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Fellowship profile

SmartVA and ANACONDA improvement in China

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CRVS course prospectuses

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

CRVS Fellowship reports and profiles

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

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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.

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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.

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Fellowship profile: SmartVA and ANACONDA improvement in China

From January to March 2019, Dr Jinlei Qi from the Chinese Center for Disease Control and Prevention (China CDC) undertook a Fellowship at the University of Melbourne (UoM): analysis of verbal autopsy (VA) data and application of Analysis of Causes of National Deaths for Action (ANACONDA) to China's mortality data. This profile provides an overview of country context in relation to civil registration and vital statistics (CRVS), and documents Jinlei's personal fellowship experiences and outcomes and the broader impact her Fellowship might have on improving the quality of mortality data in China.

Country context

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ANACONDA can reduce staffs' workload

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Country context

An upper-middle income country with a population of around 1.4 billion, China is the world's most populous country, with nearly 60 per cent of its population living in urban areas (**Figure 1**).¹ According to China National Human Development Report 2016, China has made impressive progress in human development over recent decades, as reflected in improvements in key indicators like poverty reduction, income, health, education, and socio-political participation.² Whilst China in the 1980s was classified as having a low Human Development Index (HDI), in 2008 it exceeded the world average HDI, and in 2014 its HDI reached a high-level of 0.727.²

1 The World Bank Group. China country data. 2019. Available at <https://data.worldbank.org/country/china>

2 United Nations Development Programme (UNDP). China National Human Development Report 2016: Social Innovation for Inclusive Human Development. Beijing, China; Development Research Center of the State Council of China: 2016.

Nearly 60 per cent of China's population lives in urban areas.

Figure 1. Map of China's provinces



Source: Geology.com, available at <https://geology.com/world/china-satellite-image.shtml>



The CRVS system of China

China CDC is working with D4H to improve its CRVS system.

China is committed to improving its CRVS system. A strong CRVS system produces reliable and timely vital statistics, which can then be used to guide health policy and planning decisions. In order to make sure its national population is counted and included in decision-making, China CDC has partnered with the Bloomberg Philanthropies Data for Health Initiative (D4H) to strengthen CRVS.³ As the University of Melbourne China CDC works with the central government to coordinate the country's public health system at three levels: provincial, municipal, and district.⁴

Since 2015, China CDC – with the support of D4H – has been carrying out activities to improve the quality of cause of death (COD) information and death reporting. In 2017, 7.3 million deaths were reported in China, with three-quarters of these deaths occurring in community settings where a physician was not present to medically certify the COD (**Box 1**).⁵ At the time of Jinlei's fellowship, only 2.5 per cent of these reported deaths were coded for mortality statistics⁴ – a percentage that China CDC is committed to improving.

Box 1. What is medical certification of cause of death (MCCOD)?

When a patient dies in a hospital or health facility, a medical certificate of cause of death (MCCOD) (COD) should be completed.⁶ The medical death certificate is usually completed by a physician who attended to the patient or a physician who is familiar enough with the patient's medical history to confidently ascertain the COD.⁷ To certify a death, the physician must first identify the disease or injury leading directly to death, and then trace back the sequence of events to determine the underlying COD.

To further improve its CRVS system and resulting mortality statistics, China CDC and D4H are collaborating on a number of interventions, including field testing of automated verbal autopsy (VA) and training on how to use the Analysis of Causes of National Deaths for Action (ANACONDA) tool.

- 3 Chinese Center for Disease Control and Prevention. Bloomberg Philanthropies Data for Health Initiative CRVS Work Plan, April 2019-March 2021. Unpublished; 2019.
- 4 Wang LD, Wang Y, Yang GH, Ma JQ, Wang LP, Qi XP. China Information System for Disease Control and Prevention. National Bureau of Asian Research: Center for Health and Aging.
- 5 Qi J. SmartVA and ANACONDA improvement in China's CRVS system [video interview]. Melbourne, Australia: Bloomberg Philanthropies Data for Health Initiative, Civil Registration and Vital Statistics Improvement, The University of Melbourne; 2019. Available at <https://www.youtube.com/watch?v=jWFgtqX9ACQ>
- 6 The University of Melbourne. Strategies for improving the quality of cause of death data in hospitals. CRVS development series. Melbourne, Australia: Bloomberg Philanthropies Data for Health Initiative, Civil Registration and Vital Statistics Improvement, The University of Melbourne; 2017.
- 7 Lomas HD, Berman JD. Diagnosing for administrative purposes: some ethical problems. *Social Science and Medicine* 1983; 17:241-244.



SmartVA

In 2017 and 2018, China CDC with the support of UoM D4H, carried out two phases of automated VA, or SmartVA (**Box 2**), piloting projects in 22 counties and districts from 9 provinces in the east, central, northwest, and southwest areas of China.²

SmartVA may be a useful tool for use in community settings.

Box 2. What is verbal autopsy (VA) and SmartVA?

Verbal autopsy VA is a method for collecting information about an 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 (COD).⁸ 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 COD data similar in quality and reliability to MCCOD in hospitals.⁹

The VA process consists of three steps:

1. Setting up an interview by a trained VA staff member at the household level (or another appropriate place);
2. Conducting a structured interview to collect information on signs and symptoms of illnesses, and events that the deceased suffered before death and;
3. Interpreting the interview data to diagnose the most probable COD (historically, this was done by physicians, however automated methods are now widely available).¹⁰

Physician-certified VA can be costly and time-consuming, particularly in community settings where physicians may not be available. As such, automated methods of collecting and analysing VA questionnaire data have been developed (with SmartVA being one of these). Compared to paper-based VA, automated methods generally reduce data entry errors and speed up the interview process.^{9,11}

8 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

9 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.

10 Senanayake, CH. Fellowship profile: Country-specific adaptation of a SmartVA DHIS2 integration module for Sri Lanka. CRVS country perspectives. Melbourne, Australia: Bloomberg Philanthropies Data for Health Initiative, Civil Registration and Vital Statistics Improvement, the University of Melbourne and Ministry of Health, Nutrition and Indigenous Medicine, Sri Lanka; 2019.

11 University of Melbourne. Challenges associated with automated VA training and rollout, CRVS development series. Melbourne, Australia: Bloomberg Philanthropies Data for Health Initiative, Civil Registration and Vital Statistics Improvement, The University of Melbourne; 2018.



China CDC staff were trained in ANACONDA and death registration completeness.

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Around 11,000 VA interviews were conducted as part of this pilot, and evaluation results indicated that SmartVA generated plausible COD patterns in accordance with Global Burden of Disease estimates.² These results suggest that SmartVA has potential for assigning COD in rural areas in China, although it has yet to be tested in some of the more under-developed challenging provinces where communities have limited medical records as well as poor infrastructure and health services.²

12 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

13 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.

14 Senanayake, CH. Fellowship profile: Country-specific adaptation of a SmartVA DHIS2 integration module for Sri Lanka. CRVS country perspectives. Melbourne, Australia: Bloomberg Philanthropies Data for Health Initiative, Civil Registration and Vital Statistics Improvement, the University of Melbourne and Ministry of Health, Nutrition and Indigenous Medicine, Sri Lanka; 2019.

15 University of Melbourne. Challenges associated with automated VA training and rollout, CRVS development series. Melbourne, Australia: Bloomberg Philanthropies Data for Health Initiative, Civil Registration and Vital Statistics Improvement, The University of Melbourne; 2018.

ANACONDA

As part of efforts to improve the quality of China's COD data, China CDC worked with UoM D4H to organise a training workshop for the ANACONDA tool (**Box 3**). In addition to training participants on the use of ANACONDA, this training workshop also covered the importance of completeness of death registration (**Box 4**). It was attended by China CDC staff from all 31 provinces, with all training materials translated into Chinese.² Upon request of these staff, a Chinese version of ANACONDA has been developed.

Box 3. What is the Analysis of Causes of National Deaths for Action (ANACONDA) tool?

ANACONDA is built on a set of standard demographic and epidemiological concepts that underlie mortality data quality.¹⁶ It provides a 10-step logical evaluation framework.¹⁷ First, it overviews the input data and applies some simple checks to the mortality data. Then, it assesses the quality of COD data and computes an overall index of mortality data quality, the Vital Statistics Performance Index (VSPI(Q)). All the computational steps are automated and straightforward.

By regularly applying this assessment tool and carefully interpreting the outputs, country governments can better understand:

- How reliable the input data from their routine CRVS systems are;
- What the probable biases or errors are;
- Progress in improving the quality of mortality and cause of death data, and;
- Where and what kind of interventions are most urgently needed to further strengthen their existing systems.¹⁸

Box 4. What is registration completeness and why is it important?

Without reliable vital statistics, completeness estimates are it is impossible to know where to focus improvement measures and potential CRVS interventions. A complete CRVS system is the best and most cost-effective source of routine, timely and detailed data on births, deaths and COD. However, globally, around one-third of births and one-half of deaths are not registered.¹⁴ In CRVS systems where not all births and deaths are registered, the accurate measurement of registration completeness should be a core function.¹⁹

The completeness of registration is defined as the percentage of actual births or deaths in a population that are registered. It is the number of registered births or deaths divided by the actual number of births or deaths in a population.

$$\text{Completeness of death registration (\%)} = \frac{\text{(number of registered deaths)}}{\text{(actual number of deaths)}} \times 100$$

¹⁶ The University of Melbourne. Improving registration and certification in Colombia. CRVS country perspectives. Melbourne, Australia: Bloomberg Philanthropies Data for Health Initiative, Civil Registration and Vital Statistics Improvement, The University of Melbourne; 2018.

¹⁷ 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, The University of Melbourne; 2017.

¹⁸ The University of Melbourne. A new method for estimating the completeness of death registration. CRVS summaries. Melbourne, Australia: Bloomberg Philanthropies Data for Health Initiative, Civil Registration and Vital Statistics Improvement, The University of Melbourne; 2018.

¹⁹ The University of Melbourne. The importance of routinely measuring birth and death registration completeness. CRVS summaries. Melbourne, Australia: Bloomberg Philanthropies Data for Health Initiative, Civil Registration and Vital Statistics Improvement, The University of Melbourne; 2018.



The Fellowship project

At the time of her fellowship commencement in 2019, Jinlei held the position of assistant researcher at China CDC, working in death surveillance and vital registration. One of the primary challenges Jinlei experienced in this role was the uncertainty of death certification accuracy, with inaccuracies often stemming from staff confusion and COD coding interpretation issues. In an effort to address these issues, Jinlei focused her CRVS Fellowship on SmartVA and ANACONDA.

Reflections: take-home lessons

SmartVA is essential for improving COD data

Since the implementation of SmartVA in China in 2017, a crucial task for Jinlei has been to learn how to analyse this SmartVA data and share resulting conclusions with colleagues and other CRVS stakeholders. Jinlei underscored the importance of using SmartVA not only in China, but in other low- and middle-income countries seeking to apply meaningful tools to improve quality of COD data and to reduce the proportion of uncertain mortality codes.

A personal interest in ANACONDA

A second component of Jinlei's fellowship was ANACONDA. Jinlei's personal interest in ANACONDA stemmed from her desire to understand the formula and models behind the tool, and was initially drawn to it as she wondered about the advantages and disadvantages of such models. Having learned more about ANACONDA throughout the CRVS Fellowship, Jinlei is optimistic about ANACONDA's role in CRVS improvement efforts in China.

ANACONDA can reduce staff workloads

Jinlei remarked that China CDC staff would benefit from further training in ANACONDA. She emphasised the effectiveness of ANACONDA in producing data that can be used for health policy, particularly in places such as China's western provinces, for example, where there is often only one staff member per province responsible for death surveillance.⁴ With a high population and constrained resources, these staff have limited capacity to report on deaths in their provinces making ANACONDA an incredibly useful tool for evaluating mortality data. Electronic tools, Jinlei confirmed, lighten staff workloads whilst also helping to find deficiencies in data.

Benefits for CRVS development in China

Jinlei found her fellowship experience to be immensely helpful for her learning and professional development. Going forward, Jinlei is eager to spread what she has learned from her fellowship to colleagues in China, and in doing so, hopes to help improve the capacity of staff to complete their death surveillance work with greater ease and accuracy.

As China CDC rolls out SmartVA and applies ANACONDA to highlight data inaccuracies and other issues, the quality of China's mortality data will significantly improve, allowing the government to make more informed health policy and planning decisions.

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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