloomberg Data for Health Initiative,¹⁹ it was determined that the sample must include at least 100 CHPS Zones to have an uncertainty range between one and 25 per cent (**Table 2**) (**Figure 7**). The workload for CHPS CHO will be about two VA interviews per month.

¹⁹ Bloomberg Philanthropies Data for Health Initiative. Sampling strategies for representative national CRVS verbal autopsy planning: A guidance document and sample size calculator tool. Melbourne, Australia; Bloomberg Philanthropies Data for Health Initiative, Civil Registration and Vital Statistics Improvement, University of Melbourne; 2018.

Table 2 Characteristics of Ghana and the Volta Region

Characteristic	Ghana	Volta Region
Number of Districts	216	25
Population	28,308,301	2,434,212
Crude Death Rate (CDR) (per 1,000 population)	7.9	8.8
Number of CHPS Zones (clusters)	4,751	440
Population covered by CHPS Zones	16,962,676	1,569,089
Population per CHPS Zone	3,570	3,566
Average number of communities per CHPS Zone	4	4
Average number of deaths per month	2	2.5
Percentage of all deaths in hospital (ie. potential number of deaths with medical certification)	14%	18%
Percentage of deaths not notified		10%
Number CHPS Zones required for pilot		100
Expected population in Sample		196,300
Expected number of deaths in the sample		1,728
Expected number of VA needed per year		1,276

Figure 7 Output from the CRVS VA Sample Size Calculator Tool





Annex 1 Notification form

A. DETAILS ABOUT DECEASED AND EVENT

0.	District / Sub-District /Community	
1.	SERIAL NUMBER	
2.	FULL NAME OF DECEASED	
3.	AGE OF DECEASED	
4.	SEX OF DECEASED	
5.	DATE OF DEATH (DAY/MONTH/YEAR)	
6.	PLACE OF DEATH	
7.	USUAL ADDRESS OF RESIDENCE	

B. DETAILS ABOUT INFORMANT

1.	FULL NAME OF INFORMANT	
2.	ADDRESS	
3.	TELEPHONE NUMBER	
4.	DATE OF REPORTING	

Note: This is not a burial permit or a death certificate.

DECLARATION

I do hereby declare that I have been notified of the death of and permission is hereby granted for the burial of the deceased after the registration of the death with the Birth and Death Registry.

Name:

Title:

Signature.....

Date (DAY/MONTH/YEAR)

Stamp

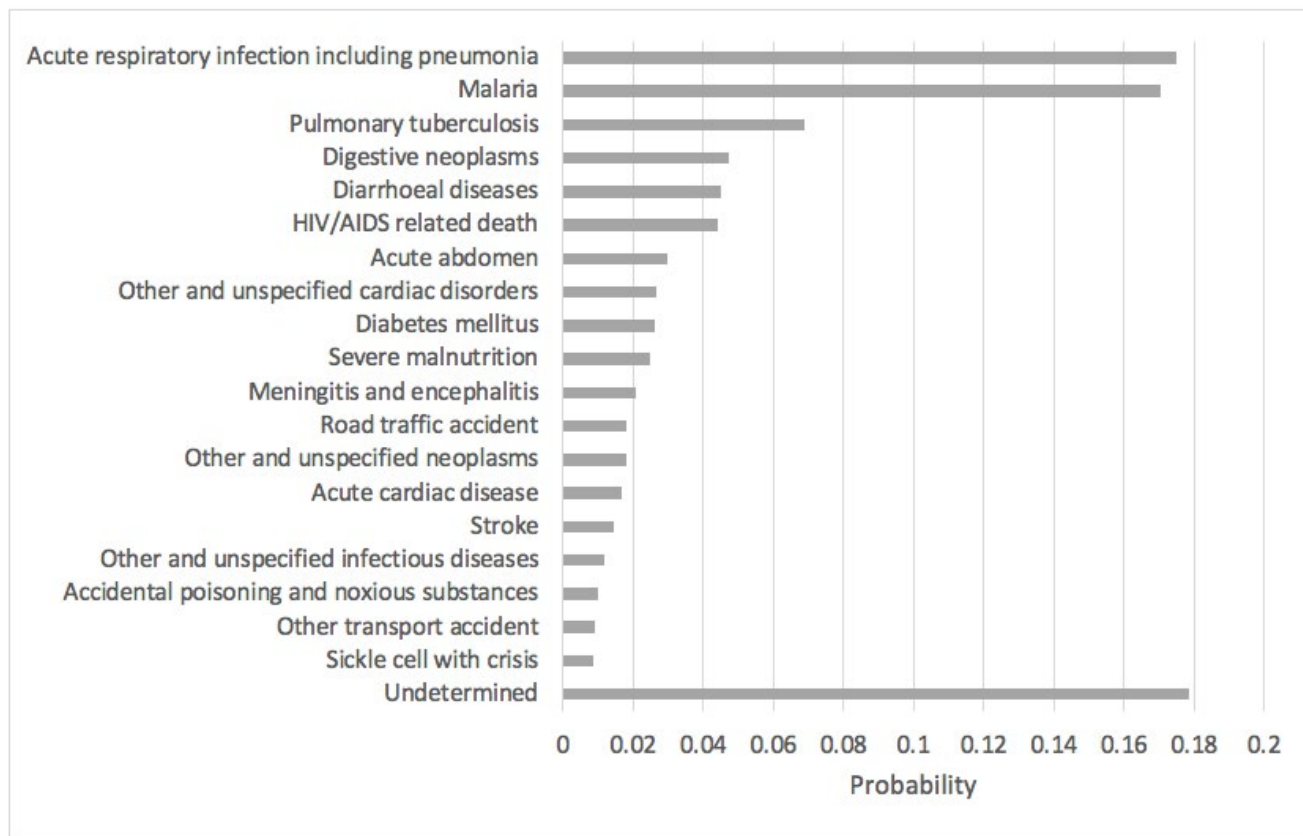
Annex 2 InterVA cause-specific mortality fractions

Cause-specific mortality fractions, VA pre-test analysed with InterVA, Ghana 2017 (N=99)

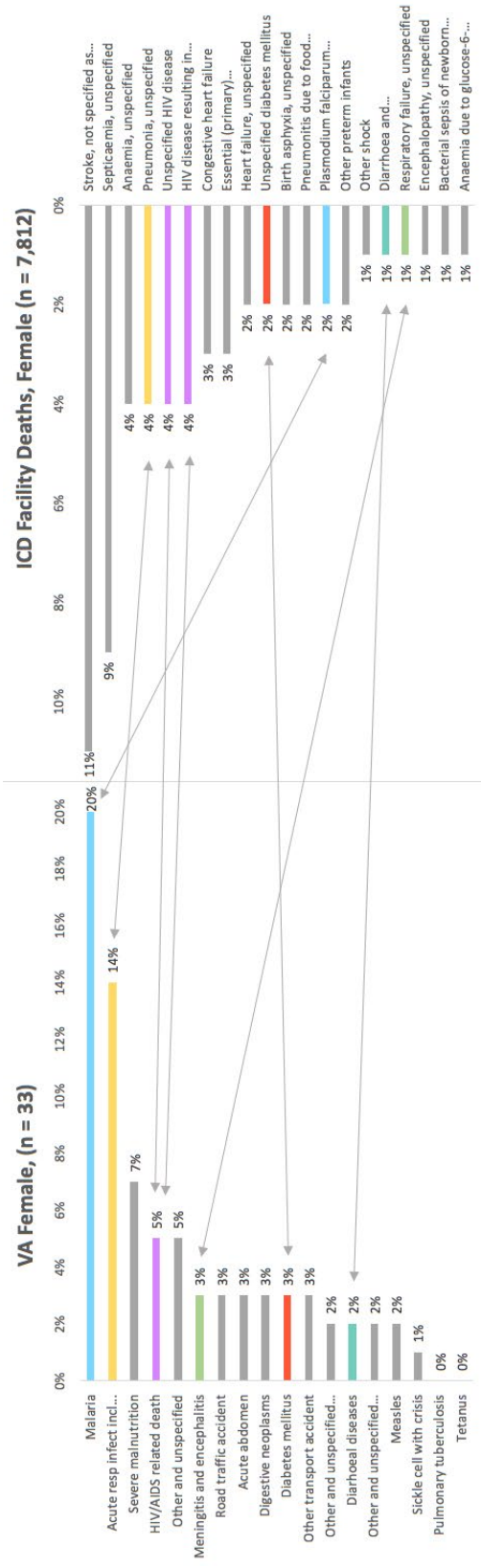
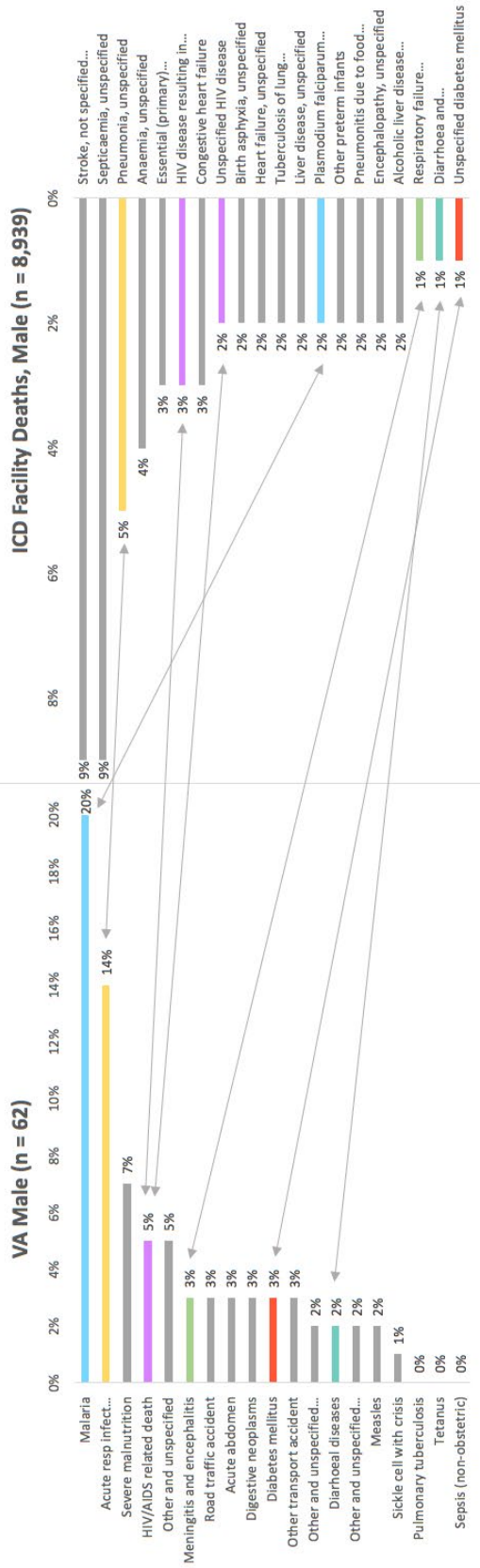
Rank	Cause of death	Likelihood
1	Undetermined	0.1786
2	Acute respiratory infection including pneumonia	0.1750
3	Malaria	0.1706
4	Pulmonary tuberculosis	0.0687
5	Digestive neoplasms	0.0473
6	Diarrhoeal diseases	0.0450
7	HIV/AIDS related death	0.0441
8	Acute abdomen	0.0296
9	Other and unspecified cardiac disorders	0.0268
10	Diabetes mellitus	0.0262
11	Severe malnutrition	0.0247
12	Meningitis and encephalitis	0.0206
13	Other and unspecified neoplasms	0.0180
14	Road traffic accident	0.0180
15	Acute cardiac disease	0.0166
16	Stroke	0.0143
17	Other and unspecified infectious diseases	0.0116
18	Accidental poisoning and noxious substances	0.0101
19	Other transport accident	0.0090
20	Sickle cell with crisis	0.0086



Cause-specific mortality fractions, VA pre-test analysed with InterVA, Ghana 2017 (N=99)



Annex 3 Comparison of the top 20 causes of death





Annex 4 Fellow profile, Francis Yeji

Ghana's CRVS system is faced with challenges resulting in low completeness of death notification, registration and certification, and poor-quality cause of death data. The need to build in-country capacity to strengthen the CRVS system in Ghana is crucial to improve the evidence base for health policy. Therefore the CRVS Fellowship program awarded to me provided a major opportunity to acquire skills and build capacity in CRVS systems, focusing on verbal autopsy (VA) analysis and scale-up in Ghana.

As research officer at the Navrongo Health Research centre in Ghana, I coordinated field operations for VA data collection for many years until 2016 when I was seconded to the Policy Planning Monitoring and Evaluation Division (PPMED) of the Ghana Health Service (GHS). My role in VA implementation in Ghana has been; overseeing the planning, introduction, training, community sensitization and data collection during the Bongo pre-test, and planning for the Volta Region pilot.

Since 2016, I have been actively involved with the initial preparation and stakeholder consultation meetings, as well as designing the implementation. I led the field implementation team for the phase one pre-test in Bongo where we sensitized the community and trained health workers to conduct VA interviews.

The University of Melbourne awarded to me a two-month CRVS Fellowship to work on the topic "Verbal Autopsy Scale up in Ghana". During the first phase of the fellowship I worked at the Swiss Institute for Tropical and Public Health (SwissTPH), University of Basel, under the guidance of Professor Don de Savigny. During the second phase I was based at the at the Melbourne School of Global and Population Health, University of Melbourne, working under the guidance of Dr Tim Adair. It was a privilege to be awarded the fellowship and my time at the two universities working with the mentors has been of enormous benefit.

I will use the skills and capacity acquired through the CRVS fellowship to help ensure a successful implementation of the Volta Region VA pilot and subsequent national roll-out. Also, I will share my experience and knowledge gained during the fellowship with others in Ghana. The CRVS Fellowship program has been timely and useful as Ghana moves into phase two of VA implementation.



Related resources and products

University of Melbourne, D4H Initiative, CRVS Knowledge Gateway: Library

<https://crvsgateway.info/library>

CRVS country overview: Ghana. CRVS summaries.

Guidance for assessing and interpreting the quality of mortality data using ANACONDA. CRVS resources and tools.

Improving vital statistics for informed policy: The importance of data quality. CRVS development series.

Intervention: Automated verbal autopsy. CRVS summaries.

Intervention: Medical certification of cause of death. CRVS summaries.

Intervention: Mortality coding. CRVS summaries.

University of Melbourne, D4H Initiative, CRVS Knowledge Gateway: Learning Centre

<https://crvsgateway.info/learningcentre>

Topic 1: Introduction to CRVS.

Topic 4: Cause of death in CRVS.

Topic 6: CRVS tools – ANACONDA mortality data quality assessment tool.

University of Melbourne, D4H Initiative, CRVS Knowledge Gateway: Courses

<https://crvsgateway.info/courses>

Analysis of Causes of (National) Deaths for Action.

ICD-10 coding.

Medical certification of cause of death.

SmartVA.

Further reading

Ghana Statistical Service. *Civil registration and vital statistics system in Ghana. Report on the comprehensive assessment.* Accra, Ghana: Government of Ghana; 2015.

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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