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CRVS Fellowship report

An analysis of cause of death data from Papua New Guinea

November 2018

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Acronyms and abbreviations

PNG	Papua New Guinea
WHO	World Health Organization
CRVS	civil registration and vital statistics
NDoH	National Department of Health
HIV	human immunodeficiency virus
AIDS	acquired immunodeficiency virus
DHIS	Death and Discharges Health Information System
NHIS	National Health Information System
DHO	district health office
ICD-10	International Classification of Diseases and Related Health Problems, 10th Revision
PHIO	provincial health information officer
D4H	Data for Health
UCOD	underlying cause of death

Key terms

Cause of death refers to 'all those diseases, morbid conditions or injuries which either resulted in or contributed to death and the circumstance of the accident or violence which produced any such injuries' (Twentieth World Health Assembly, 1967).

Clinical record: physician's contribution to the medical record, focussed on clinical diagnoses, signs and symptoms.

Medical record: contains all the information about a patient generated as part of a hospital admission and stay.

Underlying cause of death is 'the disease or injury which initiated the train of morbid events leading directly to death, or the circumstances of the accident or violence which produced the fatal injury' (World Health Organization, 1994).

Fellowship report: An analysis of cause of death data from Papua New Guinea

Between October and December 2017, Ila Rouka and Elizabeth Mathias from the National Department of Health, Papua New Guinea (PNG), came to the University of Melbourne to analyse medical certificates of cause of death. As well as investigating the patterns and trends in mortality for the country between 2016 and 2017, the fellows were interested in assessing the quality of the certificates themselves. This *CRVS fellowship report* outlines key findings from their work, including a brief overview of deaths analysed by age group and sex; as well as pressing issues identified from the quality review in terms of incorrect medical certification practices and procedures.

Background

- **Medical certification of cause of death**
- **The CRVS system in PNG**
- **CRVS system-strengthening activities**

Fellowship project

- **Part 1: Mortality patterns and trends**
- **Part 2: Quality assessment**

Discussion

- **Recommendations**

Related resources and readings

Background

Medical certification of cause of death

The accuracy and completeness of medical death certificates have important legal and medical implications.

Population-level mortality data are derived from accurate and reliable cause of death information. This information is used by countries to plan and monitor the health of their populations, study disease distribution and emerging or neglected health problems, and address health inequities.[1] Patterns in the occurrence and distribution of mortality guide preventive and curative health care programs.[2] Medical certificates of cause of death (hereafter referred to as 'medical death certificates') are important sources of such data, as they report on the characteristics of the deceased and the causes of death. Additionally, the accuracy and completeness of a medical death certificate has legal and medical implications from clinical and public health perspectives.[3]

1 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; 2018.

2 Elvira B. Audit of death certificates. Port Moresby, Papua New Guinea: National Department of Health; 1995.

3 University of Melbourne. Reducing barriers to the accurate medical certification of cause of death. CRVS development series. Melbourne, Australia: Bloomberg Philanthropies Data for Health Initiative, Civil Registration and Vital Statistics Improvement, University of Melbourne; 2018.

The information on a medical death certificate should be reported in an internationally standardised format specified by World Health Organization (WHO) which has two parts (**Figure 1**). Part I of the certificate is used for diseases related to the sequence of events leading directly to death, and Part II is used for unrelated conditions which have no direct connection with the events leading to death but which, by their nature, contributed to death.

Figure 1 International Form of Medical Certificate of Cause of Death, Frame A, WHO 2016

***Frame A*: Medical data: Part 1 and 2**				
1 Report disease or condition directly leading to death on line a Report chain of events in due to order (if applicable) State the underlying cause on the lowest used line			**Cause of death**	**Time interval from onset to death**
		a		
		b	Due to:	
		c	Due to:	
		d	Due to:	
2 Other significant conditions contributing to death (time intervals can be included in brackets after the condition)				

Source: World Health Organization. International Classification of Diseases and Related Health Problems, 10th Revision. 5th edition. Geneva, Switzerland: WHO; 2016.

The majority of deaths in PNG occur in the community, which makes accurate medical certification challenging.

Most deaths (85–90%) in Papua New Guinea occur outside of health facilities, making the identification of cause-specific mortality challenging. Additionally, physicians are not routinely trained in the medical certification of cause of death (**Box 1**), which negatively affects the quality and accuracy of information from hospital deaths. Although the international form of the medical certificate of cause of death has been introduced into all hospitals in PNG, medical certification is not compulsory, and is not widely practiced unless requested by the family of the decedent.

Box 1: What is medical certification of cause of death?

Worldwide, death certification is routinely conducted by trained medical physicians, supported by national policy and legal frameworks. The physician is often thus tasked – in the ordinary course of performing their professional duties – with recording the underlying cause of death on a certificate that is aligned with the WHO International Form of Medical Certificate of Cause of Death (often referred to as the 'medical death certificate').

To correctly fill in the medical certificate, the physician must identify the disease directly causing the death, and then trace the sequence of events back to the underlying cause of death. The physician must also enter other diseases or conditions contributing to the death in the death certificate form. However, very few physicians have received certification training.[4]

4 University of Melbourne. *Reducing barriers to the accurate medical certification of cause of death*. CRVS development series. Melbourne, Australia: Bloomberg Philanthropies Data for Health Initiative, Civil Registration and Vital Statistics Improvement, University of Melbourne; 2018.

The Rapid Assessment conducted in 2014 found that most vital statistics for the country are being generated through surveys.

The civil registration and vital statistics system in Papua New Guinea

A 2014 Rapid Assessment of the civil registration and vital statistics (CRVS) system reported that coverage of the registration of both births and deaths was less than five percent. Collection of cause of death data was very limited. Vital statistics data were primarily based on those provided by Demographic and Health Surveys and ten-yearly censuses. The PNG CRVS system required substantial improvements in all areas. It was rated as being dysfunctional (overall score of 17% across eleven key areas) in the 2014 Assessment.[5]

The principal government stakeholders in the CRVS system of Papua New Guinea are the Ministry of National Planning & Monitoring, which oversees the Civil and Identity Registry Office and the National Statistics Office; the Ministry of Health and HIV/AIDS, which oversees the National Department of Health (NDoH), the Performance Monitoring and Evaluation Branch (PMRB), the Papua New Guinea Institute of Medical Research, and the AIDS Council; and the Ministry of Provincial and Local Level Government Affairs (DPLGA).

There are two major databases collecting data on deaths in PNG: the DHIS and NHIS.

PMRB is the custodian of the two major data bases: the DHIS (Deaths and Discharges Health Information System) and the NHIS (National Health Information System). The DHIS is the older of the two systems. It aims to collect deaths and discharge data from all health facilities in PNG. Although DHIS mortality data are not available on an on-going basis, the database holds details of tens of thousands of deaths in the decade leading to 2011. This is an invaluable resource providing detailed information about the distribution of mortality by age at death, by sex, and by province.

The NHIS is the vehicle for the monitoring and evaluation of the National Health Plan. It has been operating since 1987, and collects information from all health centres, urban health centres, and hospitals monthly. The NHIS mainly collects information on service delivery for disease programs including malaria, tuberculosis, reproductive health, nutrition, immunization services, and the availability of essential drugs and supplies. Acknowledged weaknesses include hospital reporting not being fully integrated into the main NHIS and a "less than adequate vital-registration (VR) system".[6] The NHIS provides mortality data by sex for 26 causes/cause groups selected on the basis that they are of immediate programmatic interest and/or require medical supplies. For example, data are collected about snakebites, but not for other accidents and injuries. Further, the system collects limited mortality data in broad age groups for pneumonia, diarrhoea, malaria, meningitis, and HIV/AIDS only.

It is estimated that only one to two per cent of all deaths are medically certified in PNG.

It has been estimated that 38 per cent of births are captured within the NHIS but few of these are registered except in the Port Moresby General Hospital where it is possible to register on-site. Approximately 20 per cent of all deaths are captured within the NHIS but are not registered; only seven per cent of these deaths were medically certified (1-2 per cent of all deaths).[7] Deaths can only be registered if this is done within 14 days of death and the application is accompanied by a death certificate.[8]

5 Papua New Guinea Ministry of Health and HIV/AIDS, Ministry of National Planning and Monitoring. *Bloomberg Philanthropies Data for Health Initiative Workplan*. Unpublished; 2018.

6 Papua New Guinea Ministry of Health and HIV/AIDS, Ministry of National Planning and Monitoring. *Monitoring and Evaluation Strategic Plan of the National Health Plan (2011-2020).* Final Document. Port Moresby, Papua New Guinea: Government of PNG; 2012.

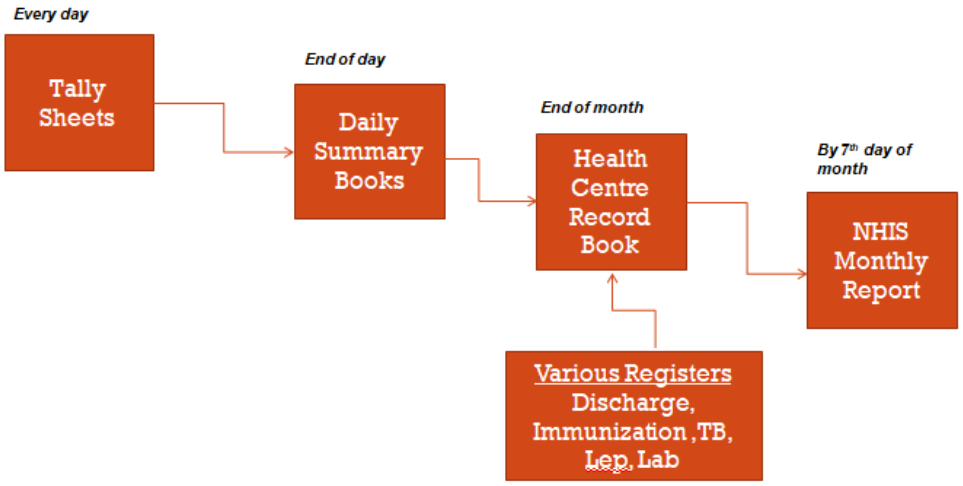
7 Unpublished thesis dissertation; 2018.

8 Papua New Guinea Ministry of Health and HIV/AIDS, Ministry of National Planning and Monitoring. *Bloomberg Philanthropies Data for Health Initiative Workplan*. Unpublished; 2018.

Processes and systems for cause of death data

Health services in PNG are delivered through a complex system of aid posts, health sub-centres, health centres, rural hospitals, and provincial hospitals. Information on the number and causes of death are one of the basic outputs of the NHIS. This information is derived from health facility discharge monthly reports and medical death certificates sent via the District Health Office (DHO) to the Provincial Health Office (PHO) at the end of each month (**Figure 2**). The information currently captured on the monthly discharge report includes: medical record number, age, sex, final diagnosis, whether there was a procedure (operation) and whether there were complications of this procedure, a second International Classification of Diseases (ICD) code for external causes, and whether the patient died. At the rural health facilities, this information is generated by community health workers, nursing officers, midwives and health extension officers, while medical officers (doctors) certify deaths in provincial hospitals and in some district hospitals, with most of them have no basic training in medical certification.

Figure 2 Flow of health information from facilities to the NHIS



NHIS = National Health Information System; TB = tuberculosis; Lep = leprosy; Lab = laboratory

At the PHO, the Provincial Health Information Officer (PHIO) examines the forms then raises and follows-up any queries with relevant health facilities if there are any queries. The forms are compiled and posted to National Performance Monitoring & Research Branch (PMRB) the following month. At the national PMRB, the discharge reports are manually registered by a Statistician and coded by a trained mortality coder using the PNG Short List, a simplified version of ICD-10 then entered in the DHIS by temporary-contracted data entry operators.[9]

9 Lewis D. *Future Direction and Options, National Department of Health, Version*: 1.0. Port Moresby, PNG: National Department of Health; 2007.

CRVS system-strengthening activities

The Rural Primary Health Services Delivery Project (RPHSDP) is an eight-year joint initiative of the Government of PNG and a number of development partners. One of its major activities has been to support the provision of mobile-enabled devices to health centres, community health posts, and district hospitals to facilitate the capture of all NHIS data (GME-HIS PROJECT). Data transmission happens in real time with instant feedback and reports. Provincial Health Information Officers can monitor the reporting status of different health facilities using the system. The system can provide line listings of ICD-coded deaths by cause, as part of a case-based register that includes GIS-coded villages. Data from the system have been available from the beginning of 2017 for five provinces (Enga, Western Highlands, Milne Bay, Bougainville, and West New Britain).

Data for Health Initiative

To generate more robust and widely available mortality data, the National Department of Health (NDoH) in partnership with the Data for Health (D4H) Initiative, have implemented two critical interventions.

Training in medical certification of cause of death

A comprehensive medical certification 'Train the Trainer' course for physicians was developed and rolled out in seven hospitals in 2017. This resulted in trainers facilitating their own certification training activities in various health facilities across the country. The total number of individuals trained through the D4H training program included 97 physicians, 22 other health professionals, and 55 final-year medical students from the School of Medicine and Health Sciences, University of Papua New Guinea.

Training on medical certification has been incorporated into university curriculum.

The incorporation of training on medical certification into the medical student curriculum is a significant accomplishment; Papua New Guinea is one of only a handful of countries in the world to incorporate such training. Training on certification provides graduating physicians with technical expertise to complete a medical certificate of cause of death. It also makes them aware of their important contribution, as individuals, to information about the distribution of mortality by cause, which is needed to develop evidence-based health policy. The training was a combined effort between D4H; staff from the School of Medicine and Health Sciences, the University of Papua New Guinea; the National Department of Health; and the Papua New Guinea Civil and Identity Registry Office.

Training in mortality coding

Mortality coding involves transforming information on medical death certificates into alphanumeric codes. This allows for the tabulation and aggregation of mortality statistics for monitoring the patterns of mortality in the population. Five coding officers from the National Department of Health, the Port Moresby General Hospital and the Papua New Guinea Civil and Identity Registry Office completed ICD-10 training in May 2017. To interpret casual relationships more easily and allocate the correct underlying cause of death, the Medical Mortality Data System (MMDS) Automated Classification of Medical Entities (ACME) Decision Tables are used. The tables are also used to determine whether a sequence of events leading to the death on the death certificate can be accepted or not.[10]

10 Walker S, Wood M. National Centre for Classification in Health, ICD-10, Student Workbook. An Interactive Training Course for ICD-10. Brisbane, Australia: National Centre for Classification in Health, Queensland University of Technology; 2017.

Part 1: Mortality patterns and trends

Methods

A total of 1,087 medical death certificates were assessed for the period 2016-2017. Detailed tabulations for summary tables and figures presented in the main report are provided in **Annex 1**.

Results

Deaths by age group and sex

As shown in **Table 1** and **Figure 3**, more male deaths were certified and entered into the system than female deaths for both years analysed, and this disparity increased with age (ie more male deaths than female were certified at older age groups).

Table 2 also highlights that over one-third of deaths in 2016 and 2017 were for children aged less than five years.

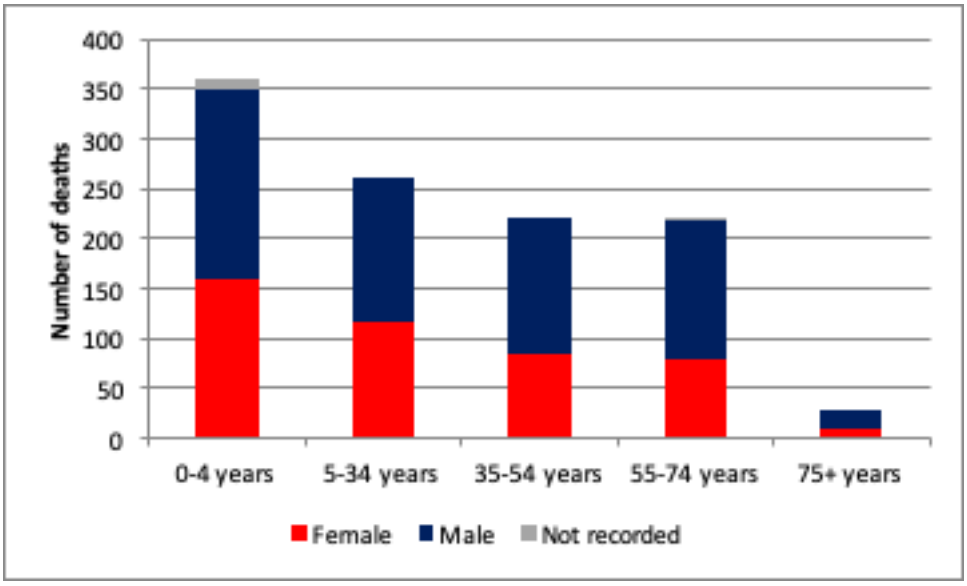
Table 1 Deaths by age group and sex, 2016-2017, Papua New Guinea

Age group	2016 (N=634)			2017 (N=453)		
	Female (%)	Male (%)	Not recorded	Female (%)	Male (%)	Not recorded
0-4 years	98 (47.1)	110 (52.9)	8 (-)	62 (44.0)	79 (56.0)	2 (-)
5-34 years	70 (45.5)	84 (54.5)	0 (-)	47 (44.3)	59 (55.7)	0 (-)
35-54 years	46 (40.0)	69 (60.0)	0 (-)	38 (35.8)	68 (64.2)	0 (-)
55-74 years	45 (34.4)	86 (65.6)	2 (-)	33 (38.4)	53 (61.6)	0 (-)
75+ years	6 (37.5)	10 (62.5)	0 (-)	4 (33.3)	8 (66.7)	0 (-)
TOTAL	**265 (42.5)**	**359 (57.5)**	**10 (-)**	**184 (40.8)**	**267 (59.2)**	**2 (-)**

Table 2 Deaths by age group, 2016 & 2017, Papua New Guinea

Age group	2016 deaths		2017 deaths	
	N	%	N	%
0-4 years	216	34.1	143	31.6
5-34 years	154	24.3	106	23.4
35-54 years	115	18.1	106	23.4
55-74 years	133	21.0	86	19.0
75+ years	16	2.5	12	2.6
TOTAL	**634**	**100.0**	**453**	**100.0**

Figure 3 Deaths by age group and sex, 2016 & 2017, Papua New Guinea



Deaths by province

As shown in **Table 3**, approximately one-third of all deaths occurred in the West New Britain province, followed by Jiwaka (17%), and Western (16%) provinces. In total, just under half (46.6%) of all deaths over the two years analysed occurred at Kimbe General Hospital, located in West New Britain.

Table 3 Deaths by province, and age group, 2016 & 2017, Papua New Guinea

Province	Age group (years)					TOTAL	TOTAL (%)
	0-4	5-34	35-54	55-74	75+		
Autonomous Region of Bouganville	14	22	20	35	1	**92**	**8.5**
Chimbu	27	15	10	21	3	**76**	**7.0**
East New Britain	0	0	0	1	0	**1**	**0.1**
East Sepik	10	17	13	13	3	**56**	**5.2**
Jiwaka	83	40	40	20	3	**186**	**17.1**
Milne Bay	49	22	15	17	5	**108**	**9.9**
National Capital District	0	0	0	1	0	**1**	**0.1**
Sandaun	12	13	13	7	0	**45**	**4.1**
West New Britain	119	86	67	67	8	**347**	**31.9**
Western	43	43	43	36	5	**170**	**15.6**
Western Highlands	1	2	0	1	0	**4**	**0.4**
Not recorded	1	0	0	0	0	**1**	**0.1**
TOTAL	**359**	**260**	**221**	**219**	**28**	**1087**	**100.0**

Part 2: Assessing the quality of medical death certificates

Methods

The tool, Assessing the quality of death certificates, from the University of Melbourne was used to assess medical death certificates from 2016.[11] This tool is designed to assess the quality of death certification practices by checking for the presence of common errors in medical death certificates. The tool can also be used to assess the quality of death certification as part of routine assessment, or to assess the training needs of doctors in designing cause of death certification training and to evaluate the effect of death certification training. Errors were classified as major or minor errors, as shown in **Annex 2**.

A total of 633 medical death certificates were assessed.

Results

As shown in **Table 4**, overall, 622 (98%) of medical death certificates assessed were not correctly filled-in. The most common error was 'additional errors', which covers aspects such as incomplete information on the deceased and/or disease or injury leading to death. The majority (95%) of certificates also did not have the time interval between disease onset and death completed. In terms of other major errors, 20% of medical death certificates had an incorrect or clinically implausible sequence leading to death; 12% multiple causes per line; and 10% had an ill-defined or poorly specified condition as the underlying cause of death.

Table 4 Death certificates by error type, 2016, Papua New Guinea

Error type	Certificates	
	N	%
Major errors		
Multiple causes of death per line	76	12
Absence of disease time interval	601	95
Incorrect sequence of events leading to death	129	20
Ill-defined or poorly specified condition entered as the UCOD	64	10
Minor errors		
Blank lines	5	1
Abbreviations used in certifying the death	103	16
Illegible hand writing	5	1
Additional errors on the certificate	613	97
Overall, the certificate was not correctly filled-in	**622**	**98**
TOTAL*	**633**	**100**

*Total equals more than 633 and 100% as each certificate can have more than one error

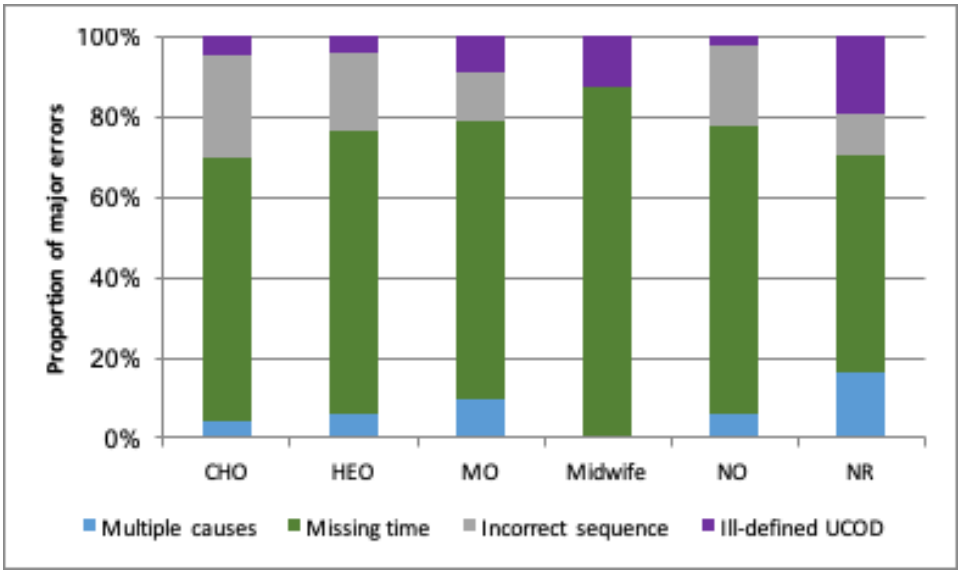
11 Rampatige R, Gamage S, Richards N, et al. *Assessing the quality of death certificates: Guidance for the rapid tool*. CRVS resources and tools. Melbourne, Australia; Bloomberg Philanthropies Data for Health Initiative, Civil Registration and Vital Statistics Improvement, University of Melbourne; 2018.

Community health officers were most likely to record an incorrect sequence leading to death on the medical certificate.

The medical death certificates were also assessed for quality according to the certifier who completed them (**Annex 1**, **Table 8**). As shown in **Figure 4**, all of the certifiers performed poorly with completing the time interval between disease onset and death, with the majority of certificates completed by midwives missing this information. Community health officers (CHO) completed over one-third of certificates that had an incorrect or clinically implausible sequence of events leading to death, the highest out of all the certifier types. For health extension officers (HEO), one-quarter of their certificates also had an incorrect or implausible sequence. Medical officers (MO) had the lowest proportion of certificates with incorrect or implausible sequences; however they did have some of the highest number with ill-defined underlying causes of death (UCOD) and multiple causes per line. Nursing officers (NO) produced the least number of certificates with an ill-defined UCOD.

There were 21 certificates that did not have a certifier recorded (NR); these certificates had a high proportion with multiple causes per line used, an incorrect or implausible sequence, and the highest number of certificates with an ill-defined UCOD (one-third of all certificates certified by this group).

Figure 4 Medical death certificates with a major error, by certifier and error type, 2016, PNG



Discussion

The most common error was not completing the time interval. The importance of completing this field should be emphasised in training.

The quality review found that 98% of medical death certificates were incorrectly completed. A high number of 'additional errors' were found on the certificates, including providing incomplete information on the deceased (date of birth, age, sex), and incomplete administrative data (A&D and station serial numbers).

Of concern is the very high proportion of certificates (95%) that did not have the time interval completed; time intervals are very important for correctly coding certain diseases and provide a check on the accuracy of the reported sequence of conditions. Further, 20% of certificates had an incorrect or clinically improbable sequence of events leading to death, and 10% had an ill-defined or poorly specified condition entered as the underlying cause of death (UCOD). These are major errors that significantly lower the quality of data on the medical death certificate, and resulting mortality statistics.

In terms of the different types of certifiers, all did poorly in completing the time interval between onset and death, especially midwives. For community health officers, health extension officers, medical officers, and nursing officers, the next highest error type was to write an incorrect or clinically implausible sequence leading to death. For midwives, it was to write an ill-defined or poorly specified underlying cause of death. This indicates a clear need for additional training on the principles of medical certification, and the concept of underlying causes of death.

Recommendations

- Training in medical certification should cover health practitioners like community health workers, nursing officers, midwives and health extension officers who are involved in certifying deaths in rural health facilities.
- The signing of medical death certificates by nursing officers who are not trained in clinical diagnosis needs to be reviewed by the Medical Board, the National Department of Health and the Law Reform Commission.
- Medical death certificates must be used in coding and selecting the underlying cause of death by applying the WHO rules for mortality coding.
- There must be a change to convert from using the earlier version of the international death certificate form to the 2016 WHO revised international death certificate form.
- There should be a software program for entering data from medical certificates of cause of death. As an interim solution, Microsoft Excel should be used by the Performance Monitoring and Research Branch, National Department of Health, for entering mortality data.
- The medical certificate of cause of death assessment tool should be applied regularly to assess the quality of death certification as part of routine procedures.
- Training on ANACONDA (**Box 2**) should be regularly conducted to enhance the quality and validity of mortality data.
- Strategies for integrating coded mortality data from medical death certificates into the eNHIS need to be developed.

Box 2: What is ANACONDA?

Built on a set of standard demographic and epidemiological concepts underlying mortality data quality, ANACONDA has been designed on 10 data quality assessment principles first published by the Health Information Systems Knowledge Hub at the University of Queensland.[14]

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 progresses can be identified, and where and what kind of interventions are most urgently needed to further strength their existing systems.

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

Annex 1 Detailed tabulations

Table 5 Total deaths by province, age group, and sex, PNG, 2016

Province	0-4 years				5-34 years				35-54 years				55-74 years				75+ years				TOTAL	TOTAL (%)
	F	M	NR	Tot.	F	M	NR	Tot.	F	M	NR	Tot.	F	M	NR	Tot.	F	M	NR	Tot.		
A R Bouganville	1	7	2	10	9	10	0	19	3	5	0	8	5	14	0	19	0	0	0	0	**56**	**8.8**
Chimbu	16	10	1	27	8	7	0	15	3	7	0	10	8	13	0	21	1	2	0	3	**76**	**12.0**
East New Britain	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	**1**	**0.2**
East Sepik	3	3	0	6	4	6	0	10	6	3	0	9	4	2	2	8	2	1	0	3	**35**	**5.5**
Milne Bay	21	18	1	40	6	7	0	13	4	5	0	9	2	8	0	10	0	2	0	2	**74**	**11.7**
Sandaun	3	8	0	11	6	7	0	13	6	7	0	13	2	5	0	7	0	0	0	0	**44**	**7.0**
Western	1	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	**2**	**0.3**
Western Highlands	0	1	0	1	1	1	0	2	0	0	0	0	0	1	0	1	0	0	0	0	**4**	**0.6**
West New Britain	52	63	4	119	36	46	0	82	24	42	0	66	23	42	0	65	3	5	0	8	**340**	**53.7**
Not recorded	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	**0.2**
TOTAL	**98**	**110**	**8**	**216**	**70**	**84**	**0**	**154**	**46**	**69**	**0**	**115**	**45**	**86**	**2**	**133**	**6**	**10**	**0**	**16**	**633**	**100.0**

F=female; M=male; NR=not recorded; Tot.=total

Table 6 Total deaths by province, age group, and sex, by province, PNG, 2017

Province	0-4 years				5-34 years				35-54 years				55-74 years				75+ years				TOTAL	TOTAL (%)
	F	M	NR	Tot.	F	M	NR	Tot.	F	M	NR	Tot.	F	M	NR	Tot.	F	M	NR	Tot.		
A R Bouganville	1	3	0	4	1	2	0	3	2	10	0	12	5	11	0	16	1	0	0	1	**36**	**7.9**
East Sepik	2	2	0	4	4	3	0	7	1	3	0	4	1	4	0	5	0	0	0	0	**20**	**4.4**
Jiwaka	37	45	1	83	19	21	0	40	8	32	0	40	8	12	0	20	1	2	0	3	**186**	**41.1**
Milne Bay	2	6	1	9	4	5	0	9	2	4	0	6	3	4	0	7	2	1	0	3	**34**	**7.5**
National Capital District	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	**1**	**0.2**
Sandaun	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	**0.2**
Western	20	22	0	42	18	25	0	43	24	19	0	43	15	20	0	35	0	5	0	5	**168**	**37.1**
West New Britain	0	0	0	0	1	3	0	4	1	0	0	1	0	2	0	2	0	0	0	0	**7**	**1.5**
TOTAL	**62**	**79**	**2**	**143**	**47**	**59**	**0**	**106**	**38**	**68**	**0**	**106**	**33**	**53**	**0**	**86**	**4**	**8**	**0**	**12**	**453**	**100.0**

F=female; M=male; NR=not recorded; Tot.=total

Table 7 Medical death certificates by error type and certifier, PNG, 2016

Certifier	Major errors				Minor errors				Overall, the certificate was not correctly completed	Total number of certificates
	Multiple causes of death per line	Absence of disease time interval	Incorrect sequence of events leading to death	Ill-defined or poorly specified condition entered as the UCOD	Presence of blank spaces within the sequence of events	Abbreviations used in certifying the death	Illegible hand writing	Additional errors on the certificate		
Community health worker	1	15	6	1	0	2	0	15	**15**	**18**
Health extension officer	11	122	34	7	3	28	0	129	**131**	**132**
Medical officer	52	366	65	46	2	49	5	368	**372**	**372**
Midwife	0	7	0	1	0	0	0	7	**7**	**7**
Nursing officer	6	71	20	2	0	20	0	74	**76**	**83**
Not recorded	6	20	4	7	0	4	0	20	**21**	**21**
TOTAL	**76**	**601**	**129**	**64**	**5**	**103**	**5**	**613**	**622**	**633**

Annex 2 Classification of errors

Error type	Description and implications
Major errors	
Multiple causes of death per line	The WHO ICD-10[13] guidelines state that only one cause should be recorded per line in a death certificate. When more than one cause is reported on a single line, it makes it difficult for coders to establish the sequence of events leading to death, thus selecting the correct underlying cause of death would be more difficult
Absence of disease time interval	The time interval should be entered for all conditions reported on the death certificate, especially for the conditions reported in Part 1. Time intervals are very important for correctly coding certain diseases and provide a check on the accuracy of the reported sequence of conditions.
Incorrect sequence of events leading to death	Mortality statistics are based on the underlying cause of death, which is the condition or injury that initiated the sequence of events that led directly to death. When a clinically improbable sequence of events is recorded, it is impossible to select the correct underlying cause of death.
Ill-defined or poorly specified condition entered as the UCOD	Ill-defined or poorly specified conditions are of no value for public health officials, and do not provide any information for decision-makers to help them design preventive health programs.[14] These include, for example, organ failure (hepatic or cardiac failure, etc.); symptoms or signs (fever, etc.); mode of dying (cardiac arrest, respiratory arrest); pathophysiological findings (shock); other (trivial diseases such as colds, rhinitis, etc.).
Minor errors	
Presence of blank spaces within the sequence of events	In completing a death certificate the certifier should use consecutive lines in Part 1 of the death certificate starting at Line 1a. The UCOD should be recorded in the lowest used line of Part 1. There should not be any blank lines within the sequence/chain of events leading to death.
Abbreviations used in certifying the death	Doctors are encouraged not to use abbreviations when certifying deaths as abbreviations can mean different things to different people. There is a chance that coders may misinterpret the abbreviation and code the death to a non-relevant code.
Illegible hand writing	Medical death certificates need to be completed clearly so that coders and other users can read the information provided in the death certificate. However, illegible handwriting makes it hard for coders to correctly identify the stated condition.

13 World Health Organization. International classification of diseases and related health problems, 10th revision. 5th ed. Geneva, Switzerland: WHO; 2016.

14 Mikkelsen L, Richards N, Lopez AD. *Redefining 'garbage codes' for public health policy: Report on the expert group meeting*, 27–28 February 2017. CRVS technical outcome series. Melbourne, Australia: Bloomberg Philanthropies Data for Health Initiative, and Civil Registration and Vital Statistics Improvement, University of Melbourne; 2018.

Related resources and products

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

https://crvsgateway.info/library

Assessing the quality of death certificates: Guidance for the rapid tool. CRVS resources and tools.

CRVS country overview: Papua New Guinea. CRVS summaries.

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

Intervention: Medical certification of cause of death. CRVS summaries.

Intervention: Mortality coding. CRVS summaries.

Redefining 'garbage codes' for public health policy: Report on the expert group meeting, 27–28 February 2017. CRVS technical outcome series.

Papua New Guinea: Targeted interventions for sustainable change. CRVS country perspectives.

Strategies for improving the quality of cause of death data in hospitals. CRVS development series.

Action guide on improving the quality of cause of death data in hospitals. CRVS action guide.

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.

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

https://crvsgateway.info/courses

ICD-10 coding.

Medical certification of cause of death.

Further reading

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.

World Health Organization. International classification of diseases and related health problems, 10th revision. 5th ed. Geneva, Switzerland: WHO; 2016.

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