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# CRVS Fellowship report

## Assessing the quality of mortality statistics in Shanghai

April 2018





## Resources available from the University of Melbourne, Bloomberg Philanthropies Data for Health Initiative

### *CRVS course prospectuses*

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

### *CRVS Fellowship reports and profiles*

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

### *CRVS analyses and evaluations*

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

### *CRVS best-practice and advocacy*

Generated through the Initiative, CRVS best-practice and advocacy resources are based on a combination of technical knowledge, country experiences and scientific literature. These resources are intended to stimulate debate and ideas for in-country CRVS policy, planning, and capacity building, and promote the adoption of best-practice to strengthen CRVS systems worldwide.

### *CRVS country reports*

CRVS country reports describe the capacity-building experiences and successes of strengthening CRVS systems in partner countries. These resources describe the state of CRVS systems-improvement and lessons learnt, and provide a baseline for comparison over time and between countries.

### *CRVS technical guides*

Specific, technical and instructive resources in the form of *quick reference guides*, *user guides* and *action guides*. These guides provide a succinct overview and/or instructions for the implementation or operation of a specific CRVS-related intervention or tool.

### *CRVS tools*

Interactive and practical resources designed to influence and align CRVS processes with established international or best-practice standards. These resources, which are used extensively in the Initiative's training courses, aim to change practice and ensure countries benefit from such changes by developing critical CRVS capacity among technical officers and ministries.

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# Fellowship profile: Assessing the quality of mortality statistics in Shanghai

Between March and June 2017, Dr Tan Ziwen, from the Department of Vital Statistics, Shanghai Municipal Centre for Disease Control and Prevention came to the University of Melbourne to learn about how to routinely assess the quality of vital statistics data, using an automated mortality data software tool, ANACONDA. This fellowship profile documents Tan's experiences while at Melbourne, including what she worked on, what she found, and what impacts this might have on improving the civil registration and vital statistics system in Shanghai.

## Country context

The CRVS system of Shanghai

Medical certification of cause of death

## Fellowship project

ANACONDA for analysing mortality data

## New skills developed

Completeness of registration

Vital Statistics Performance Index

## Take-home lessons

Related resources and readings

## Country context

Tan is from Shanghai, one of only two cities selected to participate in the Bloomberg Philanthropies Data for Health (BD4H) Initiative. Shanghai is located on the eastern coast of China and is comprised of 16 county-level districts (**Figure 1**). It is the largest city in China in terms of its urban population, and is the most populous city in the world, with a total population of about 24 million people.<sup>1</sup>

**Figure 1 Map of Shanghai, China**



Source: Encyclopaedia Britannica Incorporated, available at <https://kids.britannica.com/students/article/Shanghai/277018>

<sup>1</sup> Shanghai Economic and Social Development Statistical Bulletin 2016. Available from: <http://www.stats-sh.gov.cn/sjfb/201702/293816.html>



According to China National Human Development Report 2016<sup>2</sup> and China Sustainable Cities Report 2016,<sup>3</sup> Shanghai's Human Development Index in 2014 and 2015 were both classified as very high, with its sub-indicator, life expectancy, ranking first in China. However, with the economic growth and an aging population, Shanghai has experienced a rapid transition in causes of mortality: more people are now dying from non-communicable diseases than infectious ones, much like what is seen in other parts of China and the world.<sup>4,5</sup>

To keep track of the changes in the pattern of mortality, and to make more targeted health policies and programs in Shanghai, more reliable and timely mortality data from the civil registration and vital statistics (CRVS) system is needed.

### The civil registration and vital statistics system in Shanghai

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

The first death registration system in Shanghai was implemented in 1951 for the Hukou population.<sup>6</sup> In 1973 the system was extended to include non-Hukou residents who had lived in Shanghai for longer than six months, and in 1990, the entire system was computerised. The system has achieved a self-reported 99.8% completeness level in death registration<sup>7</sup> and requires each death to be medically certified by a hospital physician or a community doctor, with detailed causes of death properly assigned.

The Department of Vital Statistics, Shanghai Municipal Centre for Disease Control and Prevention (SCDC) is responsible for the running, management and quality control of the system, as well as the statistical analysis of collected mortality data. It reports annually to the Shanghai Municipal Commission of Health and Family Planning.

### Certification of deaths

**Certification** is the process physicians use to determine the underlying cause of death.

In Shanghai, every death has to be medically certified and have a cause of death assigned using a local adaptation of the International Medical Certificate of Cause of Death.<sup>8</sup> This is required by law, regardless of if the death occurred in a health facility or community setting (for example, at home).

**Mortality coding** is a complex process by which all diseases and conditions recorded on a medical death certificate are transformed from text to alpha-numeric codes.

Mortality data from the medical death certificates are then entered into the mortality database by colleagues at community health centres (CHCs) or directly reported to the SCDC through the online system. Mortality coding happens at the CHCs or district SCDCs by trained manual coders using a Chinese version of the International Classification of Diseases volumes, tenth edition (ICD-10), which was adopted in 2002.<sup>9</sup>

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.

3 United Nations Development Programme (UNDP). *China Sustainable Cities Report 2016: Measuring Ecological Input and Human Development*. 2016. Beijing, China; UNDP: 2016.

4 Zhou M, et al. Cause-specific mortality for 240 causes in China during 1990-2013: a systematic subnational analysis for the Global Burden of Disease Study 2013. *Lancet* 2016; 387(10015):251-72.

5 Milner J, Wilkinson P. Trends in cause-specific mortality in Chinese provinces. *Lancet* 2016; 387(10015):204-5.

6 Hukou refers to the household registration system in China, which was established to register vital events for people based on their location of birth (as opposed to where they reside)

7 For more information on completeness, see: 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: 2017.

8 World Health Organization. *International Statistical Classification of Diseases and Related Health Problems, 10th revision, vol. 2, 10th edn*. Geneva, Switzerland; WHO: 2016.

9 For more information on coding, see: University of Melbourne. *Intervention: Mortality coding*. CRVS summaries. Melbourne, Australia; Bloomberg Philanthropies Data for Health Initiative, Civil Registration and Vital Statistics Improvement, the University of Melbourne: 2017.



## The fellowship project

As one of the core team members of the Shanghai CRVS program, Tan has been involved in almost all aspects of the BD4H Initiative in Shanghai, including the baseline assessment, medical record review, verbal autopsy (VA),<sup>10</sup> as well as attending various training programs like ICD coding, medical certification of cause of death, and VA investigator training.

The aim of Tan's fellowship project was to assess the quality of Shanghai's mortality data using ANACONDA.

When asked about what interested her most about the Initiative, Tan remarked about the scale, range of interventions, different assessment and analysis tools available, and the numerous training materials developed. But what impressed her most was the idea of 'saving lives by counting deaths', which indicates that only by improving the death registration system, including improving completeness and recording the cause of death accurately, that planners and policy-makers can fully understand the major causes of death and their trends, and then take corresponding measures for targeted prevention, and ultimately achieve the goal of saving lives.

The aim of Tan's fellowship project was to assess the quality of mortality data from Shanghai, using the software tool ANACONDA (Analysis of Causes of National Deaths for Action).<sup>11</sup> This tool offers a structured, sequential framework to help countries identify the main problems and errors in their mortality data by comparing it to established epidemiological and demographic patterns (**Box 1**).

### Box 1: What is ANACONDA?

Built on a set of standard demographic and epidemiological concepts underlying mortality data quality, ANACONDA has been designed with a significant expansion on both the content and technology of ANACoD (Analysing mortality levels and Causes of Death), the Excel tool developed by the World Health Organization (WHO) with the 10 data quality assessment principles first published by the Health Information Systems Knowledge Hub at the University of Queensland.<sup>12</sup>

ANACONDA provides a logical evaluation framework consisting of 10 steps, which starts with a broad overview of the input data, applies some simple checks to the mortality data, followed by a detailed assessment of the quality of COD data, and finally computes an overall index of mortality data quality, the VSPI(Q). All the computational steps are automated and straightforward.

By regularly applying this stepwise assessment tool, and carefully interpreting the outputs, country governments can acquire a better understanding on how reliable the input data is from their routine CRVS systems, what the probable biases or errors are, how much progress can be identified, and where and what kind of interventions are most urgently needed to further strength their existing systems.

10 For more information on verbal autopsy, see: University of Melbourne. *Intervention: Automated verbal autopsy*. CRVS summaries. Melbourne, Australia; Bloomberg Philanthropies Data for Health Initiative, Civil Registration and Vital Statistics Improvement, the University of Melbourne: 2017.

11 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.

12 Abouzahr C, et al. Mortality statistics: a tool to enhance understanding and improve quality. *Pacific Health Dialog* 2012; 18(1):247-70.

The VSPI is a composite metric used to evaluate the performance of a CRVS system. It assesses six dimensions of the quality of mortality data.

Moreover, ANACONDA is able to compute an overall index of mortality data quality based on the vital statistics performance index (VSPI) proposed by Phillips et al,<sup>13</sup> where six dimensions were combined to evaluate the performance of CRVS system:

1. quality of age and sex reporting,
2. quality of cause of death reporting,
3. biologically plausible COD,
4. level of cause-specific detail available,
5. completeness of death reporting, and
6. data availability/timeliness.

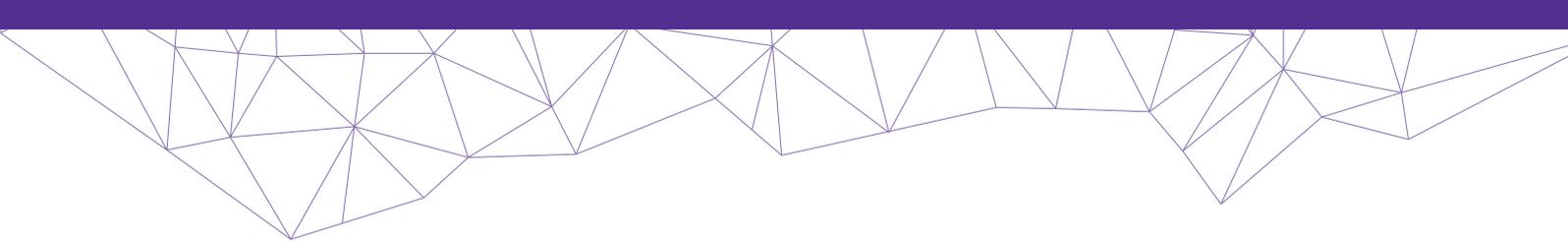
The adapted VSPI in ANACONDA, labelled as VSPI(Q), takes the first five dimensions into account and scores the country input data from 0 to 100 on each of these five dimensions. The VSPI(Q) is a continuous value ranging from 0 to 1 and can be classified into one of five categories depending on the calculated value:

- Very high (0.85-1.0).
- High (0.70-0.84).
- Medium (0.50-0.69).
- Low (0.25-0.49).
- Very low (<0.25).<sup>14</sup>

The individual component scores and relative contributions of the five quality dimensions to the overall gap in VSPI(Q) (compared with 100%) are presented in ANACONDA as well, to show the different importance of the dimensions in affecting the overall quality of mortality and cause of death input data. By applying ANACONDA to Shanghai mortality databases over time, a summary appraisal for system performance can be generated, which can be used to identify where progress has taken place, and where improvements are most needed.

<sup>13</sup> Phillips DE, Lozano R, Naghavi M, et al. A composite metric for assessing data on mortality and causes of death: the vital statistics performance index. *Population Health Metrics* 2014; 12:14.

<sup>14</sup> 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.



## Reflections: new skills

Results from Tan's analysis showed that Shanghai has very complete death registration and high-quality mortality statistics.

### *Completeness of registration*

While at the University of Melbourne Tan learnt about a new method to estimate the completeness of death registration, which is based off locally available data such as the crude death rate, under-five mortality rate, and population age structure.<sup>12</sup> She was able to apply this new method to the data to show that completeness has been very high since 2002, and over 99% since 2011.

### *Vital statistics performance index*

Tan also used ANACONDA to produce a VSPI(Q) score for Shanghai data from 2002 to 2016. Judging from the VSPI(Q) scores and its classifications, she concluded that the Shanghai CRVS system has indeed kept a high-level of performance for all these years. Moreover, over the past 15 years, the scores of overall VSPI(Q) and quality of cause of death reporting had both demonstrated a steady and continuous increase, with no deaths reported with missing age or sex, or a medically impossible cause of death.

## Reflections: take-home lessons

During the second week of her fellowship in Melbourne, Tan attended the Technical Advisory Group (TAG) meeting of BD4H Initiative. During the meeting, TAG members responsible for different countries shared their own experiences and challenges, and Tan learned first-hand that in many countries the death registration systems are imperfect with serious problems of under-reporting, and in some countries the data collected from their CRVS systems have never been analysed or used.

This made her more deeply aware that although the CRVS system in Shanghai is working well, there is still a lot that could be improved, especially in data utilisation. Tan later reflected that she realised with more specialised analytical skills, her team could make much better use of the data in CRVS system to provide more targeted recommendations for health policy development.

Overall, the most important thing Tan learned was how to apply ANACONDA to analyse and evaluate the quality of mortality data. When she returned to Shanghai, her plan was to share these new analytical skills with her colleagues to, 'allow everyone to progress together and help more people realise the importance of accurate and timely mortality data'.

<sup>15</sup> University of Melbourne. Summary: 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



## Related resources and products

### University of Melbourne, BD4H Initiative, CRVS Knowledge Gateway: Library

<https://crvsgateway.info/library>

*CRVS country overview: Shanghai, China. CRVS summaries.*

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

*Improving registration: best-practice guidelines. CRVS summaries.*

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

*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, BD4H 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, BD4H Initiative, CRVS Knowledge Gateway: Courses

<https://crvsgateway.info/courses>

Analysis of Causes of (National) Deaths for Action.

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:



## For more information contact:

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