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CRVS country reports

Brazil: Reflections on the first four years of the Bloomberg Philanthropies Data for Health Initiative

March 2021





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

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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.

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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

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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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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Brazil: Reflections on the first four years of the Bloomberg Philanthropies Data for Health Initiative

This report, which forms part of a series of papers documenting interventions led by the Bloomberg Philanthropies Data for Health Initiative at the University of Melbourne over a four year period from 2015 to 2019, presents the interventions implemented through the Initiative in Brazil to improve the quality and timeliness of data produced by the country's civil registration and vital statistics system. Other reports in this series and further resources on the Initiative's activities in Brazil can be found on the CRVS Knowledge Gateway <https://crvsgateway.info/>

Executive summary

Strengthening Brazil's CRVS system

Improving the quality of cause of death data – reducing garbage codes

Background

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Ensuring sustainability and facing challenges

Executive summary

Brazil's civil registration and vital statistics (CRVS) system is strong and well-functioning. However, continuous improvement of vital event registration and mortality data are required to ensure better health policy and resource allocation that will benefit the whole population. In acknowledgement of this, huge efforts to strengthen and improve Brazil's CRVS system have been made over the past four decades, resulting in very high completeness of birth and death registration (>95 per cent).^{1,2} While important achievements were made over this period, the overall quality of mortality data remained poor.³ This inadequacy, which resulted in a high percentage of ill-defined and unusable cause of death (COD) codes, was caused by several factors, including the high proportion of deaths occurring outside health facilities, geographic barriers to certifying causes of death in rural populations, and poor quality medical certification in some areas. In response to these issues, the Ministry of Health (MOH) undertook continuous monitoring of the country's COD data with data quality improvement a top priority.¹

Understanding the complex CRVS challenges Brazil faced, the Bloomberg Philanthropies Data for Health (D4H) Initiative worked alongside Brazil over a four year period ending in March 2019 to improve the quality of mortality statistics and COD coding accuracy.

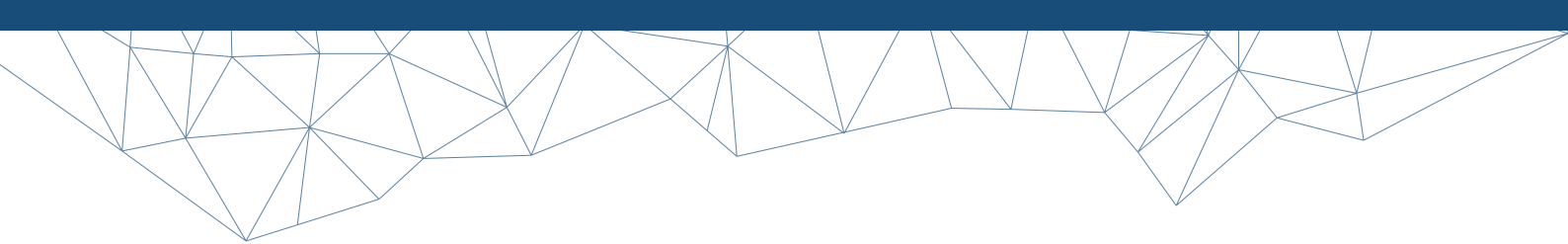
With the support of D4H, Brazil extended its existing investigation systems to help decrease the proportion of deaths assigned to ill-defined or unusable codes (also known as "garbage" codes), consequently improving the quality and representativeness of its vital statistics to inform policy and decision-making.⁴ These interventions resulted in changes to the classification of causes of death, which led to an 18 per cent reduction in garbage codes in the 60 prioritised cities involved in the Initiative in Brazil and the MOH developing a manual and protocol for the investigation of all hospital deaths.

¹ Ministry of Health. Brazil Ministry of Health: Bloomberg Data for Health Initiative Phase 1 Work Plan. Unpublished; 2016.

² de Lima R. *Fellowship profile: Investigating garbage codes to improve mortality statistics in Brazil*. CRVS country reports. Melbourne, Australia: Bloomberg Philanthropies Data for Health Initiative, Civil Registration and Vital Statistics Improvement, The University of Melbourne and Brazil Ministry of Health; 2018. <https://crvsgateway.info/file/9783/1855>

³ Ibid.

⁴ Ibid.



With technical assistance from D4H, Brazil was able to successfully implement new technologies such as automated verbal autopsy (VA), reducing the time to conduct interviews and gather information on the deceased.⁵ Efforts were also made to train doctors in correct medical certification of cause of death (MCCOD) by developing a free smart phone app to support doctors when assigning a COD and reduce potential errors.⁶ To complement these efforts a new automated mortality coding tool (Iris) was implemented, which saw over 70 senior coders trained, with testing carried out across the country.⁷ This introduction ensured that Brazil's coding would align with international standards. Furthermore, Brazil was one of the first countries to introduce the data quality assessment tool "ANACONDA" (ANALysis of Causes of National Deaths for Action) sub-nationally, thus increasing the capacity of data custodians in Brazil to critically analyse COD data and monitor the need for, and impact of, quality improvement efforts.⁸ ANACONDA can be utilised to monitor the quality of mortality data annually, allowing Brazil to continue identifying specific issues with their mortality data and intervene accordingly.⁹ With the support of the Initiative and work conducted through the CRVS Fellowship Program, the tool was translated into Portuguese in 2018.¹⁰

While Brazil's CRVS system was already functional at the outset, support from D4H and the deployment of innovative technologies allowed Brazil to gain the capacity and knowledge to largely eliminate residual inconsistencies and errors in its mortality statistics, resulting in a mortality data system comparable to that of the most advanced countries.

Strengthening Brazil's CRVS system

"We conducted a study about 14 years ago that identified that the main causes for under-registration [of deaths] were poverty, excluded people, and the distance between those people and the health system, and also the registries themselves. Since then, there was great improvement, with the social inclusion programme, the expanding of the capacity of the registries and also the health services. But there are still areas that we need to tackle."

– Dr Antonio Tadeu Ribeiro de Oliveira, Researcher, Brazil Civil Registration Steering Committee and the Statistics Office

The CRVS system within Brazil is highly functional, with the MOH prioritising improved data completeness and quality. An international study conducted in 2015 (based on data from 1980 to 2012) concluded that Brazil's Vital Statistics Performance Index (VSPI) was "high", a score which typically indicates a high completeness of death registration but less timely mortality data, and an increased frequency of ill-defined and unspecified causes of death.¹¹ In practical terms this meant that Brazil produced good quality, but not excellent, vital statistics.

At the beginning of the Initiative, the University of Melbourne (UoM) conducted a baseline evaluation to identify the key successes Brazil had accomplished in improving its CRVS system and to identify any ongoing challenges (see **Box 1**). From this evaluation, with cooperation from country stakeholders, a work plan was created that focused on interventions to build on Brazil's strengths and generate the evidence needed to improve the efficiency and accuracy of the already well-functioning system.¹² The work plan aimed to ensure that by increasing the accuracy of mortality data every person in Brazil would be accounted for.

To address the accuracy of mortality data, Brazil's MOH prioritised the reduction of garbage codes, initially focusing on codes related to causes of death with the highest potential to impact policy and allocation of resource.¹³ Mortality statistics from reliable COD data form a major resource for effective health planning, and thus, reducing the number of deaths assigned to garbage codes has been a top priority for Brazil.

5 The University of Melbourne. Brazil Endline Narrative Report. Melbourne, Australia: Bloomberg Philanthropies Data for Health Initiative, Civil Registration and Vital Statistics Improvement, The University of Melbourne. Unpublished; 2019.

6 Ibid.

7 Ibid.

8 Ibid.

9 The University of Melbourne. Topic 6 – CRVS tools: ANACONDA Mortality Data Quality Assessment Tool. CRVS Knowledge Gateway: Learning Centre. Available at: <https://crvsgateway.info/ANACONDA-Mortality-Data-Quality-Assessment-Tool-686>

10 Medeiros de Souza AC. *Fellowship profile: Customising ANACONDA and strengthening the quality of mortality data in Brazil*. CRVS country perspectives. Melbourne, Australia: Bloomberg Philanthropies Data for Health Initiative, Civil Registration and Vital Statistics Improvement, The University of Melbourne; 2019. Available at: <https://crvsgateway.info/file/9779/2667>

11 Mikkelsen L, Phillips DE, Abouzahr C, et al. *A global assessment of civil registration and vital statistics systems: monitoring data quality and progress*. The Lancet. 2015; 386(10001): 1395-1406. Available at: [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(15\)60171-4/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(15)60171-4/fulltext)

12 The University of Melbourne. *Brazil CRVS Country Overview*. Melbourne, Australia: Bloomberg Philanthropies Data for Health Initiative, Civil Registration and Vital Statistics Improvement, The University of Melbourne; 2015. Available at: <https://crvsgateway.info/file/5155/135>

13 Ministry of Health. Brazil Ministry of Health: Bloomberg Data for Health Initiative Phase 1 Work Plan. Unpublished; 2016.

“I believe our work is showing results, we already have results today. We will only be satisfied when we achieve a level of information similar to many developed countries, such as Australia, or some Scandinavian countries, or even countries in Latin America, such as Chile or Cuba, which have an outstanding level of information.”

– Fatima Marinho, Ministry of Health of Brazil

Box 1: Baseline status of CRVS in Brazil

At the beginning of the Bloomberg Philanthropies Data for Health (D4H) Initiative, partner cities and countries were involved in completing a baseline evaluation. The baseline evaluation framework is a best-practice technical tool used to comparatively measure and track the impact of CRVS technical interventions.¹⁴ The tool works by providing a comprehensive scientific assessment of the CRVS system at baseline, to help countries identify the most efficient and cost-effective areas for CRVS technical intervention.¹⁵

The baseline evaluation for Brazil’s CRVS system was conducted in late 2015, with material for the report primarily drawn from a baseline evaluation visit, as well as a desk review of other documents.¹⁶ While Brazil was found to have a very well-functioning system, with the MOH committed to improving their data quality and completeness, remaining challenges included:

- Notable inter-regional differences in the quality of cause of death (COD) data and completeness levels, both of which were lower in the remote North and Northeast of Brazil where births and deaths are less likely to occur within health facilities. Completeness in these areas was found to be around 90 per cent, significantly lower than the national completeness average of births and deaths, 99 per cent and 98 per cent respectively.¹⁷
- A high proportion of deaths with ill-defined or garbage codes used to classify the COD. The evaluation found that approximately 33 per cent of Brazil’s causes of death were garbage coded, with ill-defined causes accounting for around seven per cent.¹⁸

The baseline evaluation also illustrated the efforts Brazil had made to improve the quality and completeness of birth and death data, including incorporating active searches for vital events into routine duties, mortality surveillance, and the use of verbal autopsy.¹⁹ The need for additional work to help reduce the proportion of garbage codes and increase completeness in areas with low birth and death registration was, however, made apparent.²⁰

Improving the quality of cause of death data – reducing garbage codes

Background

All deaths in Brazil are required to have a MCCOD assigned by a physician, using the World Health Organisation’s (WHO) international form of medical certificate of cause of death, to be coded according to the International Classification of Diseases and Related Health Problems – Version 10 (ICD-10).²¹ Despite this, Brazil’s proportion of deaths assigned to ill-defined causes and garbage codes (see **Box 2**) remained high, collectively representing 33 per cent of all deaths in 2013.²² As garbage codes have no use in informing public health policy due to the underlying cause of death (UCOD) being too vague, the true pattern of mortality in the country was likely biased.

14 The University of Melbourne. *A framework for evaluating national CRVS systems at baseline*. CRVS technical outcome series. Melbourne, Australia: Bloomberg Philanthropies Data for Health Initiative, Civil Registration and Vital Statistics Improvement, The University of Melbourne; 2018. Available at: <https://crvsgateway.info/file/10319/277>

15 Ibid.

16 The University of Melbourne. *Brazil CRVS Country Overview*. Melbourne, Australia: Bloomberg Philanthropies Data for Health Initiative, Civil Registration and Vital Statistics Improvement, The University of Melbourne; 2015. Available at: <https://crvsgateway.info/file/5155/135>

17 Ibid.

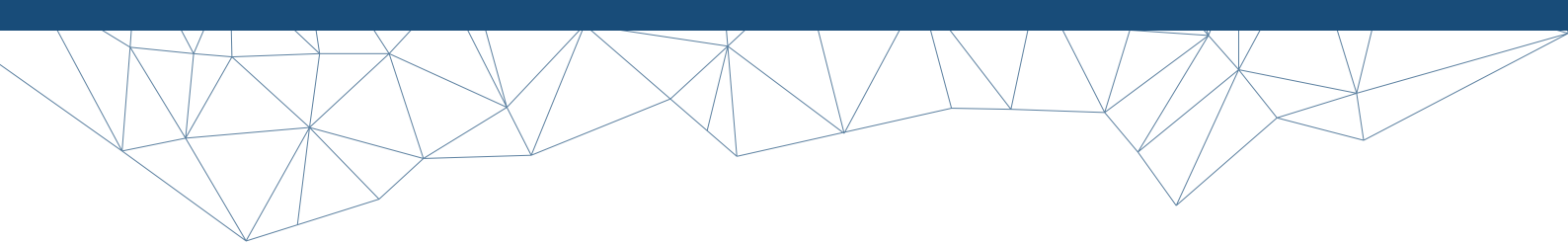
18 Naghavi M, Wang H, Lozano R, et al. Global, regional, and national age-sex specific all-cause and cause-specific mortality for 240 causes of death, 1990-2013: a systematic analysis for the Global Burden of Disease Study 2013. *The Lancet*. 2015; 385(9963): 117-171.

19 The University of Melbourne. *Brazil Endline Narrative Report*. Melbourne, Australia: Bloomberg Philanthropies Data for Health Initiative, Civil Registration and Vital Statistics Improvement, The University of Melbourne. Unpublished; 2019.

20 The University of Melbourne. *Brazil CRVS Country Overview*. Melbourne, Australia: Bloomberg Philanthropies Data for Health Initiative, Civil Registration and Vital Statistics Improvement, The University of Melbourne; 2015. Available at: <https://crvsgateway.info/file/5155/135>

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

22 The University of Washington. *GBD 2013: Global Burden of Diseases, Injuries, and Risk Factors*. Seattle, Washington: Institute for Health Metrics and Evaluation; 2013.



Several factors were found to be causing deficiencies in the quality of Brazil’s mortality data, notably the quarter of deaths occurring outside of health facilities (where it is difficult to ascertain the most probable UCOD), and geographic barriers preventing medical certification in rural populations without access to physicians.²³ Fatima Marinho from the MOH addressed the disparities in data across Brazil:

“There are richer states, richer cities, cities with good data, and they need to be in solidarity with those that have less, those where data is not good. They are usually the poor ones as well, those with problems, with less people.”

Brazil’s MOH continuously monitors COD data, and prior to the D4H intervention, employed a number of strategies to improve data quality.²⁴ Coding of death certificates was undertaken both manually and using an automated coding system designed specifically for use in Brazil (Mortality Medical Data System; MMDS), and where the two methods yielded different causes of death, a specialist committee was tasked to determine the most appropriate UCOD.²⁵

Box 2: What are garbage codes?

The use of ill-defined and unusable (often referred to as “garbage”) codes to classify causes of death can threaten the utility of mortality data. Garbage codes include any code that:²⁶

- Cannot, or should not, represent an underlying cause of death – for example, septicaemia, senility, or headache
- Represents a symptom or condition that belongs in some other part of the sequence of events leading to death
- Insufficiently specifies a cause of death.

Strengthening the investigation system to reduce garbage codes and improve data quality

With support from the D4H Initiative, the MOH is now strengthening the existing investigation system for COD determination by including an investigation into deaths initially assigned to garbage codes.²⁷ The intervention focused on garbage codes related to diseases with the most significant potential to impact policy and allocation of resources – for example, unspecified diabetes, unspecified stroke, and unspecified injuries (primarily linked to road safety).²⁸ Deaths assigned an ill-defined cause were investigated by the MOH using a combination of established methods including autopsy, medical records reviews, and physician-certified verbal autopsy (PCVA) to re-assign the COD.^{29,30} With more in-depth investigation practices and improved physician training in MCCOD, Brazil has the potential to reduce the number of garbage codes dramatically and better understand the health status of the population.

Before national rollout, it was crucial to build an evidence base that demonstrated the importance of investigating ill-defined and garbage codes, allowing the key stakeholders to understand the intervention’s value and how the practices can be adapted for successful implementation. Thus, a pilot study was conducted in 2016 in seven cities across all five regions of Brazil (Paraná state, Belo Horizonte, Caicó, Mossoró and Goiânia), to investigate and reclassify garbage codes, build capacity, identify the intervention’s strengths and weaknesses, and generate a plan for national rollout.³¹ D4H-supported workshops were also conducted throughout the pilot phase, with 324 physicians trained in MCCOD and the importance of usable ICD codes for public health policy.³² By March 2017, approximately 2200 deaths were investigated with close to 93 per cent having their COD reclassified to a usable ICD-10 code.³³ This provided a scientifically sound evidence-base to inform the MOH’s decision to scale-up the activities.

23 Ministry of Health. Brazil Ministry of Health: Bloomberg Data for Health Initiative Phase 1 Work Plan. Unpublished; 2016.

24 Ibid.

25 Ibid.

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

27 Ministry of Health. Brazil Ministry of Health: Bloomberg Data for Health Initiative Phase 1 Work Plan. Unpublished; 2016.

28 Ibid.

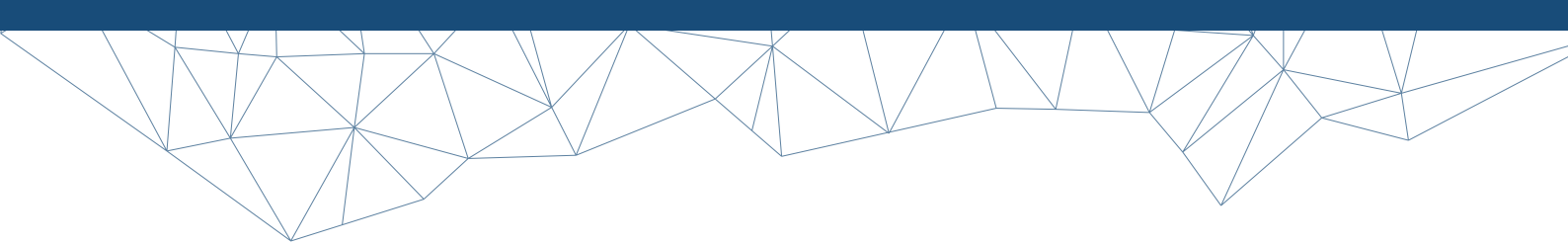
29 Ibid.

30 The University of Melbourne. *Brazil CRVS Country Overview*. Melbourne, Australia: Bloomberg Philanthropies Data for Health Initiative, Civil Registration and Vital Statistics Improvement, The University of Melbourne; 2015. <https://crvsgateway.info/file/5155/135>

31 Ministry of Health. Brazil Ministry of Health: Bloomberg Data for Health Initiative Phase 1 Work Plan. Unpublished; 2016.

32 Ministry of Health. Brazil Ministry of Health: Bloomberg Data for Health Initiative Phase 2 Work Plan. Unpublished; 2017.

33 Ibid.



By conducting a pilot study at the start of the D4H intervention in Brazil, the country had a clearer idea of the strengths and challenges of their COD data. Raquel Barbosa de Lima, MOH, Department of Health Situation Analysis, addressed the importance of the pilot study for the investigation of garbage codes:

“With this pilot study what we were able to learn and confirm was when we start to develop a project – that needs to be introduced in the country as a whole – we need to perform a pilot study to identify which are the main strengths within our results and which points we can move on and leave for another step.”

To examine this pilot study in more detail, Ms Barbosa de Lima took part in the D4H capacity building CRVS Fellowship Program (**Box 3**) at UoM, arriving in Melbourne in 2018 to receive support in analysing data from the pilot study.³⁴ Her work during the Fellowship generated key conclusions from the garbage code investigations and confirmed the importance of conducting pilot studies prior to rolling out interventions at the national level.³⁵ Ms de Lima also highlighted the significance of local actors and community involvement when conducting investigations, enabling the community to develop a comprehensive understanding of the investigation process, as activities implemented as part of pilot studies may become routine in the future.³⁶ These reflections were taken back to the MOH, aiding future implementation of garbage code investigations, while also highlighting the importance of data quality improvement strategies and how these can be implemented successfully.

Raquel emphasised the importance of the project for Brazil, stating:

“...this [D4H] support is very important for us, because it's not enough to collect the data. We need to know how to analyse them. We can [now] make a better assessment of the results to be able to present them and also to think from these results how to create strategies for interventions and introduction of this project in Brazil.”

Box 3: The University of Melbourne CRVS Fellowship Program

As part of the Bloomberg Philanthropies Data for Health (D4H) Initiative, the University of Melbourne conducts a CRVS Fellowship Program to build individual and institutional technical capacity, working towards improving the quality, policy utility, and sustainability of CRVS systems within low-to-middle income countries.

Nationals from D4H countries complete a six-week study of a CRVS area of importance to their respective regions under the guidance of University of Melbourne experts, as well as establishing relationships and networks within the global CRVS community. Program participants are employed in various organisations, including government and research institutions.

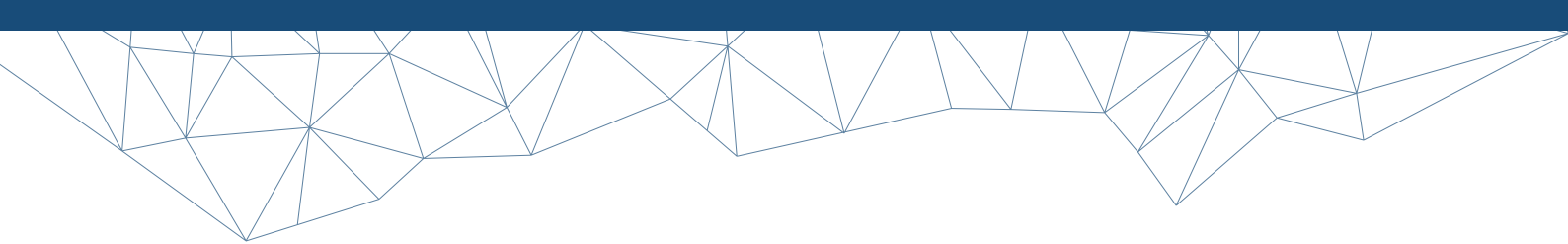
By the end of 2016, all 26 states plus the federal district and approximately 60 municipalities, which collectively accounted for 50 per cent of all deaths in Brazil, agreed to adopt the garbage code investigation system – additional cities are requesting to join this endeavour and will be added on an annual basis.³⁷ An investigation of garbage codes examined more than 80 000 deaths to which a garbage code had been allocated as the UCOD. Changes in the classification of causes of death resulted in an 18 per cent improvement in 60 prioritised cities. The garbage code investigation has now been institutionalised by the MOH through the development of a manual and protocol for the investigation of hospital deaths. Reinforcing the results of this investigation, face-to-face MCCOD training for physicians continued throughout the intervention, resulting in the training of over 2600 physicians across the 60 cities.

³⁴ de Lima R. *Fellowship profile: Investigating garbage codes to improve mortality statistics in Brazil*. CRVS country reports. Melbourne, Australia: Bloomberg Philanthropies Data for Health Initiative, Civil Registration and Vital Statistics Improvement, The University of Melbourne and Brazil Ministry of Health; 2018. <https://crvsgateway.info/file/9783/1855>

³⁵ Ibid.

³⁶ Ibid.

³⁷ Ministry of Health. Brazil Ministry of Health: Bloomberg Data for Health Initiative Phase 2 Work Plan. Unpublished; 2017.



Application of CRVS tools

As discussed previously, while Brazil’s CRVS system was well-functioning, significant disparities existed between regions. To address these disparities, D4H worked closely with committed stakeholders to provide interventions and tools to enable Brazil to move closer towards a highly robust system capable of being model example for South America. Innovative tools were introduced to work alongside existing practices, providing additional knowledge and techniques appropriate for Brazil and helping build country capacity to assess the quality of COD data in line with international standards.^{38,39}

The following supporting tools have been implemented with the intention of elevating Brazil to a best practice CRVS system with a ‘very high’ VSPI score, helping to ensure sustainable best-practice and access to necessary health resources by the whole population.

SmartVA

Brazil’s existing PCVA system, implemented as part of an overall monitoring and investigation system intended to reduce the occurrence of garbage codes, used the WHO long-form VA questionnaire to capture information on deaths with each interview taking around 50 minutes to complete.⁴⁰ As part of the D4H intervention, a shorter VA questionnaire was introduced (SmartVA; see **Box 4**), resulting in time and labour savings as well as increased efficiency of the VA process. A validation study was initially conducted in two sites, São Paulo and Recife, to determine whether SmartVA was the best questionnaire to use moving forward. Based on the preliminary results of the study, the MOH elected to switch to SmartVA, reducing individual interviews to only 25 minutes.⁴¹ In addition to improvements in the overall efficiency of the VA process, the transition will permit the MOH to investigate more community deaths, thus improving the overall quality of COD data in Brazil.

Box 4. What is SmartVA?

SmartVA, or automated verbal autopsy (VA), involves the use of a handheld device to collect 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).^{42,43} For routine VA implementation in the context of CRVS systems, paper-based approaches are not recommended due to the additional time required and the risk of errors being introduced during transmission to an electronic format.⁴⁴

SmartVA has three basic elements:^{45,46}

1. A questionnaire to collect information from the family of the deceased about signs and symptoms preceding death, coupled with electronic data collection and management software.
2. An automated diagnostic algorithm to generate the most probable COD based on responses to the questionnaire.
3. A target COD list, which includes all causes that can be diagnosed with reasonable accuracy.

ANACONDA

ANACONDA software assists those using it to critically assess the quality of available mortality data (see **Box 5**). By integrating this software into Brazil’s data production and analysis process, evaluation and interpretation of the data will be possible, enabling confident use of the results to plan targeted interventions to improve the population’s health status.

38 Ministry of Health. Brazil Ministry of Health: Bloomberg Data for Health Initiative Phase 1 Work Plan. Unpublished; 2016.

39 Ministry of Health. Brazil Ministry of Health: Bloomberg Data for Health Initiative Phase 2 Work Plan. Unpublished; 2017

40 Ministry of Health. Brazil Ministry of Health: Bloomberg Data for Health Initiative Phase 1 Work Plan. Unpublished; 2016.

41 Ministry of Health. Brazil Ministry of Health: Bloomberg Data for Health Initiative Phase 2 Work Plan. Unpublished; 2017.

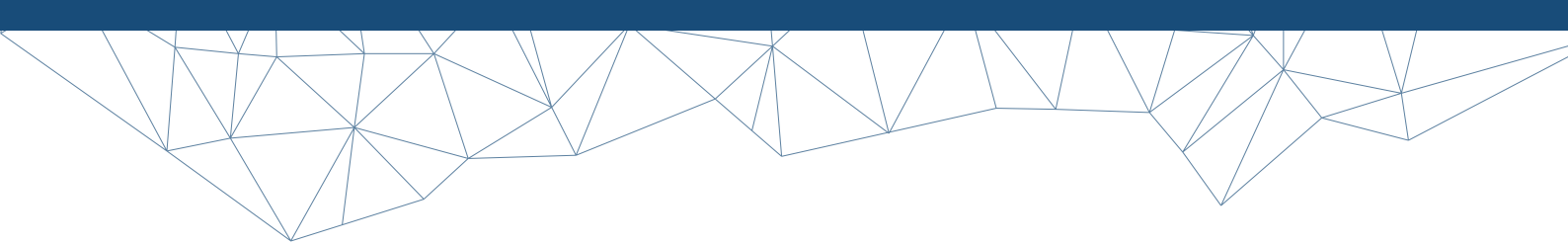
42 de Savigny D, Riley I, Chandramohan D, et al. Integrating community-based verbal autopsy into civil registration and vital statistics (CRVS): system-level considerations. *Global Health Action*. 2017; 10(1): 1272882. Available at: <https://www.tandfonline.com/doi/full/10.1080/16549716.2017.1272882>

43 The University of Melbourne. Topic 6 – CRVS tools: ANACONDA Mortality Data Quality Assessment Tool. CRVS Knowledge Gateway: Learning Centre. Available at: <https://crvsgateway.info/ANACONDA-Mortality-Data-Quality-Assessment-Tool-686>

44 The University of Melbourne. Topic 4 – Cause of death in CRVS: Automated verbal autopsy. CRVS Knowledge Gateway: Learning Centre. Available at: <https://crvsgateway.info/Automated-VA-557>

45 Ibid.

46 Ibid.



“This tool [ANACONDA] assists the improvement of quality of mortality information in Brazil – especially cause of death and helps to identify the codes that we could improve to assist better health policies and actions which would have a real impact on the population’s health.”

– Ana Cláudia Medeiros de Souza, ANACONDA trainer and statistician, Brazil MOH

Box 5. What is ANACONDA?

ANACONDA is an electronic tool that checks for potential errors and inconsistencies in mortality and COD data to assesses data accuracy and completeness. Use of ANACONDA helps to build analytic capacity in the core epidemiological and demographic concepts that underlie mortality data.⁴⁷ Requiring only the age and sex structure of the source population and the ICD-10 codes by sex and standard age groups, it then applies over 23 tests to the data, conducting all the calculations needed for a comprehensive data quality review and automatically generating the associated figures and tables from which a report can be written.⁴⁸

ANACONDA is structured logically and all the computational steps are automated – it is particularly useful for individuals and organisations responsible for the production of routine mortality data, as it allows them to regularly monitor the quality of their datasets over time and between sub-national levels.

ANACONDA has been designed with a significant expansion on both the content and technology of ANACoD (ANALysing mortality levels and Causes of Death); an Excel tool developed by the WHO in partnership with the Health Information Systems Knowledge Hub at the University of Queensland.⁴⁹

ANACONDA allows Brazil to monitor and identify the most frequently misused COD codes, allowing the country to implement appropriate strategies to improve COD data according to country needs and resources. Launch of the Portuguese version of ANACONDA took place at the National Meeting on the improvement of COD information in Brazil in 2018.⁵⁰ The meeting covered the many efforts of the Brazilians to improve COD information. Ana Cláudia Medeiros de Souza completed the translation of the tool and supporting materials as part of the aforementioned capacity building CRVS Fellowship Program at UoM.

“Brazil is a very large country, it is very diverse, and we had, at this workshop, all the states here, and this is very important, because the states are the ones that are actually going to act to improve the quality of this data.”

– Ana Cláudia Medeiros de Souza, ANACONDA trainer and statistician, Brazil MOH

Medical certification of cause of death smartphone app

A smartphone app to assist physicians in establishing a COD was identified as a cost-effective tool with significant potential to impact the quality of physician-certified causes of death in Brazil.² In 2016 the app, a relatively inexpensive tool to develop, was piloted with 40 physicians, with feedback from the testing addressed by developers in early 2017. Following the initial pilot, further testing was conducted with 80 physicians from two major hospitals in Belo Horizonte, with the app finalised in May 2017. MOH and IT consultants oversaw the entire development of the app, with a focus on ensuring it would be inexpensive to maintain, free of charge for users, and available on both Android and Apple devices. The second version of the app was finalised and formally launched by the MOH in October 2018, with over 27 000 downloads by March 2019.⁵¹

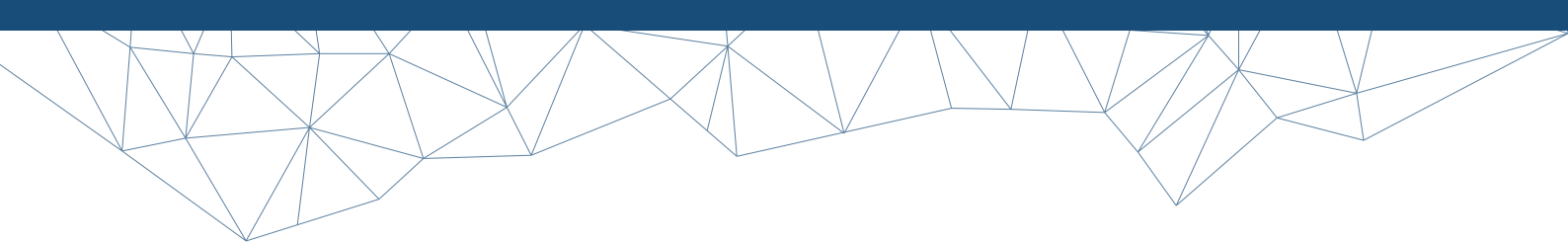
47 The University of Melbourne. Topic 6 – CRVS tools: ANACONDA Mortality Data Quality Assessment Tool. CRVS Knowledge Gateway: Learning Centre. Available at: <https://crvsgateway.info/ANACONDA-Mortality-Data-Quality-Assessment-Tool-686>

48 Ibid.

49 Ibid.

50 Medeiros de Souza AC. *Fellowship profile: Customising ANACONDA and strengthening the quality of mortality data in Brazil*. CRVS country reports. Melbourne, Australia: Bloomberg Philanthropies Data for Health Initiative, Civil Registration and Vital Statistics Improvement, The University of Melbourne; 2019. <https://crvsgateway.info/file/9779/2667>

51 The University of Melbourne. Brazil Endline Narrative Report. Melbourne, Australia: Bloomberg Philanthropies Data for Health Initiative, Civil Registration and Vital Statistics Improvement, The University of Melbourne. Unpublished; 2019.



Iris – automated mortality coding

Prior to the D4H intervention, Brazil used a nationally developed mortality coding software based on the MMDS that was introduced into the mortality coding system in 2006. As part of the Initiative, Iris, an automated coding software based on principles of the ICD-10, was introduced (see **Box 6**).

Box 6. What is Iris?

Iris is an automated, interactive mortality coding system, which codes multiple causes of death and selects an underlying cause of death for statistical tabulation. The system is based on the International Form of Medical Certificate of Cause of Death recommended by the WHO, and causes of death are coded according to ICD-10 and the mortality classification rules of the WHO. Iris has two primary purposes:⁵²

1. To provide a system where the language-dependent aspects are separated from the software and stored in database tables and can be easily modified for national purposes.
2. To improve international comparability of mortality data.

In March 2017, regional Iris training was held for over 70 senior coders and mortality information system coordinators from each state, with participants from Colombia and Peru also attending. Field testing of the software continued throughout the country, resulting in the training of an additional 100 coders and the Iris dictionary being finalised and approved by the MOH.⁵³

The introduction of Iris not only ensures that Brazil now complies with international recommendations for coding software, but it also greatly simplifies the country's mortality coding process.⁵⁴ In addition, its introduction eliminates the need to develop and undertake annual updates of the previously used, Brazil-specific automated coding software (MMDS), as the Iris Institute provides regular updates.

Ensuring sustainability and facing challenges

Government support and high-level stakeholder involvement are crucial to ensuring that the CRVS interventions and training introduced by D4H are maintained. In Brazil, consistent stakeholder support has also underpinned the CRVS system improvements developed under the Initiative.

The focus of all the D4H work in Brazil has been to ensure the sustainability of the technical interventions. For example, planned improvements to the quality of mortality data resulted in UoM training a cadre of more than 2600 physicians in accurate death certification, with the improved certification skills of participating physicians enhanced by the institutionalisation of MOH protocols to reduce garbage coding.

From the beginning of D4H in Brazil, emphasis was placed on the importance of involvement at both the national and subnational levels to create a sustainable system equipped to capture the whole population. This collaboration and the implementation of innovative tools and processes will provide the impetus needed to ensure that Brazil can be a model for other Latin American countries.

SmartVA has been mandated by the MOH as best practice for improving the diagnostic accuracy of deaths which occur outside of health facilities. This innovation, together with the routine use of the ANACONDA software to continuously monitor the quality of mortality data, has now enabled Brazil to regularly assess and monitor data quality. With the implementation of interventions occurring in municipalities across Brazil, awareness and competence has been generated at both the national and local levels to support data improvement and analysis efforts. This strategy has helped build greater awareness throughout all tiers of the country's CRVS system of the policy value of reliable data for both national and sub-national planning, resulting in a stronger and more responsive system better equipped to meet and anticipate the health needs of the population.

⁵² The University of Melbourne. Topic 6 – CRVS tools: Iris ICD coding tool. CRVS Knowledge Gateway: Learning Centre. Available at: <https://crvsgateway.info/Iris-ICD-coding-tool-397>

⁵³ The University of Melbourne. Brazil Endline Narrative Report. Melbourne, Australia: Bloomberg Philanthropies Data for Health Initiative, Civil Registration and Vital Statistics Improvement, The University of Melbourne. Unpublished; 2019.

⁵⁴ The University of Melbourne. Topic 6 – CRVS tools: Iris ICD coding tool. CRVS Knowledge Gateway: Learning Centre. Available at: <https://crvsgateway.info/Iris-ICD-coding-tool-397>

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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