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Fellowship profile:

Understanding patterns and
trends in mortality in Shanghai

March 2019



Applying country experiences and knowledge



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CRVS development series

The CRVS development series, generated through the Initiative, form a lasting archive of concise and easily accessible evidence and knowledge on strengthening CRVS systems. The content is based on a combination of technical knowledge and country experiences, as well as the scientific literature. The series 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 technical outcome series

This series focuses on filling a range of scientific knowledge gaps and offering new tools, methods, findings and approaches for CRVS systems and data improvement. The series has a strong empirical focus. It reports 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.

CRVS resources and tools

Capacity-building resources and tools are designed to influence and align CRVS processes with established international or best-practice standards and to help countries improve their systems. 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.

CRVS country perspectives

CRVS country perspectives describe the capacity-building experiences and successes of strengthening CRVS systems in partner countries, including fellowship reports. The series describes the state of CRVS systems improvement in partner countries, and provides a baseline for comparison over time and between countries.

CRVS action guides and summaries

Many papers from the development and technical outcome series have accompanying action guides or summaries, which provide a succinct overview of key points and, in the case of action guides, a suggested way forward for countries.

Published by Civil Registration and Vital Statistics Improvement, Bloomberg Philanthropies Data for Health Initiative, University of Melbourne

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**Made possible through funding from
Bloomberg Philanthropies
www.bloomberg.org**

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Suggested citation

Lei C. *Fellowship profile: Understanding patterns and trends in mortality in Shanghai*. CRVS development series. Melbourne, Australia: Bloomberg Philanthropies Data for Health Initiative, Civil Registration and Vital Statistics Improvement, University of Melbourne; 2019.



Fellowship profile: Understanding patterns and trends in mortality in Shanghai

From January to March 2019, Dr Chen Lei from Shanghai Municipal Center for Disease Control and Prevention (SCDC) came to the University of Melbourne to receive support in analysing medical records reviews and analysis of verbal autopsy (VA) data. This fellowship profile documents Chen Lei's experiences whilst at Melbourne, including what she worked on, what she learned, and what impact this might have on improving the quality of mortality data in Shanghai.

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Country context

China is an upper-middle income country comprised of 22 provinces (23 including Taiwan), 4 directly-controlled municipalities (Beijing, Tianjin, Shanghai, and Chongqing), 5 autonomous regions, and the 2 special administrative regions of Hong Kong and Macau. 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.¹

Shanghai is the most populous city in the world, and China the most populous country.

Located on the eastern coast of China, Shanghai is composed of 16 districts. It is the largest city in China in terms of its urban population, and its population of about 24 million makes it the most populous city in the world.² Of its total population, 14 million are registered permanent residents, whilst 9 million are a 'floating population'; this is because migrants residing in Shanghai for less than 6 months are ineligible for permanent resident registration.³ Shanghai is one of two cities participating in the Bloomberg Philanthropies Data for Health (D4H) initiative, with the aim of improving its civil registration and vital statistics (CRVS) system.

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

2 Shanghai Economic and Social Development Statistical Bulletin 2016. Available from: <http://www.stats-sh.gov.cn/sjfb/201702/293816.html>

3 Shanghai Centre for Disease Control. Bloomberg Philanthropies Data for Health Initiative Work Plan. Unpublished; 2017.

The CRVS system of Shanghai

The SCDC surveillance system is responsible for collecting birth and death data.

China's Center for Disease Control and Prevention (CDC) works with the central government to coordinate the country's public health system at several levels: provincial, municipal, and district.⁴ The Shanghai Municipality Center for Disease Control (SCDC) surveillance system covers all districts in Shanghai and is responsible for health data collection as well as the birth and death registry.⁵

The SCDC system is fully computerised and electronically records vital events – like births and deaths – in real-time.³ Over 98 per cent of births occur in hospitals.⁶ Upon delivery, birth certificates are issued to parents, who then take the certificate to the local police station to register the birth.⁶

As for deaths, physicians complete death certificates for deaths that occur at home and in-hospital using the International Form of Medicate Certificate of Cause of Death, and these death data are sent electronically to SCDC within 72 hours of the death occurrence.³ When a death occurs at home, family members notify the local Public Security Office, Civil Affairs Office, and Community Health Centers (CHC). CHC physicians then conduct a variant of a verbal autopsy (VA) (**Box 1**) interview via a 20-minute structured interview with the decedent's family members, and where possible, conduct a medical record review to conclude probable cause of death (COD).³

Box 1: What is verbal autopsy?

Verbal autopsy 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).⁷ 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.⁸

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
3. Interpreting the interview data to diagnose the most probable COD (historically, this was done by physicians, however automated methods are now widely available).

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. Available at <http://pacifichealthsummit.org/downloads/HITCaseStudies/Functional/CISDCP.pdf>

5 The University of Melbourne. *CRVS country overview: Shanghai*. CRVS action guides and summaries. Melbourne, Australia: Bloomberg Philanthropies Data for Health Initiative, Civil Registration and Vital Statistics Improvement, The University of Melbourne, 2016. Available at https://crvsgateway_info.myudo.net/file/9760/136

6 Shanghai Centre for Disease Control. Bloomberg Philanthropies Data for Health Initiative Country profile: China-Shanghai. Unpublished; 2017.

7 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.

8 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.

Gaps in the SCDC system include missing information on home deaths.

Although the SCDC surveillance system is efficient and functional, there are still several areas of uncertainty. Some vital events, particularly amongst infant, elderly, and ‘floating’ populations, go unreported.^{3,5} Efficient death registration amongst the ‘floating’ population is a challenge, meaning that death registration in Shanghai is likely to be incomplete.³ Moreover, a high proportion of deaths occur at home (about 35 per cent), for which COD accuracy has not been determined, and critical data quality assessments have had limited capacity.⁵ About six per cent of deaths with a COD have an ill-defined cause.³

Improving mortality data

The SCDC is determined to improve the quality of mortality statistics.

Given these issues, SCDC and other stakeholders have demonstrated a strong commitment to improving the quality of mortality statistics generated by the surveillance system, as well as the accurate analysis of vital statistics data. D4H together with SCDC, the Department of Public Security, Department of Civil Affairs, and Department of Family Planning discussed and selected a suite of interventions and trainings aimed at improving the quality of mortality data as well as the skills and capabilities of coders and other SCDC staff who are responsible for the collection, coding, analysis, and dissemination of mortality data.³

A key focus of Shanghai’s CRVS improvement strategy is on increasing the quality of mortality statistics generated by the surveillance system, which SCDC and local stakeholders emphasised was a key need.³ Focusing on the quality of mortality statistics will ensure that the surveillance system will capture high-quality data for deaths occurring in health facilities, and will enhance the reliability of COD data by improving the quality of medical certification of cause of death for facility-based deaths as well as coding of COD (**Box 2**).

Box 2: What is medical certification of cause of death?

When a patient dies in a hospital or health facility, a medical certificate of cause of death (COD) should be completed.⁹ 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.¹⁰ 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.¹⁰

9 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, University of Melbourne; 2017.

10 Lomas HD, Berman JD. Diagnosing for administrative purposes: some ethical problems. *Social Science and Medicine* 1983; 17:241-244.



The fellowship project

Chen Lei works in the Department of Vital Statistics and as a conductor of the CRVS program at SCDC. Her work involves routine collection of data from CDC physicians, analysis and evaluation of the data collected, and provision of feedback to these physicians. At the end of each year, Chen Lei provides the physicians with a summary of the data analysis and feedback on the data. As for her work in the CRVS program, Chen Lei has several duties, including coordinating with staff from various backgrounds and working on data analysis for Shanghai's CRVS interventions. The six D4H interventions include 1) assessing the quality of medical certification, 2) certification training, 3) improving quality and quantity of mortality statistics via the ANACONDA tool, 4) birth and death registration completeness training, 5) rapid assessment of quality of coding of COD, and 6) manual coder training.³

Chen Lei's fellowship focused on medical records review and the automated VA validation study.

Chen Lei's fellowship in Melbourne was focused on analysis of the data collected on these interventions. She analysed data related to the first intervention – assessing quality of medical certification – which involved a medical records review and automated VA validation study. For this intervention, about 2000 medical records from were reviewed for the 25 leading CODs in Shanghai with the purpose of ascertaining which CODs are frequently incorrectly assigned by physicians, in addition to gold-standard cases to validate the use of VA for community deaths. A cadre of Shanghai physicians and lay interviewers were trained to perform the medical records review and VA interviews respectively.

Reflections: take-home lessons

New statistical and analytical skills

Chen Lei was eager to learn new analytical skills and estimation methods.

Given that Chen Lei's background in epidemiology and statistics, she especially interested in learning skills like data cleaning and analysis for all births and deaths registered in Shanghai. She remarked that the fellowship was a good way for her to learn methods of estimating completeness of registration as well as for measuring other gaps in data, which will help determine what health challenges Shanghai is facing.

Addressing garbage codes

What Chen Lei accomplished in her fellowship will help in addressing the issue of 'garbage codes', codes that have no use in informing public health policy, as the related underlying cause of death is too vague or simply impossible. In Shanghai, the issue of garbage codes is seen in the way in which home deaths are often assigned 'old age' as an underlying cause of death. Chen Lei stated that 'old age' is a common garbage code, and that her work will help produce more accurate COD data.

An opportunity to share knowledge

Chen Lei wanted to be as productive as possible and share what she learnt.

Chen Lei wanted to learn as much as possible during her time in Melbourne. She was worried about time constraints, however, saying that she wanted to complete as much work as possible before returning to Shanghai. She wanted to hone her skills in Melbourne so that she could then share what she learnt with her colleagues back in Shanghai. This would mean that the knowledge Chen Lei gained during the fellowship could benefit other CRVS stakeholders.



Benefits for CRVS development in Shanghai

The rest of China will be able to follow Shanghai's model for CRVS improvement.

The reliability of Shanghai's COD has not yet been determined, which is why Chen Lei aimed to find some valuable conclusions during her fellowship that will guide subsequent interventions, like implementation of VA and training for physicians in medical certification. The VA research, on the other hand, provided clarity on the underlying causes of death that had previously remained unknown. Chen Lei's analysis will help Shanghai develop medical certification and coding training for physicians and coders as a part of broader efforts to improve mortality data. Achievements made by SCDC may be used as a model for the rest of China to draw upon as it fills in the gaps in its CRVS system and make informed health policy decisions.



Related resources and products

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

<https://crvsgateway.info/library>

CRVS country overview: Shanghai, China. CRVS summaries.

A new method for estimating the completeness of death registration. CRVS summaries

Improving registration: best-practice guidelines. CRVS summaries.

Intervention: Automated verbal autopsy. CRVS summaries.

Intervention: Improving registration practices. 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 5: Improving quality and presentation of vital statistics.

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

<https://crvsgateway.info/courses>

Estimating the completeness of birth and death registration.

ICD-10 coding.

Medical certification of cause of death.

SmartVA.

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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CRICOS Provider Code: 00116K

Version: 0319-01

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