CRVS country report
An audit of the death notification database of Solomon Islands

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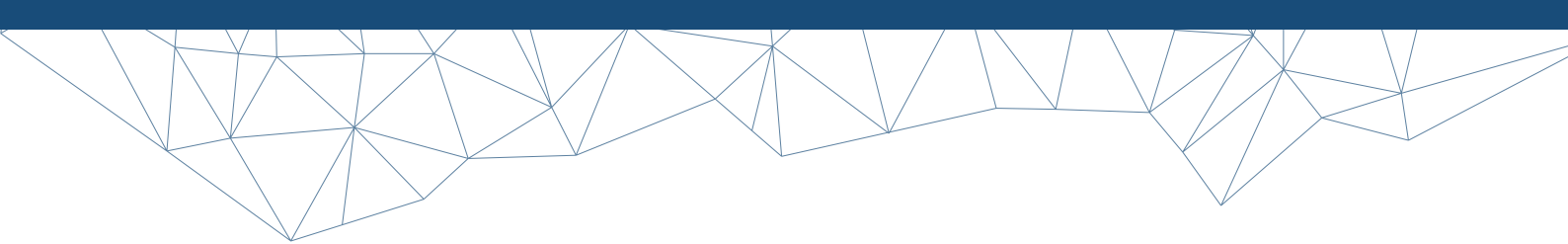
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An audit of the death notification database of Solomon Islands

This report presents the findings of an audit led by Bloomberg Philanthropies Data for Health Initiative at the University of Melbourne to assess records entered into Solomon Islands' Excel-based death notifications database. Outcomes of the audit will provide insight into the overall quality of death notification data and inform interventions to address any data quality issues moving forward.

Introduction

Timeliness and accuracy are two important factors affecting the potential utility of mortality data within civil registration and vital statistics (CRVS) systems.[1] Even though proper registration of deaths is an essential component in ensuring timeliness and accuracy of mortality data, half of all global deaths are not registered, and thereby not captured, within CRVS systems.[2] To ensure proper registration of mortality data, the World Health Organization (WHO) has emphasised that in addition to improving the quality of data collection, transcribing, compiling and transmitting practices, improvements to processes for checking and storing in databases, particularly in terms of recording necessary information are equally as important.[3] So long as the necessary variables of reported deaths are incomplete or inaccurate, achieving high completeness of death reporting will be of limited value.

Solomon Islands, a Pacific Island nation, had a projected population of 700 000 in 2018.[4] With a crude death rate of 5.5 per 1000 population as calculated by its 2009 population census, around 3500 to 4000 deaths are estimated to occur annually.[5,6] Under the Bloomberg Philanthropies Data for Health Initiative at the University of Melbourne, a formal notification process was introduced for deaths; both those certified by medical practitioners and those reported by nurses which could not be certified by a medical practitioner. Deaths are formally notified using a standard paper form by health staff attached to health facilities, following which the records are collated at the Health Information Systems (HIS) unit in the capital, Honiara, digitising the paper-based notification within a central Microsoft Excel database.[7]

Literature analysing the quality of death notification in Pacific Island countries, including Solomon Islands, is uncommon. This audit was done to review the quality of selected variables of records entered into the Excel-based notification database of the Solomon Islands, assessing completeness and timeliness of death notification data. The findings are of country-level importance and, owing to contextual similarities, may help inform potential regional-level interventions to improve CRVS systems. Ongoing generation of evidence such as that produced by this audit, in tangent with regional knowledge-sharing and collaboration, are essential to improve CRVS systems.[8,9]

1   Adair T, Lopez AD. *Estimating the completeness of death registration: An empirical method*. PLoS One. 2018;13(5):e0197047

2   World Health Organization. *Civil registration: why counting births and deaths is important*.; 2020. Available from: https://www.who.int/news-room/fact-sheets/detail/civil-registration-why-counting-births-and-deaths-is-important

3   World Health Organization, University of Queensland. *Improving the quality and use of birth, death and cause-of-death information: guidance for a standards-based review of country practices*. 2010.

4   Solomon Islands - National Statistics Office. Projected population by province 2010 - 2025: Solomon Islands Government; 2020. Available from: https://www.statistics.gov.sb/statistics/social-statistics/population
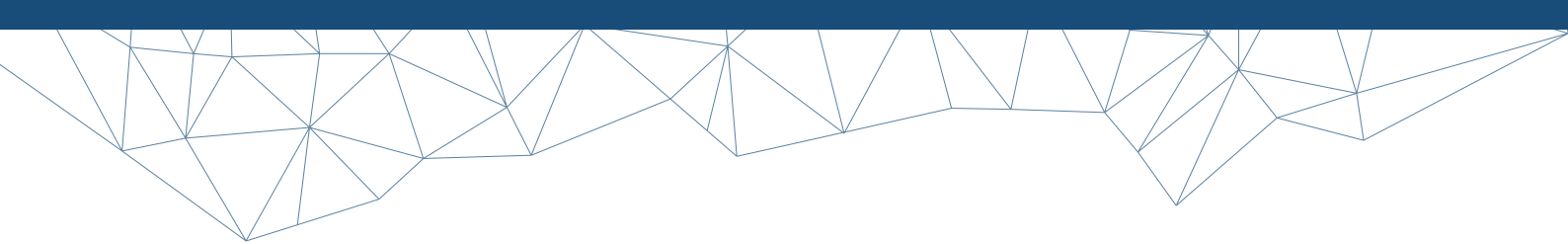
5   Solomon Islands National Statistical Office, Ministry of Finance and Treasury. 2009 Population and Housing Census- National Report ND

6   Solomon Islands National Statistics Office, Solomon Islands Ministry of Health and Medical Services, Pacific Community. Demographic and Health Survey-Solomon Islands 2015. 2017

7   Hodge N, Slatyer B, Skiller L. Solomon Islands Health System Review. 2015

8   AbouZahr C, de Savigny D, Mikkelsen L, Setel PW, Lozano R, Lopez AD. *Towards universal civil registration and vital statistics systems: the time is now*. Lancet. 2015;386(10001):1407-18

9   AbouZahr C, de Savigny D, Mikkelsen L, Setel PW, Lozano R, Nichols E, et al. *Civil registration and vital statistics: progress in the data revolution for counting and accountability*. Lancet. 2015;386(10001):1373-85

CRVS country reports

The findings of this audit reflect errors that occurred between January 2016 to October 2019, either when health staff were completing the death notification form or when HIS staff transcribed the details into the Excel database. Evidence generated through the audit will support further investigation into the errors occurring in these two processes, helping to increase the quality of data in the individual-level tracking function of the District Health Information System-version 2 (DHIS-2), planned to be in implementation from late 2020.

Methods

This audit is closely aligned to the five-step approach of an audit cycle.[10]

Step 1 - Selection of a topic

With a scarcity of literature on the quality of death notification data in Solomon Islands, this audit assessed selected variables of records entered into the country's Excel-based notifications database in order to understand the overall quality of death notification data and inform interventions to address any data quality issues moving forward.

At the time of audit, the DHIS-2 system was in a transitional period of being upgraded to an individual-level deaths record. Historic death notifications, stored in an Excel database, were waiting to be imported into the DHIS-2 tracker capture module following release of the audit's findings. Prospective records will be entered directly into DHIS-2 once completed notification records are received.

The findings of this audit have three uses. Firstly, they serve as a review of historic death notifications in order to amend errors prior to importation into the DHIS-2 database. Secondly, identification of systemic errors at the facility level in filling death notification forms will inform remedial training. Thirdly, identification of transcription/entry errors into the database will inform design of a module for training in data entry.

Step 2 - Defining standards

Having ensured face, content and consensual validity, an implicit tool with a list of variables to be reviewed for each record was developed for this audit.[11] For each variable, its presence or absence was noted in relation to each recorded death in the database. The tool included the following 11 variables:

1. Name/s of the deceased
2. Date of birth or age of the deceased
3. Date of death of the deceased
4. Sex of the deceased
5. Home address/usual residence of the deceased
6. Current address of the deceased
7. Place of death of the deceased
8. Notifier's name
9. Notifier's designation
10. Date of signing the form
11. Time between the date of death and date of reporting health staff signing the notification form.

10   Limb C, Fowler A, Gundogan B, Koshy K, Agha R. *How to conduct a clinical audit and quality improvement project*. Int J Surg Oncol (N Y). 2017;2(6):e24
11   Abramson JH, Abramson ZH. Research Methods in Community Medicine. 2008

Step 3 - Measuring performance

Notification forms entered in the Excel database from January 2016 to October 2019 were assessed using the tool, with a total of 4046 records reviewed.

Step 4 - Data analysis and implementation of changes

The Excel-based database was imported into a Statistical Package of Social Sciences (SPSS) version 26 datasheet. Descriptive statistics were used. Frequencies and percentages of death records with missing details for the above data-items were described. Notification-delay was described with a median and interquartile (IQR) range. Comparisons were made between the findings of each province. Interventions will be implemented once restrictions imposed during the COVID-19 pandemic are relaxed.

Step 5 - Improvement checking and maintenance

A re-assessment will be conducted after one year, with national-level staff carrying out continuous data reviews.

Results

The distribution of the notification forms according to the province of notification is shown in **Table 1**. Most of the notifications from the Honiara Capital Territory were deaths notified by medical practitioners – in other provinces, deaths were almost all notified by nurses. The national completeness estimates were calculated based on estimates of national deaths generated from model life tables with inputs of under-five and adult mortality rates (**Table 2**). Provincial completeness (**Table 1**) was estimated using the empirical completeness method and scaling results to national completeness estimates.

Table 1: Provincial distribution of notification forms

Province	Frequency (N)	Percentage (%)	Completeness in 2018 (%)
Honiara Capital Territory	1696	41.9	92.3
Western	537	13.3	38.1
Malaita	411	10.2	20.5
Guadalcanal	394	9.7	22.8
Choiseul	251	6.2	28.7
Makira-Ulawa	247	6.1	42.4
Temotu	171	4.2	58.4
Isabel	168	4.1	42.0
Central	152	3.8	23.9
Rennel and Bellona	19	0.5	31.7
Total (National)	**4046**	**100.0**	**43.2**
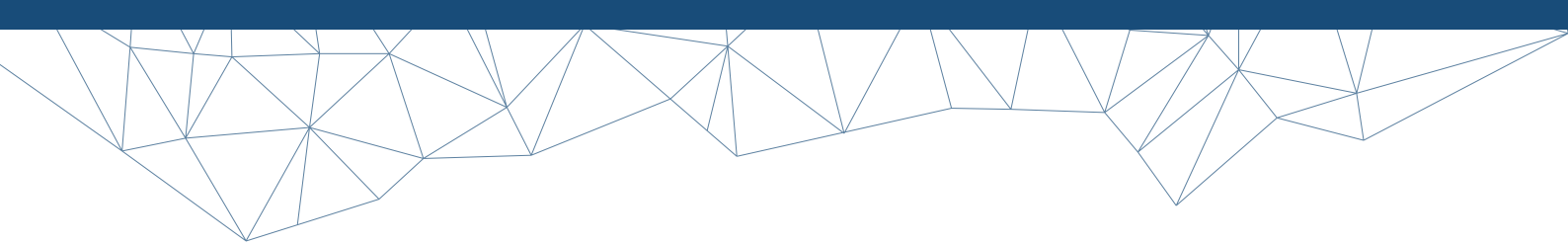
As shown in **Table 2**, a trend of rising notification completeness can be observed from 2016 to 2018.

Table 2: National estimated death notification completeness for Solomon Islands

Year	Death notifications	Notification completeness
2016	471	13.2%
2017	990	27.2%
2018	1596	43.2%

Classification of the death notifications by health facility (as obtained from the database) is summarised in **Table 3**.

Table 3: Distribution of the death notifications by health facility

Health facility type	Frequency	%
Hospitals (Including NRH)	2086	51.5
Area Health Centers (AHCs)	550	13.6
Rural Health Centers (RHCs)	899	22.2
Nurse-aide posts (NAPs)	500	12.4
Not mentioned	11	0.3
Total	**4046**	**100.0**

The frequency of records that did not include respective variables reviewed by the implicit tool is shown in **Table 4**. Relatively higher incomplete proportions were observed for the age and residential locations. The sex-related details were found to have the highest rates of completeness.

Table 4: Distribution of records with missing data-items (total=4046)

Data-item	Missing frequency	Missing record (%)
1. Presence of the name/s of the deceased	14	0.3
2. Presence of the date of birth or age of the deceased	277	6.8
3. Presence of the date of death of the deceased		
Completely missing	23	0.5
Partially missing	20	0.6
4. Presence of the sex of the deceased	9	0.2
5. Presence of the home address of the deceased		
Province	213	5.3
Village	353	8.7
6. Presence of the current address of the deceased		
Province	193	4.8
Village	246	6.1
7. Presence of the place of death of the deceased	125	3.1
8. Presence of the notifier's name	51	1.3
9. Presence of the notifier's designation	151	3.7
10. Mentioning the date of signing the notification form		
Completely	126	3.1
Partially	16	0.4
Incompatibility with date of death	85	2.1

The distribution of missing records, once stratified by provinces, is shown in **Figure 1** and **Annex 1**. A wide provincial-variation was noted in the distribution of the proportion of records with incomplete individual data-items. Relatively highest proportions included: reporting of age or date of birth in Central province, place of death in Rennell and Bellona province, and home village in the Honiara province (where the concept of 'home village' may be more difficult to articulate).
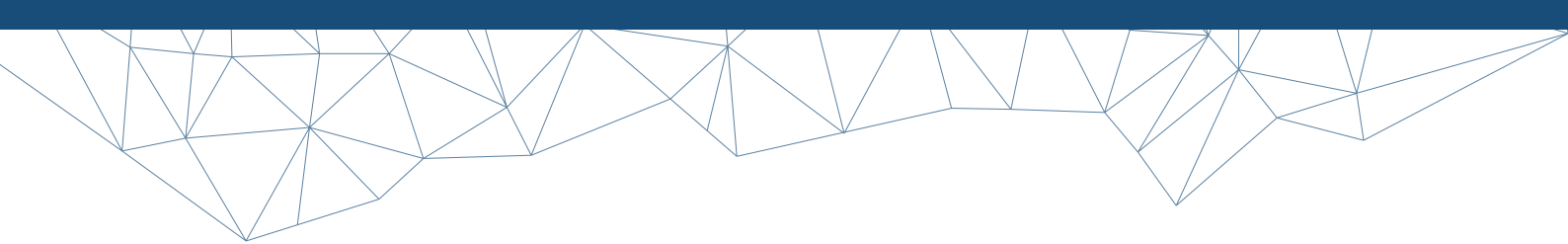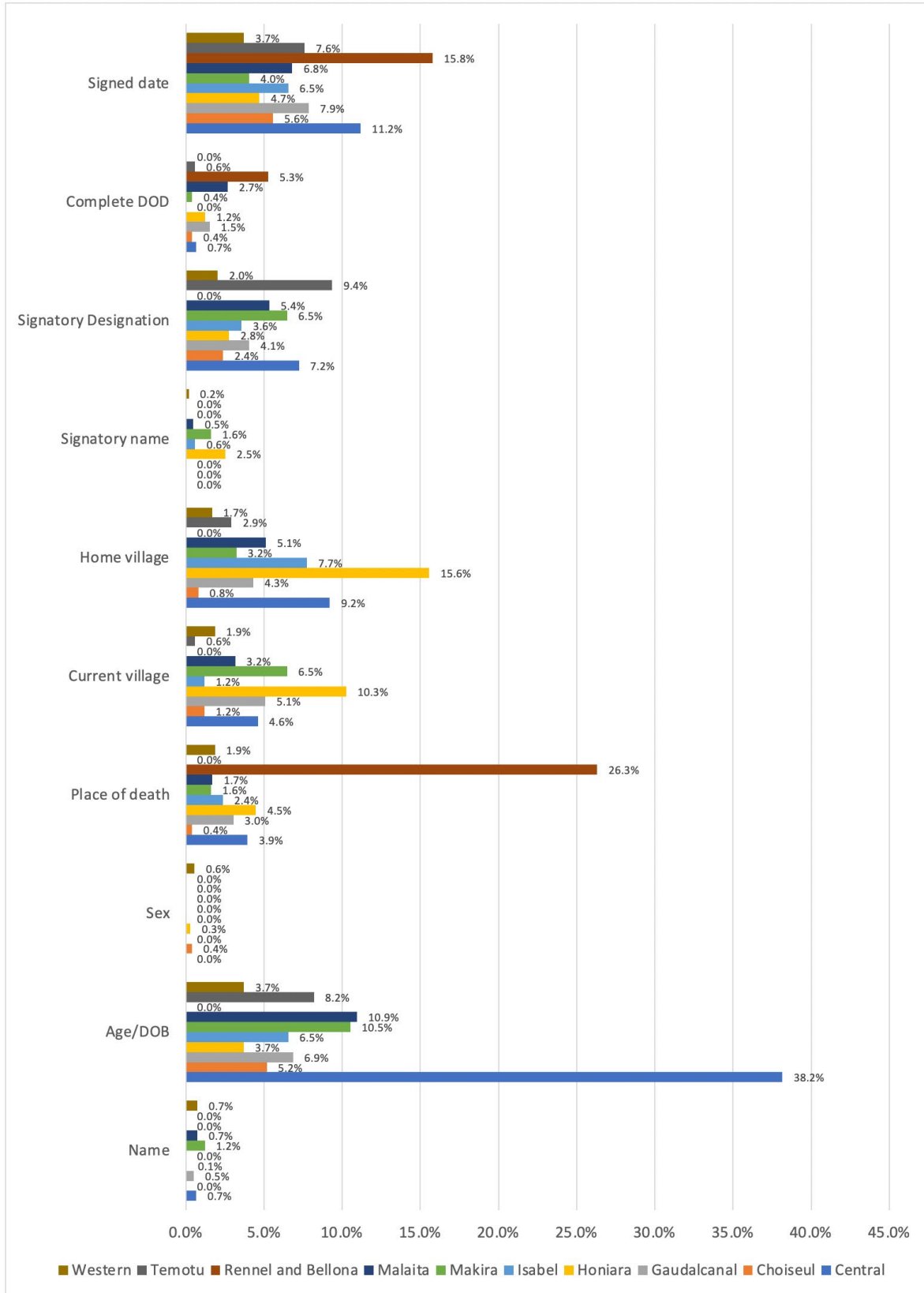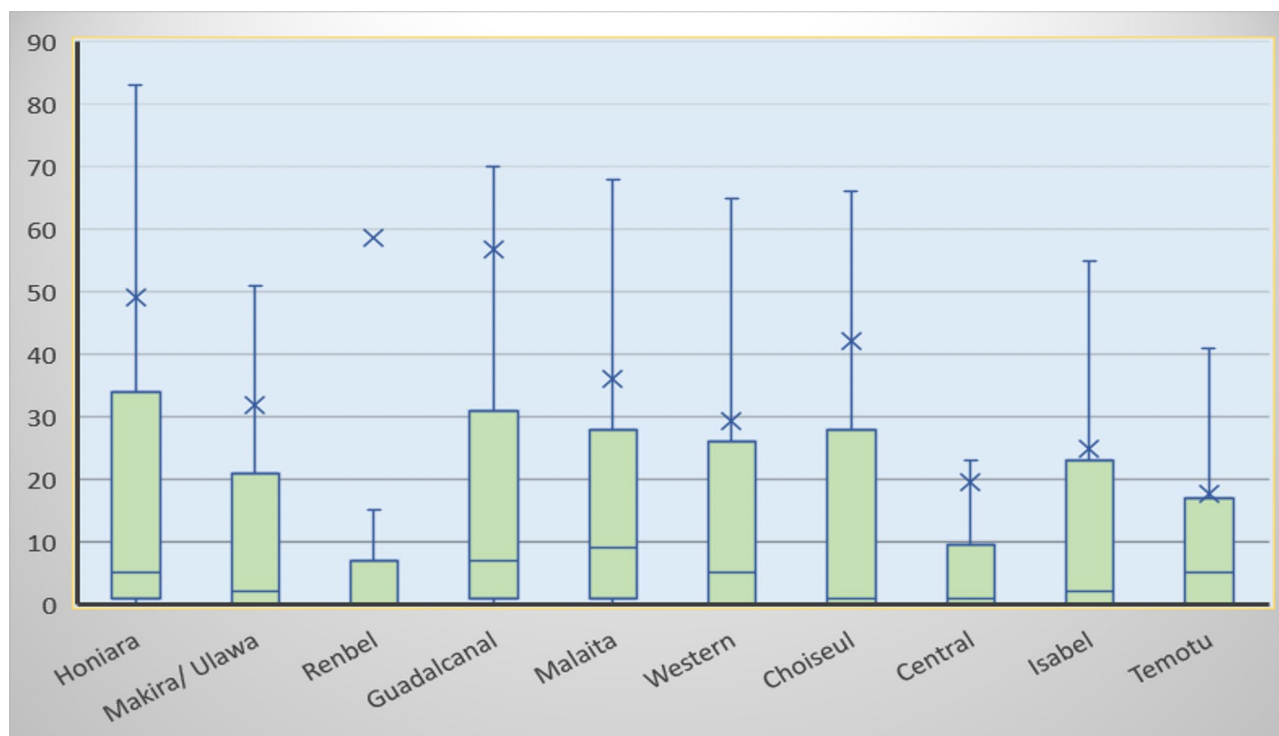
Figure 1: Distribution of missing data-items by province

After excluding the cases with extreme outliers (i.e. more than 1000 days of delay) the overall median delay of signing the notification form was five days (IQR: 0 to 28). **Figure 2** shows the distribution of delays when stratified by province.

Figure 2: Distribution of delay of notifications

*Delays of more than 1000 days have been excluded, mean values are marked with crosses

The mean values were markedly higher than the median values reflecting the positive skewness attributed by the outliers. Malaita and Guadalcanal provinces had the highest median delays.

Discussion

This is the first documented audit of completeness of data items and timeliness of notification of death records entered in the national level database in Solomon Islands. The findings showed that while the overall missing data-items of notified death records are less than 10 per cent, and median delay of signing the death notification is around five days, a wide provincial-level variation is present. The rising trends of the notification completeness estimates point towards the potential benefits of strengthening the current interventions related to the CRVS system.

The criteria in the tool used in this audit reflect 11 essential data-items that must be captured to enable sufficient utility of the notification system. Quality data from a properly functioning notification system serve as the background for all CRVS processes,[12] and a country's notification database, when operating correctly, produces invaluable data on mortality characteristics to inform health policy and programming.[13] These may include, calculation of specific death rates (e.g. area-specific, gender-specific, age-group specific etc.), which are important in identification and prioritising interventions.[14] In order to ascertain these characteristics, information about decedents such as; name, age, location of death and residential address must be entered into the system accurately. Furthermore, a complete death notification database may help to identify deaths

12   Cobos Muñoz D, Sant Fruchtman C, Renggli S, deSavigny D. *CRVS innovations: Assessing the performance of CRVS systems*. Melbourne, Australia: Bloomberg Philanthropies Data for Health Initiative, Civil Registration and Vital Statistics Improvement, University of Melbourne; 2019

13   World Health Organization. *Civil registration: why counting births and deaths is important*. 2020. Available from: https://www.who.int/news-room/fact-sheets/detail/civil-registration-why-counting-births-and-deaths-is-important

14   The University of Melbourne. *Importance of age, sex and cause of death in mortality statistics*. 2019. Available from: https://crvsgateway.info/Importance-of-age-sex-and-cause-of-death-in-mortality-statistics~679
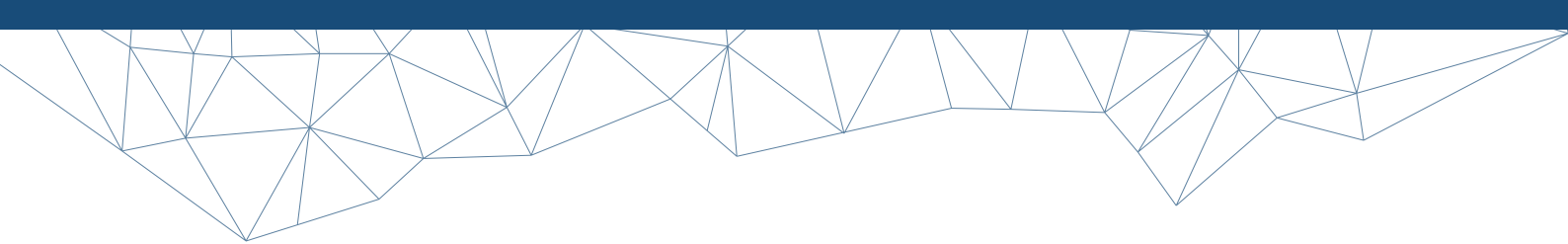
suitable for a subsequent verbal autopsy,[15] enabling the capture of cause-of death information for deaths without physician certification.[16] In order to identify these deaths, completeness of data-items is essential.

The overall median delay of form signing after death was five days (even after excluding extreme outliers). This may reflect a composite of three delays for community deaths: (1) a delay in the notifying nurse hearing about the fact of death; (2) a delay in the notifying nurse obtaining an interview to collect details about the deceased, and finally; (3) a delay in filling and signing the notification form. While this audit did not aim to determine the relative contribution of these delays to the overall delay, we have observed each delay occurring in specific cases. In particular, it has been noted that in more remote facilities, where catchment villages may be some distance from the health facility and communication networks remain poor, the delays in nurses hearing about deaths and obtaining an interview are significant. In Honiara, where community death notifications are completed by hospital emergency department staff, often outside clinical working hours when they are able to follow up next of kin for interviews, the second delay type may predominate. As a result of this audit, the relevant contributions of these delays are being investigated, and will require tailored solutions depending on the context. For delays in nurses hearing about the fact of death, our interventions are focusing on strengthening active surveillance and regular monitoring visits to catchment villages, as well as supply-side strategies such as churches and cemeteries reporting deaths to health facilities. For delays in obtaining interviews and completing the notification form, interventions will need to focus on strengthening nurse-community communication channels and documentation processes. For facility deaths, interventions will be focused on timely medical certification of cause of death, including introducing standard timeframes by which notification should be completed.

This audit was carried out on the digitised database of death notifications, so some missing information here may represent errors in digitisation. For prospective death notifications, this highlights the value of having more validation functions (e.g. comparison of dates in different data items) in the DHIS-2 system to be implemented. For the retrospective records, separate validation will be conducted comparing the details in the database with the received notification forms. If it is found that the errors have occurred at the health-facility level (i.e. while filling the death notification forms), feedback must be given through the respective provincial HIS officers.

The stratification of the findings by province conducted in this audit is useful to identify provinces in need of prioritisation for interventions. As examples, **Figures 1** and **2** show that in Central province, the percentage of records with missing information on decedent's age is relatively higher than in other provinces. Similarly, in Malaita province the delay of signing the notification form is relatively higher. These province-specific explorations would help to manage specific weaknesses and enable national improvements in overall performance parameters as well.

Since audits on the completeness of the variables of notified deaths are not commonly documented, the methodology used in this audit, including the use of the judgmentally validated tool, could be of benefit in similar settings. This audit further highlights the importance of having an integrated data evaluation system for death notifications that evaluates more than just the fact of notification. Emphasis must not be limited to the completeness of notification, but should also be extended to the completeness of the *variables* within the notified records.
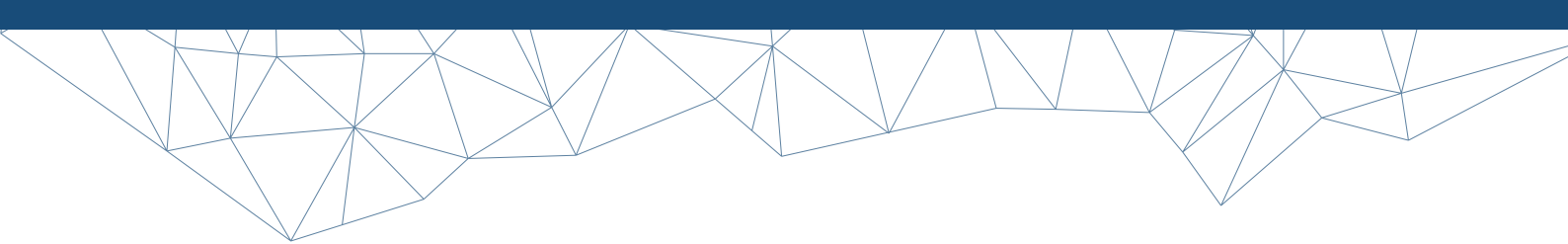
Two limitations were present in this audit. Firstly, stratification of the findings was only limited to the provincial level and was not done at the five-tier level of health facilities.[17] This was due to two reasons, the first being that as a preliminary audit conducted on a secondary data source (i.e. the excel database), facility-level description of findings was decided to be sub-optimal. The second reason was due to discrepancies between facility-names and facility-types, potentially rendering tier-level analysis unreliable. Changing the facility-type according to the facility-name during the analysis process was also decided to be inappropriate. Based on the recommendations of this audit, however, necessary changes to the database will be made.

The second limitation was that incomplete variables (i.e. an informant not including necessary information on the notification form) could not be distinguished from missing variables (i.e. information not available or known) due to informants assuming that a particular data item is not relevant for that case. As an example, an informant may have kept "home village" blank for a deceased person who lived in Honiara throughout their lifetime, where ideally, they should have entered "Honiara" for both the current and home addresses. Whether "home village" information was known by the informant or not, cannot be determined from the database.

Conclusions and recommendations

In the database, death notification records with individual level incomplete variables ranged between 0.2 per cent to 8.7 per cent. Notable observations included: missing age in 6.8 per cent of records, and a median delay of five days between the date of death and the date of signing the notification form. Wide inter-provincial variations of these parameters were observed. Based on these important findings, a comprehensive audit is planned with primary data in order to identify the causes of incompleteness. Province-specific interventions are being developed as a result of the findings presented here.

Annex 1

Supplementary Table 1: Distribution of missing data-items by province

	Name	Age/ DOB	Sex	Place of death	Current village	Home village	Signatory name	Signatory Design	Complete DOD	Signed date
Central	1 (0.7)	58 (38.2)	0 (0.0)	6 (3.9)	7 (4.6)	14 (9.2)	0 (0.0)	11 (7.2)	1 (0.7)	17 (11.2)
Choiseul	0 (0.0)	13 (5.2)	1 (0.4)	1 (0.4)	3 (1.2)	2 (0.8)	0 (0.0)	6 (2.4)	1 (0.4)	14 (5.6)
Gaudalcanal	2 (0.5)	27 (6.9)	0 (0.0)	12 (3.0)	20 (5.1)	17 (4.3)	0 (0.0)	16 (4.1)	6 (1.5)	31 (7.9)
Honiara	21 (0.1)	63 (3.7)	5 (0.3)	76 (4.5)	174 (10.3)	264 (15.6)	43 (2.5)	47 (2.8)	21 (1.2)	80 (4.7)
Isabel	0 (0.0)	11 (6.5)	0 (0.0)	4 (2.4)	2 (1.2)	13 (7.7)	1 (0.6)	6 (3.6)	0 (0.0)	11 (6.5)
Makira	3 (1.2)	26 (10.5)	0 (0.0)	4 (1.6)	16 (6.5)	8 (3.2)	4 (1.6)	16 (6.5)	1 (0.4)	10 (4.0)
Malaita	3 (0.7)	45 (10.9)	0 (0.0)	7 (1.7)	13 (3.2)	21 (5.1)	2 (0.5)	22 (5.4)	11 (2.7)	28 (6.8)
Renbel	0 (0.0)	0 (0.0)	0 (0.0)	5 (26.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (5.3)	3 (15.8)
Temotu	0 (0.0)	14 (8.2)	0 (0.0)	0 (0.0)	1 (0.6)	5 (2.9)	0 (0.0)	16 (9.4)	1 (0.6)	13 (7.6)
Western	4 (0.7)	20 (3.7)	3 (0.6)	10 (1.9)	10 (1.9)	9 (1.7)	1 (0.2)	11 (2.0)	0 (0.0)	20 (3.7)

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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