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DATA FOR HEALTH INITIATIVE

CRVS Fellowship report:
A national verbal autopsy scale-up strategy for Tanzania

November 2020

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Acronyms and abbreviations

CHW	Community Health Worker
CDO	Community Development Officer
COD	cause of death
CRVS	civil registration and vital statistics
CSMF	cause-specific mortality fraction
EHO	Environmental Health Officer
ICD-10	International Statistical Classification of Diseases and Related Health Problems, version 10
MOH	Ministry of Health
NBS	National Bureau of Statistics
ODK	Open Data Kit
PO-RALG	President's Office-Regional Administration and Local Government
RITA	Registration, Insolvency and Trusteeship Agency
SAVVY	Sample Vital Registration with Verbal Autopsy
VA	verbal autopsy
VAI	verbal autopsy interviewer
VIPER	Verbal Autopsy Interpretation, Performance and Evaluation Resource
WEO	Ward Executive Officer

CRVS Fellowship report: A national verbal autopsy scale-up strategy for Tanzania

Between February and March 2020, David Lenga from the Ministry of Health in Tanzania, completed a CRVS Fellowship funded by the Bloomberg Philanthropies Data for Health Initiative at the University of Melbourne to develop a national strategy for scaling up verbal autopsy in Tanzania. This report outlines the proposed strategy and discusses strategies to ensure sustainability and mitigate potential challenges.

Background: Verbal autopsy activities in Tanzania

The Government of Tanzania is in the process of transforming its real-time mortality reporting to improve monitoring and control of communicable and non-communicable diseases. With a population of approximately 55.9 million in 2019, and an estimated 362 000 deaths expected per year, about 70 per cent of these deaths take place in the community rather than in healthcare facilities.[1] Until now, there has not been a reliable method for ascertaining the cause of death (COD) for community deaths, resulting in COD information being unavailable for most deaths in the country. Furthermore, while about nine per cent of deaths have a medically certified COD, only half of these have a useable COD for health policy, planning and tracking progress towards the Sustainable Development Goals.

Verbal Autopsy (VA) is a proven and practical method to ascertain causes of death at population-level for deaths that occur outside health facilities and that have not been medically certified for the underlying COD. VA interviews are conducted by trained interviewers with family members or relatives of the deceased person who are asked about the circumstances and events leading to the death of a person, including signs and symptoms and their durations. The probable COD from the completed VA interview is then assigned by either a trained physician who reviews the filled in VA questionnaire, or by a computer algorithm. VA causes of death are then tabulated using a pre-determined list of target causes with associated International Statistical Classification of Diseases and Related Health Problems, version 10 (ICD-10) codes. The primary output from a VA system are the cause-specific mortality fractions (CSMFs) at population level by age and sex and, where possible, geography. Outputs from VA data analysis can be presented in a country's annual vital statistics report to complement the mortality data from facility-based medically certified COD.

There have been earlier efforts to implement VA as part of mortality surveillance in Tanzania. These include the nationally representative Sample Vital Registration with Verbal Autopsy (SAVVY), the Health and Demographic Surveillance System sentinel sites, periodic Demographic and Health Surveys, and other research projects that used VA for mortality follow-up. However, most of these VA implementations have been in research settings and have only occurred in small non-representative areas and for selected population groups. Moreover, none were integrated with the country's national civil registration and vital statistics (CRVS) system.

The integration of a community-based VA system was identified as a priority intervention in Tanzania's CRVS strategic plan. As a result, the country has begun institutionalising VA implementation into the CRVS and health systems, allowing for the routine collection of COD information for community deaths to inform evidence-based health policy and programming decisions.

1 National Bureau of Statistics of Tanzania. Tanzania in Figures: 2019. 2020. Available at: https://www.nbs.go.tz/nbs/takwimu/references/Tanzania_in_Figures_2019.pdf

Pre-testing and demonstration phase

Initial VA pre-test

Prior to implementing VA on a broad scale, a technical feasibility exercise must first be undertaken. In Tanzania, the pre-test began in 2017 and was implemented in 10 wards across three regions (Pwani, Tanga, and Morogoro). VA data was collected using tablets and sent to the Ministry of Health (MOH) server which councils, regions and national level staff can access through the CRVS-VA Manager Tool. CSMFs were produced from this data using the Insilico algorithm.

The pre-test accomplished the following:

- Adoption and adaptation of the World Health Organization's (WHO) 2016 VA questionnaires for implementation in the country, which included translation into Kiswahili
- Development and validation of procedures for collecting VAs in collaboration with key stakeholders
- Identification of areas for collaboration within the CRVS system to improve the completeness of death notification and registration
- The need to identify appropriate cadres to conduct VA interviews (e.g. Community Health Workers [CHWs], Environmental Health Officers [EHOs], Community Development Officers [CDOs)], Ward Executive Officers [WEO]). Configuration of acceptable IT system to support VA implementation
- Confirmation of data security and confidentiality provisions of data collection and processing
- Preliminary costing of VA start-up.

Iringa demonstration

Results from the pre-test implementation of VA confirmed the technical feasibility for large scale roll-out of VA, providing evidence to progress to the next phase to explore systems integration for introducing VA into Tanzania's CRVS and health system. To test and determine how the system integration process would work across the different institutions, a larger-scale demonstration was conducted in Iringa region, beginning in October 2018.

Iringa is one of Tanzania's 31 administrative regions, has a population of 941 238 and covers a total area of 35 743 square kilometres. The region is administratively divided into three district councils, one municipal council and one town council: Iringa District Council (with a population of 254 032), Kilolo District Council (population 218 130), Mufindi District Council (population 265 829), Iringa Municipal Council (151 345) and Mafinga Town Council (51 902).

VA was implemented in all 106 wards of Iringa, aiming to capture all community deaths. VA interviews were conducted by EHOs and CDOs working in the wards. For areas without titled officers, WEOs were used instead. These officials were selected due to their existing close working relationships with the target communities, and because they are permanent employees with a capacity to take on this extra workload on top of their existing duties. On average, VA interviewers should be able to conduct five to eight interviews per month.

Results of Iringa demonstration

A total of 2007 VA interviews across the 106 wards of Iringa were conducted, with data processed, analysed and disseminated to stakeholders. The CRVS death notification system captured 36 per cent (n=2007) of all deaths expected in a nine-month period (n=5693), assuming a crude death rate of 6.7 per 1000 population. Of the 2007 VAs collected, 71 per cent occurred outside of health facilities (i.e. in the community) and 29 per cent occurred in a health facility. The largest proportion of VAs were conducted for adults aged 12 years and above (87 per cent of all interviews), followed by children aged 28 days to 11 years (eight per cent), and finally, neonates (four per cent).

Cumulative results from all councils within the Iringa region indicated that HIV/AIDS was the leading COD for all 106 wards, with a CSMF of 18 per cent. Next followed 'other and unspecified cardiac diseases' (12 per cent), 'other and unspecified infectious diseases' (nine per cent), acute respiratory infections (seven per cent), and pulmonary tuberculosis (six per cent).

Lessons from the Iringa demonstration

The Iringa approach meant that many more VAs were conducted than were needed to establish the CSMFs. From the sample size of approximately 100 wards, 50 per cent of all VAs (n=970) were randomly selected about from 2007 deaths and compared against the CSMFs from the total number of VAs. The results demonstrated that there was minimal change in the order and level of the CSMFs, especially in the top five causes (which accounted for more than 50 per cent of all deaths) (**Table 1**).

Table 1: Top 20 comparison of VA-based causes on all deaths versus randomly selected 50% of total deaths

All VA records	n=2007	
Cause	**Count**	**%**
HIV/AIDS related death	357	18%
Other and unspecified cardiac diseases	237	12%
Other and unspecified infectious diseases	173	9%
Acute resp. infections incl. pneumonia	138	7%
Pulmonary tuberculosis	116	6%
Road traffic accident	90	4%
Acute cardiac disease	88	4%
Digestive neoplasms	86	4%
Other and unspecified NCD	84	4%
Stroke	57	3%
Diabetes mellitus	50	2%
Prematurity	40	2%
Acute abdomen	40	2%
Liver cirrhosis	39	2%
Other and unspecified neoplasms	36	2%
Assault	36	2%
Pregnancy-related sepsis	34	2%
Diarrhoeal diseases	30	1%
Other transport accident	25	1%
Accidental fall	23	1%

Randomly selected records	n=970	
Cause	**Count**	**%**
HIV/AIDS related death	173	18%
Other and unspecified cardiac diseases	129	13%
Other and unspecified infectious diseases	87	9%
Acute resp. infections incl. pneumonia	69	7%
Pulmonary tuberculosis	62	6%
Digestive neoplasms	51	5%
Acute cardiac disease	46	5%
Other and unspecified NCD	41	4%
Road traffic accident	41	4%
Diabetes mellitus	30	3%
Stroke	26	3%
Pregnancy related sepsis	21	2%
Liver cirrhosis	20	2%
Acute abdomen	19	2%
Prematurity	18	2%
Assault	18	2%
Diarrhoeal diseases	17	2%
Other and unspecified neoplasms	15	2%
Other transport accident	12	1%
Epilepsy	11	1%

National strategy for verbal autopsy scale-up

Sampling, sample size and selection

Because VA is a method to provide information on causes of death in a population, a sampling strategy is essential in order to produce COD and CSMF information at both the national and sub-national levels in a relatively cost-effective way, while ensuring VA data is representative of the national and regional situation suitable for use at a policy and practice level.

During scale-up, the recommended approach is to use stratified cluster sampling, as done by the National Bureau of Statistics (NBS) for the Demographic Health Surveys. Sample size calculations show that conducting VAs on all deaths in approximately 200 wards is sufficient to generate national CSMFs with acceptable precision for the top 20 causes of male and female deaths, separately. Sampling would be completed by the NBS in collaboration with the MOH and the President's Office – Regional Administration and Local Government (PO-RALG).

Collaboration between CRVS stakeholders

In Tanzania, VA implementation is designed to function as a collaboration between the MOH, Registration, Insolvency and Trusteeship Agency (RITA), PO-RALG, NBS, and other stakeholders.

The role of local government in VA implementation

Through decentralisation of Tanzania's CRVS system, WEOs are responsible for identifying and reporting deaths in the communities to RITA. A VA will be conducted by government officials working in the wards after a death has been notified and registered in the CRVS system. Since WEOs will be officially commissioned to conduct this task, they will supervise all the VAIs within the ward. All these employees sit under PO-RALG.

Death notification

Notification of deaths to RITA occurs in the following two ways:

1. **In the decentralised death registration regions:** when a person dies, a burial permit is issued by WEOs where key variables of the deceased are filled into a "D2" form, thereby notifying and registering the death. Later, a family member is given one copy of the D2 form and another is sent to the WEO for issuing of the death certificate. Once the death certificate is issued, notifications are electronically sent to the CRVS server. The MOH and RITA will link their collection systems tools (RITA-mobile and MOH-VA manager) for notification, ensuring the exact number of deaths in each ward is recorded, avoiding discrepancies between registered deaths and the number of VAs.

2. **In non-decentralised death registration regions:** the same initial procedures above are undertaken, with the exception of the notification papers being sent to the district as a paper form on a monthly basis.

Sensitisation during scale up

Sensitisation meetings about the importance of community death data collection at the regional, district and ward levels will be conducted, involving WEOs, councillors, District Executive Directors, District Medical Officers, HMIS focal persons, RITA focal persons, CHW coordinators and the community as whole to understand the situation for designing and implementing various interventions appropriately.

Training

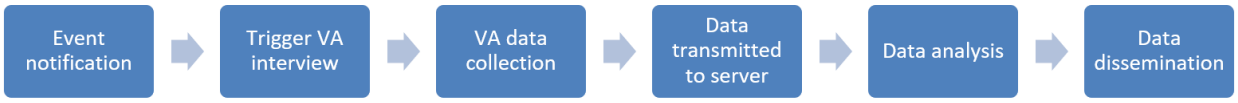
As observed during the demonstration period, staff changes necessitate ongoing training opportunities, and existing staff will need refresher training. Tanzania has developed a sustainable training program by integrating the VA module into the VA interviewer training syllabi. Training will also be provided to council-level supervisors (one per council), regional supervisors, and one dedicated national supervisor.

Data collection

Data collection will be coordinated by the MOH, RITA and PO-RALG. WEOs are responsible for identifying and reporting deaths in the communities to RITA. VA will be conducted by government officials working in the community under the directive of VEOs, following the notification and registration of a death in the CRVS system.

Data will be collected using smart tablets. Once collected, data will be submitted nationally through the mobile phone network/WIFI to the Open Data Kit (ODK) Aggregate Server/CRVS-VA Manager tool which councils, regional, and national-level governments have access to. Linkage of community-based VA outputs with the DHIS-2 system will take effect so that data on all community deaths will be available for planning and decision-making purposes (**Figure 1**).

Figure 1:VA data collection process



Data analysis, interpretation, dissemination and use for health programming

Data analysis is essential for proper day to day management and longer-term planning in the health sector. Users of health information include those delivering care and those responsible for managing and planning health programmes both within the country (health, local government and finance ministries) and outside (development partners and technical support agencies).

As part of a national scale-up, VA Manager and DHIS2 will be integrated into the broader CRVS system for death reporting, VA data collection, data transfer, data analysis and reporting. This integration will be led by the Information and Communication Technology branch of the MOH.

There will be capacity building training provided for monitoring and evaluation (M&E) officers and health program staff on basic data analysis and interpretation of VA data, including use of automated software for assigning and assessing the plausibility of causes of death. This training will improve understanding of statistical and M&E concepts in VA data analysis, and enhance skills in VA interview data analysis and interpretation of results.

Monitoring and evaluation

A sustainable supervision plan is important for maintaining quality in VA implementation. With the quality of VA COD data primarily relying on the quality of death notification and VA interviews, continued and periodic support and supervision for VA interviewers is essential. Tanzania has developed a routine support supervision mechanism that is integrated with other field supervision activities (see supervision checklist in **Appendix 2**). A data monitoring and evaluation plan will be established to monitor progress, facilitate problem solving, and assess data quality. Alongside the field supervision, the VA Manager Tool helps data managers at all levels to track field progress and provide supervisory feedback to areas where issues are observed. Well-trained VA supervisors should be readily engaged in planning, coordination, and implementation processes to ensure they have a complete understanding of the system.

Monitoring of standard methods for conducting interviews

VA supervisors will ensure that standard guidelines and operating procedures are used to conduct interviews, including ensuring that the right respondents are interviewed, interview questions asked in a standardised way, consent received, counselling offered, and privacy and confidentiality maintained.

Trained field supervisors will check that VAs are conducted on all reported eligible deaths and periodically (monthly/quarterly) observe and assess a certain percentage (for example, 10 per cent) of interviews for every interviewer. Preferably, this information will be collected using an electronic device and these data compiled for discussion in regular debriefing meetings.

VA Manager Tool

The Verbal Autopsy Manager Tool monitors the quality and progress of VA data collection processes, includes real time data as submitted by VA interviewers, and generates summary distributions of VA records by age-specific module type (infant, child or adult), time of submission, geographical area, and interviewer. Use of this tool also allows physicians to review VA interviews electronically and assign a COD. Since the VA data will be collected through tablets and sent to the MOH server for storage, the VA Manager Tool helps officials who have access to VA data to monitor field activities.

Reporting and solving

A clear strategy of reporting field issues and solving them will be established, along with identifying the lead person or persons for coordination and problem solving.

Debriefing sessions

Regular meetings between the interviewers, supervisors and data managers will be held to discuss the field issues and support interviewers in their work. Meetings will occur regularly with interviewers to solve problematic interviews and address any arising community relations issues. These meetings will also help a standardised implementation of VA activities to maintain VA quality.

Online discussion group

A Facebook or WhatsApp group will be set up to quickly communicate and solve any arising issues and updates from the field. Users of this platform will comprise all levels of authority from national through to ward level.

Interpretation of verbal autopsy and cause of death data

VA data must be interpreted to evaluate the plausibility of the mortality information and to understand the strengths and limitations of the data. VA data can analysed by using the University of Melbourne-developed Verbal Autopsy Interpretation, Performance and Evaluation Resource (VIPER) tool.[2] VIPER helps users to understand the VA population, estimate the completeness of death reporting, asses the plausibility of the age-sex distribution of death, conduct a plausibility analysis on the CSMFs, and present the main findings of VA data for policy action.

COD analysis and data interpretation will be carried out quarterly to monitor the patterns (by age, sex and geography) and COD trends, along with characteristics such as undetermined percent, missing age/sex data, refusal percent, missing and duplicate records, etc. Regular reporting and monitoring of these characteristics will help to improve VA activities.

Anticipated challenges

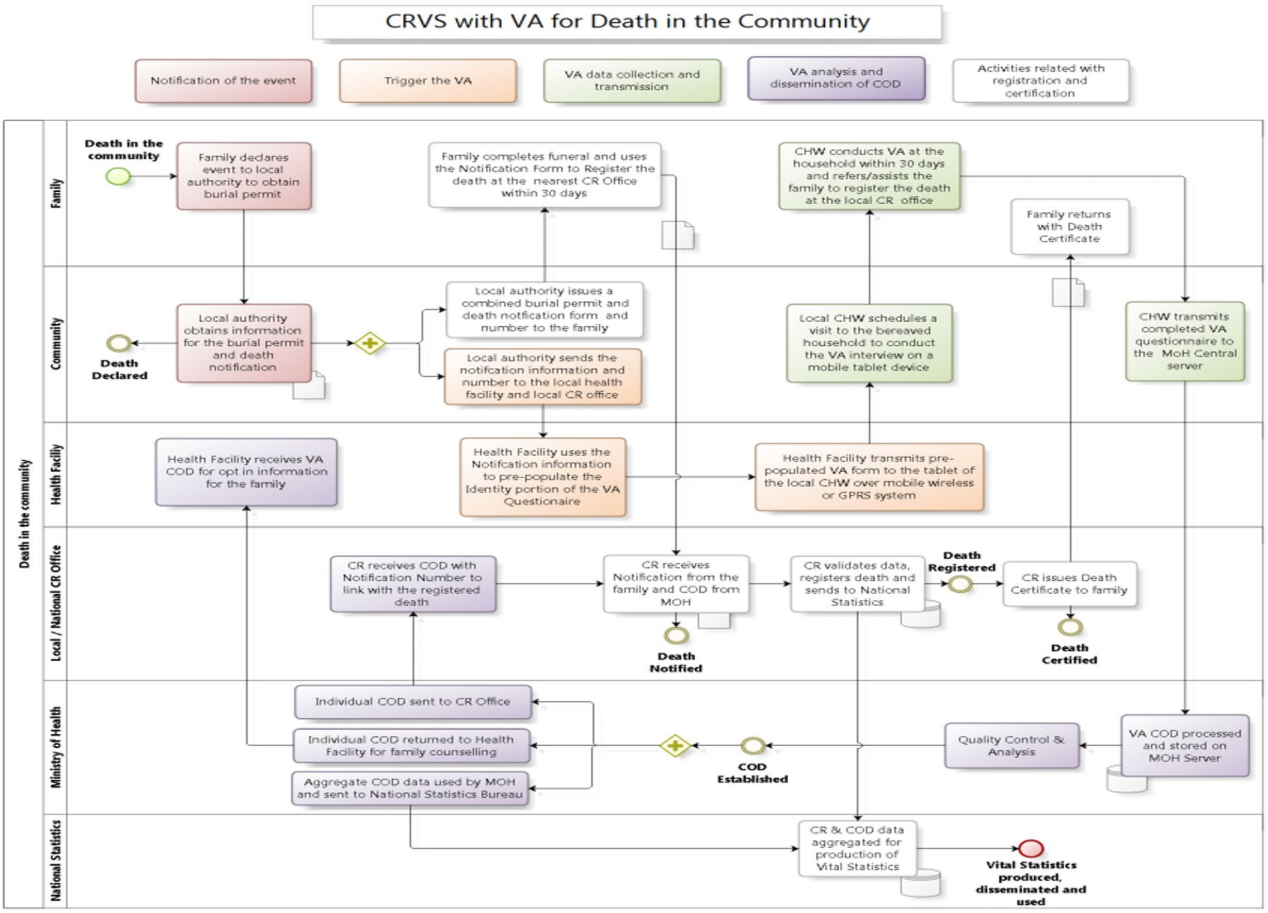
The following challenges and potential solutions have been observed:

1. **Human resource capacity to conduct VAs:** during the demonstration phase, identifying appropriate human resource cadres with the capacity to conduct VAIs was a challenge. To address this, government officials (EHOs and CDOs) already working in the wards were selected as interviewers during the scale-up. For areas without a titled officer, WEOs were selected in place.
2. **Issues with the notification system:** For VA scale up, MOH and RITA will link their death notification data collection tools (RITA, mobile and MOH, VA Manager). This will help the VAIs to obtain the exact number of deaths in each ward in order to conduct a VA on all relevant deaths.
3. **Supervision at council level:** A challenge observed during the demonstration phase was the supervision system, as there was no supervision occurring at the lower level. For the scale up, there will be a sound channel of supervision occurring from the national level, all the way to the lower ward levels.

2 For more information on this tool, see: https://crvsgateway.info/VIPER

4. **Cost of conducting VAs:** during the demonstration phase, a payment was made per VA interviewer, however, this strategy proved to be very expensive. In order to scale up VA, the payment modality will need to change. While there will be a cost associated per VA interview, the cost will not be a flat rate, rather, payment will be made for necessary transportation and internet coverage to attend geographical locations for the interviews. A more sustainable approach, however, would be to include VA interviews into local government planning, namely, the Comprehensive Council Health Plan. Doing so would enable councils to allocate a budget for VA activities rather depending on donor funding.

Appendix 1: Verbal autopsy implementation process workflow



Appendix 2. Supervision checklist for verbal autopsy interviewers

Name of VAI: ..... Location:..... Date:.....

S/N	Assessment Areas	Assessment Rank		
		Very good	Good	Poor
	Avaiability of Tools			
01	Do VAI have all required data collection tools in place? What are the VA data collection tools? (Tablets, Charger, Bags and Notebook) 1. Tablet? Installed with CRVS App, with data collection form installed? With data collection form configured correctly?			
	Interviewing Skillls			
02	Introductory skills to the household and ability to explain the CRVS and Verbal Autopsy concept comprehensively 1. What is CRVS? 2. Why do we collect CRVS data?			
03	Ability to create good relationship to household members 1. Ask a question, how do they do this?			
04	Do VAI managed to identify a proper household respondent? 1. Ask a question on how do they identify a respondent 2. A good respondent is the one closest relationship to the deceased, can communicate well and within acceptable age			
05	Do VAI ask or request for the consent prior proceeding with VA interviewing? 1. Does the interview start with a consent?			
06	Do VAI able to establish appropriate age of the deceased hence to get the right VA questionnaire? 1. What are different techniques to get and validate date of birth and date of death 2. How is it for a very old person (often with not known date of birth) 3. How is it for a very young child, (age in days or hours)			
07	Do VAI able to ask questions in order as was organized in the paper or tablet PC?			
08	Do VAI able to ask the questions in a comprehensive and understandable way to the respondent? 1. Check if VAI understands all questions or if they have specific concerns on any specific question			
09	Do VAI managed to establish confidential environment during interview? 1. Where are the interviews conducted (inside the house, outside the house, in a quiet place)? Who is around during the interview?			
10	Did VAI ask all questions at the household of the deceased during the interview? 1. Ask if VAI have ever had to skip or terminate the interview.			
	Accuracy during Interview			
11	Do VAI record the answers correctly?			
12	Did VAI able to respond correctly the questions asked by household member(s)?			

	Overcoming Challenges			
13	Is the data collected by VAI reflecting a real household interviewed?			
14	Do VAI have any problem on how to manage and use data collection tools (e.g. T/PCs)			
15	Do VAI able to troubleshoot T/PC problems?			
16	Do VAI able to overcome household challenges that may occur during VA interviewing? 1. Responding to verbal and non-verbal cues (crying, mute, furious etc) 2. Tackling interview refusals 3. Tackling false responses (how to identify false responses?)			
17	What are the challenges you are facing in this CRVS - VA work			
	Protocol Observation			
18	Do VAI use the local government hierarchic during day to day activities? Who do they seek or inform or use as reference of the VA interview progress			
	Supervisor's Observation			
19	What is the presentation and behaviour of VAI? 1. Smartness 2. Use of appropriate language 3. Not under influence of substances (Cigarette, alcohol, cannabis etc)			
		Yes	No	
20	Any allegation received from co-field worker or community member(s) complaining of misconduct of this VAI?			

Assessor's comments: .....

Assessor's name:..... **Signature:**..... **Date:** .....

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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.

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