

Report on the data analysis and reporting writing workshop held in Noumea, New Caledonia, 19–29 September 2016

Prepared by the National Department of Health, Papua New Guinea

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Acknowledgement

This report was compiled by representatives of the National Department of Health, Papua New Guinea, in 2017. Because the team did not have access to enough data for full analysis and publication, it undertook all analysis as an exploratory exercise to provide indicators where possible, and to examine the strengths and weaknesses of the data collection systems and processes, as well as the data itself.

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Ms Manah Dindi
Acting Manager
Performance Monitoring & Research Branch
National Department of Health
Papua New Guinea

Ms Barbara Angoro
Senior Health System Researcher
Performance Monitoring & Research Branch
National Department of Health

Executive summary

Vital statistics provide crucial information on the population in a country. Accurate data on births, deaths and cause-of-death by age group and sex are critical for monitoring population health, identifying health priorities and evaluating the impact of health programmes. Two major administrative sources of vital statistics data are civil registration systems and records maintained by the National Department of Health, based on the events of birth and death that occur in health facilities.

Health and civil registration data are particularly important in the Pacific region in the context of policy-making, planning and meeting international commitments to monitor progress towards achieving the 2030 sustainable development goals (SDGs), including tracking improvements in maternal and child health and evaluating the success of programmes enacted to combat non-communicable diseases (NCDs) as a major public health emergency in the region.

Staff from the Department of Health in Papua New Guinea participated in the Data Analysis and Report Writing Workshop organised by the Brisbane Accord group under the leadership of the Pacific Community (SPC) in New Caledonia on 19–29 September 2016. The purpose of the workshop was to support Pacific Island countries to analyse their registry-based data and to produce a vital statistics report based on the analysis. This work was undertaken in alignment with country commitments against those set out in the Regional Action Framework for Civil Registration and Vital Statistics, which Pacific Island countries, including Papua New Guinea, have signed up to.¹ Specifically, goal three of the framework commits Papua New Guinea to producing accurate, complete and timely vital statistics (including on cause-of-death) based on registration records, and dissemination of the same.

Papua New Guinea was represented at this training by staff from the Performance Monitoring and Research Branch of the National Department of Health (NDoH). Invitations were also sent to the Civil Registration Office and the National Statistics Office, but they were not able to attend.

This report aims at providing a summary of some of the key lessons learnt from the workshop and presents a preliminary report of the analysis conducted, based on the data that were available.

All countries were required to bring to the course unit-record data on births, deaths and cause-of-death from the civil registration and/or the health database for the years 2012–2015 (where available). Papua New Guinea faced challenges in accessing these data (at a national level) and the participants were able to provide only: (i) aggregate data on births and deaths from the National Health Information System (NHIS); (ii) unit-record data on deaths for four pilot provinces; and (iii) unit record data on births and deaths from Port Moresby Hospital. This limited the level of analysis that the course aimed at achieving. However, the data available allowed for a basic level of analysis, which is presented in this report. It is worth noting that this is the first report ever produced for births, deaths and cause-of-death using the health data collected by the National Health Information System (NHIS) and the e-NHIS.²

¹http://www.unescap.org/sites/default/files/Regional.Action.Framework.English.final_.pdf

² e-NHIS is the pilot project on the electronic version of NHIS. It uses mobile phone technology to send health facility data back to NHIS.

Birth data that were analysed were drawn from the NHIS, based on aggregate records for 2015, and from Port Moresby General Hospital Maternal Register, based on unit-record data for the years 2015–2016. The analysis of birth data was limited to live births, i.e. all foetal deaths were excluded.

Death data were extracted from NHIS, based on aggregate records for 2011, and from e-NHIS based on unit-record data for deaths for 2015–2016. The latter represents deaths in the health facilities of only four pilot provinces, and excludes the provincial hospitals.

Cause-of-death data for 2011 were taken from NHIS, and collated by age group and sex, and coded according to version 10 of the International Classification of Diseases (ICD 10) Papua New Guinea shortlist. This was further tabulated according to the ICD General Mortality List 1.

Due to the incompleteness of the data, much key analysis could not be done. However, preliminary findings show that there is a high number of infant deaths (deaths to children aged less than one year old), and a high number of deaths occurring in the 30–49 year age group (to persons of both sexes). Infectious diseases are the leading cause of deaths in all age groups. Less than 10% of deaths in the 30–69 age group are caused by non-communicable diseases (NCDs). However, it is apparent that the onset of NCDs is seen quite early on in life, in the 30–49 age group.

Notably, the analysis revealed cases of death due to contraception sterilisation; in 2011, three women died as a result of routine a tubal ligation procedure. This signals a major public health issue that needs to be investigated further and identified in the health facilities where these deaths occurred.

A number of data quality issues were identified, which reflected on the need to improve the design of the systems, specifically to ensure that they: (i) incorporate better data quality checks; (ii) collect unit-record data; (iii) capture all important variables, such as age of mother and sex of baby; and (iv) adopt a standardised format of data capture/reporting. The analysis underlined the potential usefulness of routinely analysing and publishing the health and vital statistics data at a national level.

The course underscored the fundamental role that the civil registration system plays as a source of vital statistics, as well as the need to ensure that Papua New Guinea continues to strengthen its efforts to improve the system. While recognising that staff from the Civil Registration Office were not able to attend the course, it is important that its focal points meet those of the Department of Health and share experiences about the course. Where possible, they should explore the possibility of initiating a comprehensive analysis of their data sets, drawing on the support available from the Brisbane Accord Group.

In general, there is great need to improve the existing data collection systems and to ensure that the data collected are analysed and made available for use in policy-making and planning. In the short term, conducting data management training workshops at the provincial and health facility level would be an important step for the Department of Health. Furthermore, working in collaboration with other departments (the Department of National Planning, the National Statistics Office and the Civil Registration Office) and stakeholders (the United Nations Population Fund, the World Health Organization, Bloomberg Data4Health) will strengthen the civil registration and vital statistics system. Important efforts in this regard would include reviving the Civil Registration and Vital Statistics (CRVS) Committee, conducting a comprehensive assessment, and developing a national CRVS improvement plan in line with other Pacific Island countries.

1) Introduction/Background

a) The importance of civil registration and vital statistics data

Accurate data on births, deaths and cause-of-death are essential for accurate monitoring of population health, identifying health priorities and evaluating health programmes. They also provide valuable context for a broad range of social development investment pertaining to education, social security, and child protection. This is particularly important in the Pacific region, due to the need to continue to monitor and report progress against the UN Post-2015 Development Agenda, and the need to respond to the impact of non-communicable diseases on the population.

Sources of birth, death and cause-of-death data include population censuses, periodic surveys and administrative records, such as those maintained by health facilities and civil registration systems. Of all the sources, civil registration systems are globally recognised as being the most robust and hence the most reliable sources of these data. Civil registration is defined by the United Nations (UN) as ‘the continuous, permanent, compulsory and universal recording of the occurrence and characteristics of vital events pertaining to the population in accordance with the legal requirements in each country.’³

Among the core attributes of civil registration systems is their ability to provide vital event data of all members of a population on a continuous basis. This is crucial in ensuring that critical indicators, such as those on mortality, are based on real, accurate data (not modelled estimates) and that such data are provided in a timely way to facilitate routine monitoring of critical development indicators. Civil registration systems also play a fundamental role in establishing legal identity and providing the public with evidentiary documents that are considered *prima facie* in the proof of one’s identity.

For Papua New Guinea, civil registration systems and the resultant vital statistics are important for achieving the overarching – Vision 2050 – as outlined in the government’s National Development Plan, under which sits the country’s Sustainable Development Plan, the Medium Term Development Plan 2 (2016–2017) and, specific to the health sector, the National Health Plan (NHP) 2011–2020. Vital statistics from civil registration are particularly useful in enabling the country to measure and monitor the goals and targets pertaining to Key Result Area (KRA) 4, (which targets improving child survival), KRA 5 (improving maternal health), KRA 6 (reducing the burden of communicable diseases) and KRA 7 (promoting healthy lifestyles). Having accurate data on births, deaths and cause-of-death will give a true picture of the health status of the nation and will also be fundamental in helping evaluate whether the current health development strategies are achieving the desired effect, or need to be reviewed.

b) Analysis training

Papua New Guinea was invited to attend the Data Analysis and Report Writing Workshop held by the Brisbane Accord Group, under the leadership of the Pacific Community (SPC), in Noumea on the 19–29 September 2016. The purpose of the training was to build the capacity of Pacific Island countries in the analysis and publication of vital statistics (with a primary focus on civil registration-based vital statistics), and to improve the availability of these statistics and their use to decision-makers for policy formulation and planning. The course was attended by 18 participants from six countries (Kiribati,

³ United Nations (UN). *Principles and recommendations for a vital statistics system, Revision 2*. UN, 2001.

Tuvalu, Samoa, Papua New Guinea, Vanuatu and Solomon Islands). The participants were drawn from civil registration offices, national statistics offices and ministries of health.

In the case of Papua New Guinea, invitations were issued to both the National Statistics Office and the National Department of Health, but only staff from National Department of Health attended the training. Staff involved in the training were from the Performance Monitoring and Research Branch of the Strategic Policy Division.

c) Purpose of this report

The course was structured to assist national teams to analyse their birth, death and cause-of-death data, and to generate a draft national analysis report and indicators in line with regional and international reporting commitments. Countries were therefore required to bring to the training unit-record data on births, deaths and cause-of-death, based on collections made by civil registration offices and departments of health.

The Papua New Guinea team did not have access to data suitable for full analysis and publication (see details below). The team therefore undertook all analysis as an exploratory exercise to provide indicators where possible, and to examine the strengths and weaknesses of the data collection systems and processes, as well as of the data itself.

The purpose of this report is, therefore, to inform the Senior Executive Management of the National Department of Health about issues identified with the National Health Information System (NHIS) and data sources. Further to that, this report gives an account of the type of analysis that was conducted and recommends approaches to improving the system.

This is the first time that much of the data collected by the NHIS has been analysed, with the workshop providing a useful exercise for the team to identify the strengths and weaknesses of the current system.

2) Data sources in Papua New Guinea

Sources of vital statistics data include population censuses and surveys (Census 2011, Demographic and Health Survey 2006) and administrative sources. For the health sector, data are mainly collected from health records/routine hospital admissions and discharge records.

For the training, data available to the Papua New Guinea participants were the hospital separation data captured by the NHIS for the whole country and by the e-NHIS for health facilities in four pilot provinces: Milne Bay, West New Britain, the Autonomous Region of Bougainville and Western Highlands.

Births analysis was done using unit-record data from the Port Moresby General Hospital Maternal Register.

NHIS captures aggregate data which are sent from each provincial health information office (PHIO) in the country. Each month, health facilities (hospitals, health centres and aidposts) send their monthly tally sheets to the PHIO, which then compiles provincial aggregate data that it sends to NHIS. Data collected at the health facility level is done using a standard NHIS form. E-NHIS is the electronic version of NHIS, which uses mobile phone technology to send health facility data back to NHIS. The major

difference between NHIS and e-NHIS is that e-NHIS uses tablets to capture patient information in unit-record data format and sends it to NHIS in real time.

There was no unit-record data available for much of the analysis, as NHIS captures only aggregate data (for births and deaths). Therefore, the participants used unit-record data from Port Moresby General Hospital Maternal Register to carry out exercises on births data that required unit records.

The data that were available for the course are outlined below.

a) Births

Birth data analysed in this report were sourced from NHIS, e-NHIS and Port Moresby General Hospital Maternal Register.

Below are the variables listed on the NHIS database (contains aggregate national data) and those from Port Moresby General Hospital Maternity Ward Register.

- Tabulated aggregate national data, presented for each province for 2015, using the variables:
 - total number of births;
 - antenatal care (1st visit, 4th visit, 2nd Tetanus Toxoid (TT));
 - booster TT, coverage % (1st and 4th), average ante-natal clinic (ANC, TT)
 - deliveries (<2.5 kg):
 - still birth,
 - transferred to hospital from health facility,
 - maternal death,
 - born before arrival at health facility,
 - virginal birth complication,
 - delivery in health facility,
 - assisted delivery by village birth attendant.
- Unit-record data from Port Moresby General Hospital Maternity Ward were collected in its database system. Data were for July 2015 to September 2016, and included the following variables:
 - medical record number (alpha-numerical);
 - mother's name, baby's name;
 - sex;
 - date of birth;
 - delivery type;
 - birth remarks; and
 - mother's address.
- Census data (2015 projected total population and 2015 projected births based on the 2011 census).

b) Deaths and cause-of-death

Death data analysed in this report were sourced from NHIS and e-NHIS. NHIS had aggregate deaths and cause-of-death data, while e-NHIS had unit-record data. At the time of training, the Papua New Guinea participants noted that e-NHIS contained deaths data from the health centres and not the

provincial hospitals. Below are the variables for deaths and cause-of-death data, for which aggregate data are captured at NHIS. Data for 2011 were used.

- Tabulated aggregate national data for deaths, presented for each province, reported under the headings:
 - diphtheria
 - neonatal tetanus
 - acute flacid paralysis
 - measles, pertusis
 - neonatal sepsis
 - pneumonia <5 yrs
 - other
 - other respiratory
 - diarrhoea <5 years
 - other
 - clinically diagnosed malaria
 - laboratory diagnosed malaria
 - all (both clinical and lab diagnosed malaria)
 - anemia
 - malnutrition
 - injury
 - typhoid
 - tuberculosis
 - leprosy
 - snake bite
 - skin diseases
 - HIV/AIDS
 - ischaemic heart diseases
 - cancer
 - hypertension
 - diabetes
 - other discharges/deaths
 - total reported deaths in the province.
- Unit-record data available were from health centres but not provincial hospitals in the four pilot e-NHIS provinces. Data used were for the period between September 2015 and September 2016. The variables collected through this system were:
 - date of admission;
 - date of discharge;
 - medical record number;
 - province;
 - procedure (whether a surgical procedure was done);
 - complications;
 - sex; and
 - age: specify age in days, months and years.
- 2011 Census data (2015 projections based on Census 2011) were also used to make projections on deaths.

Cause-of-death data were sourced from NHIS, using the most recent data available in the system, which were for 2011. Information on cause-of-death was taken from the 2011 Leading Causes of Death, coded according to the International Classification of Diseases (ICD) (version 10), Papua New Guinea shortlist version, developed together with the World Health Organization. Cause-of-death data were further tabulated according to the ICD General Mortality List 1.

c) Data collection systems

The data-collection systems used in this report are summarised in Table 1.

Table 1: Health data collection systems where information for the training was sourced

Name of System	Type of data collected	Process used to capture data	Responsible officer(s)	Are data collated electronically (at what level, and what level of detail is entered)?	How data are transmitted	Are there procedures outlined for cleaning/reviewing data?	What is the coverage and completeness of the data (for births and/or deaths)?
NHIS	Discharge data Outpatient data Admissions data (no e-copies, only hard copies available for admissions data.)	Routine health facility data are captured on daily tally sheets, and entered onto the NHIS form. Order of reporting: At the end of each month, aid posts and sub-health centres send a summary of their daily data to the supervising health centre. Supervising health centre officer-in-charge fills out a monthly summary form, which includes their own data as well as the data from sub-health centres and aid posts. This form is sent to the Provincial Health Information Office (PHIO) at the end of every month.	Each officer-in-charge of the health facility	Data collected at aid post and health centre level are manually entered onto forms. The forms from aid posts are collated, together with the supervising health centre data, and sent to the PHIO at the end of each month. Provincial health information officer enters all provincial health centres data into the database, together with the provincial hospital admissions and discharges data, and sends the aggregate e-copy of the data to the National Health Information Unit.	E-copies of the provincial data are sent via email to the National Health Information Unit, National Department of Health. Those with no internet access send pen drives with the loaded information, while others still send hard copies of the data.	No	
e-NHIS	Deaths data from health centres (excluding deaths in	The individual's unit-record data are entered directly into an electronic version of the NHIS form on tablets; information is uploaded into a cloud database.	Each officer-in-charge of the health facility.	Data are collated at the health centre level, and sent electronically to the cloud-based storage.	Using mobile technology, e-copies of the unit data is uploaded online.	No	Deaths: Completeness of the four pilot provinces E-NHIS data was 1.4%, which is very low.

Name of System	Type of data collected	Process used to capture data	Responsible officer(s)	Are data collated electronically (at what level, and what level of detail is entered)?	How data are transmitted	Are there procedures outlined for cleaning/reviewing data?	What is the coverage and completeness of the data (for births and/or deaths)?
	provincial hospitals)	Health centres, excluding provincial hospitals in the four pilot provinces, enter their daily data into the E-NHIS form. Information is transmitted using mobile technology and can be accessed in real time by the National Health Information Unit, provided they are given access by the developers.		Access to data is by password and only authorised officers are allowed access.			An important identified contributing factor is that provincial hospital deaths are not captured by the E-NHIS pilot project, hence very low number of deaths than would be expected. (numerator too low)
Hospital Maternal Register (Port Moresby General Hospital)	Births	Each ward is now connected to the hospital database so individual unit data entries are made at the wards.	Ward clerks	Ward clerks use the mothers' notes to enter in the database.	Data in the system are accessed by the Medical Records Manager, who submits to the National Capital District (NCD) Provincial Health Information Officer. The data are compiled with those of all other health facilities in NCD and sent to the National Health Information Unit.	Uncertain. However, during the training, some duplicate data were removed, highlighting the need for data cleansing to be carried out.	Births: Completeness for Port Moresby General Hospital was 0.98%. Coverage: Port Moresby General Hospital, July–October 2015)

The strengths and weaknesses of both NHIS and e-NHIS are summarised in Table 2.

Table 2: Strengths and weaknesses of health data collection systems NHIS and e-NHIS in Papua New Guinea

	Strength	Weakness
NHIS	Captures aggregated health facility data for each province (22 provinces)	<p>The database does not capture individual patient information (unit-record data). This limits the ability to conduct data cleansing/verification at national level.</p> <p><u>Deaths:</u></p> <ul style="list-style-type: none"> • The data are not disaggregated by sex; the sex variable is critical in understanding the patterns of death by sex, as males and females die of different causes. • The database reports only on selected list of cause of deaths; • Two of the variables listed in the NHIS database are listed as “Other”, which is ambiguous. <p><u>Births:</u></p> <ul style="list-style-type: none"> • The sex of the baby is not provided in the aggregated data on maternal health; • The database does not capture the age of the mother. This is critical in the assessment of the levels and trends of maternal deaths, as these require a unique set of interventions, different from female deaths due to other causes.
e-NHIS	Patient unit-record data are captured. Real-time information (for four pilot provinces)	<p><u>Deaths:</u></p> <ul style="list-style-type: none"> • Two of the variables captured are not well defined (procedure and complication); • The diagnosis of most of the patients is not provided on the summary sheet. For this study, patient diagnosis information was obtained by going through individual patient unit-record data. • The entry of medical record numbers is not standardised. This made it difficult to use as a filter to locate duplicates; some facilities entered alpha-numeric digits, whilst others entered numerical digits
Port Moresby General Hospital Maternal Register	Patient unit data are captured. Medical record numbering is consistent. The ‘Birth Remarks’ variable provides a good source of additional information, such as twins.	<p>Some important variables are not captured, such as: age of mother and weight of baby.</p> <p>Stillbirths captured in the maternal register are not highlighted prominently and could easily be overlooked and counted as live births.</p>

d) Data analysis and cleaning

Due to the limitations in the data, the analysis focused on computing a basic set of indicators and compiling some basic tabulations. From the births data, the crude birth rate and sex ratio of birth were

computed. Death data were tabulated by age and sex. Cause-of-death data were distributed by the leading causes of death and age groups. It is important to note that the indicators produced and the data presented are not generalisable or representative of the country; they are based on reported births and deaths for only very small part of the population.

All the data were entered and analysed on Microsoft Excel. A comprehensive data-cleaning exercise was conducted, which focused on checking for duplicates, imputing missing data (in cases where there were alternative sources of information to derive the data from) and standardising the records in terms of the nomenclature used to define different variables, and ensuring uniformity of the records.

3) Summary of results

The following section presents a summary of the key outcomes of the analysis performed during the course. It should be underlined that, where applicable, the data and estimates presented are limited to data from the four provinces (e-NHIS pilot project) and/or the NHIS. The findings are therefore not nationally representative and can be indicative only of the quality of the data captured by the NHIS and e-NHIS.

a) Births and fertility

Total births

Table 3 shows that 266,138 live births were reported in 2015 in the NHIS system for all provinces. This compares with an estimate of 263,545 births projected for 2015 based on the Census 2011.

In the four (e-NHIS pilot) provinces, the NHIS data (2015) on reported births and the 2015 projections based on 2011 Census differed; the 2015 projected births based on 2011 censuses were lower than the NHIS reported births. This could indicate the possibility of an undercount in the census for the provinces.

Table 3: Births data for the 4 e-NHIS pilot provinces, taken from NHIS database and 2015 Census projections and compared against e-NHIS data

Provinces where the e-NHIS is piloted	NHIS reported births (aggregate data, 2015)	2015 projected births based on 2011 Census	e-NHIS reported births (2015)
Western Highlands	17,011	13,197	In the e-NHIS system, it was discovered during training that births data were not captured on the e-NHIS system.
Milne Bay	11,199	9,779	
West New Britain	11,803	9,650	
Autonomous Region of Bougainville	8,739	9,069	

Crude birth rate

The national crude birth rate (CBR) calculated from the NHIS reported data was 32.31 per 1,000. This compares with the crude birth rate of 31.9 calculated using Census 2011 projections for 2015. The crude birth rate is the *number of births per 1,000 population over a given period of time*. CBR is important because it tells us how a population is growing or decreasing. It is unfortunate that there was only one year's worth of data; no comparison with previous years could be made.

Sex ratio at birth (reported births)

The sex ratio refers to the ratio of males to females in a given population, expressed as the number of males for every 100 females. From the reported births at Port Moresby General Hospital Maternal Register (data for five months used), there were 110 males for every 100 females born. Census 2011 reported 108 males for every 100 females that were born.

Fertility by age of mother

Tabulations of birth by age of mother could not be conducted due to lack of information on the age of the mother. Similarly, fertility rates by age (including teenage fertility) could not be calculated at the national level or provincial level, because data on the age of mother was not captured by any of the three databases. However, the total fertility rate for Papua New Guinea in 2015, calculated using projections from the 2011 Census, was 4.3; meaning that a woman would give birth to an average of four children if she survives all her reproductive years experiencing the present day age-specific fertility rates.

b) Deaths and mortality

Total deaths

In 2015, there were 661 deaths reported in the e-NHIS system for the four pilot provinces. These deaths represent only 1.4% of the total expected number of deaths for this region (as estimated by the 2015 census). The low level of reporting by the e-NHIS system is due to the system capturing only deaths occurring in the aid posts and health centres, while excluding deaths occurring in provincial hospitals. Most admissions (and discharges) occur in provincial hospitals.

Crude death rate

The national crude death rate calculated from the deaths projection for 2015 (Census 2011) for Papua New Guinea was **10 deaths per 1,000 people**. Using this crude death rate, the expected number of deaths nationally was 82,357. When the expected number of deaths was calculated using the NHIS average observed deaths, it gave national expected deaths as 8,235, which is only 10% of that calculated using the 2015 projections. This gives an indication that about 90% of deaths were not captured in the health systems.

Deaths by age group and sex

Information on deaths by age group and sex was obtained from the four e-NHIS pilot provinces and data arranged as in Table 4. The table reveals a high number of deaths in the first month of life (neonatal deaths), which drops in the early years of life and begins to rise gradually in the age group 15–19 towards ages 35–39. The distribution of deaths across all age groups and by sex is irregular—following a different pattern from the usual expected J shape; this is an indication of a very high likelihood of undercounting of deaths. Table 4 further demonstrates the irregular distribution of deaths by age and sex and the high proportion of deaths among infants (children aged below one year).

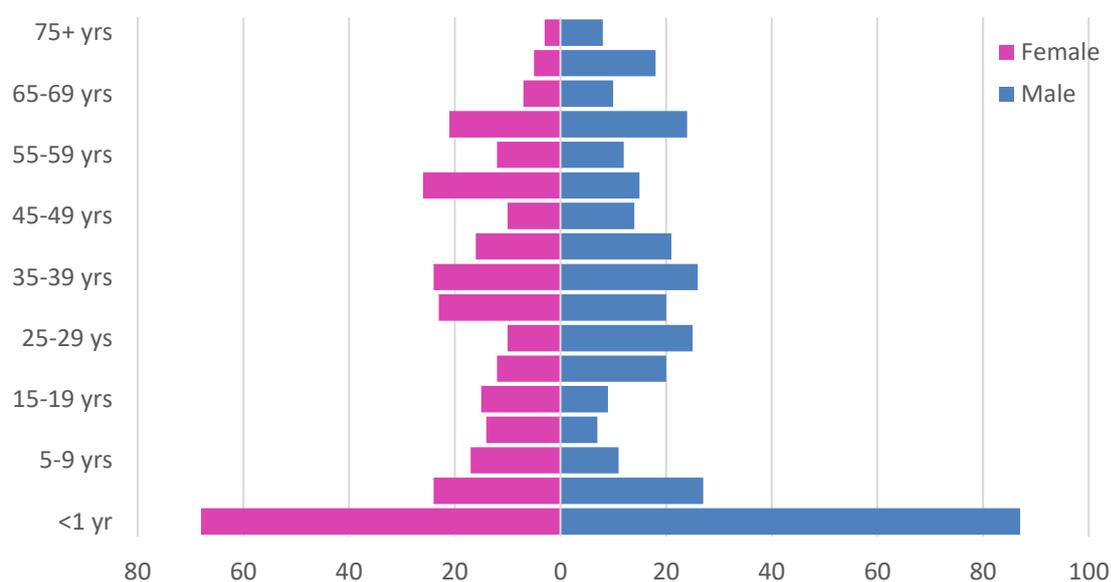
Table 4: Deaths data by age and sex (Source: e-NHIS, 2015)

Age group	Male	Female	Total
0–28 days	54	33	87
1–11 months	33	35	68
1–4 years	27	24	51
5–9 years	11	17	28
10–14 years	7	14	21
15–19 years	9	15	24
20–24 years	20	12	32
25–29 years	25	10	35
30–34 years	20	23	43
35–39 years	26	24	50
40–44 years	21	16	37
45–49 years	14	10	24
50–54 years	15	26	41
55–59 years	12	12	24
60–64 years	24	21	45
65–69 years	10	7	17
70–74 years	18	5	23
75+ years	8	3	11
Unknown	0	2	2
Total	354	309	

There were only two unknowns, which constituted a very small number so they were not re-distributed as it would not have affected the age groups.

Figure 1 presents these data graphically.

Figure 1: Distribution of reported deaths by age group and sex in 2015. (Source: e-NHIS, 2015 - District Health Facilities in 4 e-NHIS pilot provinces)



The data show an unusual distribution that potentially highlights the incomplete capture of information in the system. What the data do show, however, is a high number of deaths occurring in the less than one year-old age group.

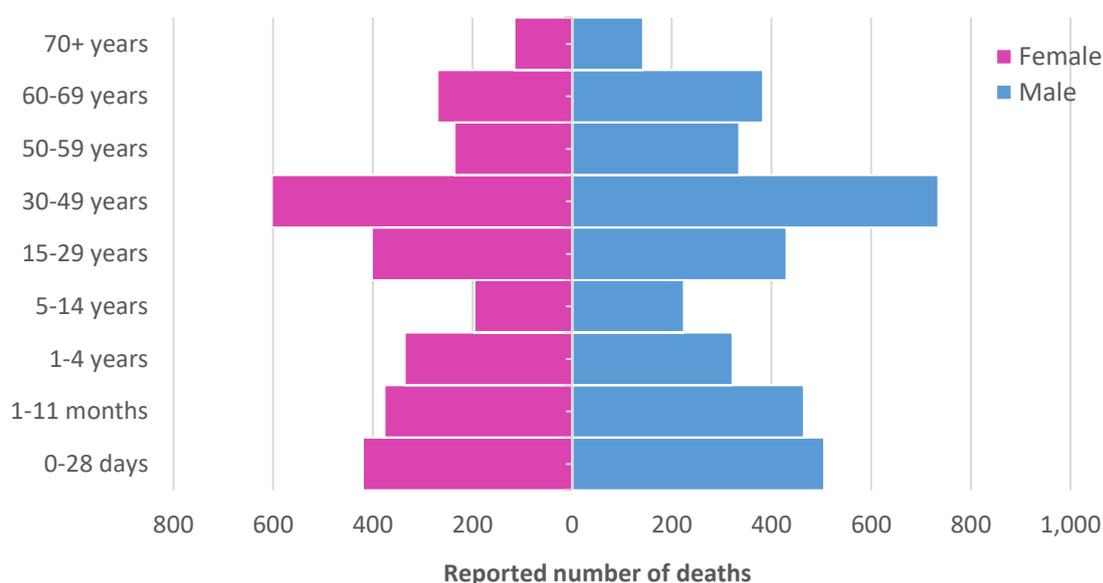
Moreover, deaths by age group and sex data obtained from the NHIS cause-of-death 2011 report were analysed post-training and are tabulated in Table 5.

Table 5: Deaths by age group and sex (NHIS 2011)

Age group	Male	Female	Total
0–28 days	506	420	926
1–11 months	465	377	842
1–4 years	322	336	658
5–14 years	224	196	420
15–29 years	430	402	832
30–49 years	735	603	1338
50–59 years	335	236	571
60–69 years	383	270	653
70+ years	142	116	258
Unknown	0	0	0
Total	3,542	2,956	6498

Figure 2 shows the same data graphically.

Figure 2: Reported deaths by age group and sex in 2011. (Source: 2011, NHIS Cause-of-death data)



As can be seen in Table 5 and Figure 2, the high number of deaths were also observed in <1 year-old age groups (0–28 days and 1–11 months old) in the NHIS 2011 cause-of-death data. The high number of deaths in the 30–49 year-old age group is also clearly shown.

Summary measures of mortality

Summary measures of mortality such as age standardised mortality rates and life expectancy were not calculated from the health data due to the incomplete reporting.

c) Causes of death

Cause-of-death data were obtained from the NHIS collections for 2011. The data had been coded according to the international classification of diseases (ICD), version 10, Papua New Guinea shortlist. This shortlist is a summarised version of the ICD 10 coding. Based on the reported deaths, the top four leading causes of deaths for males and females were perinatal conditions, pneumonia, malaria and respiratory tuberculosis (see Table 6).

Table 6: Top ten leading causes of death for 2011 (NHIS), all ages and sex

Causes of death and general mortality list code	ICD 10 codes	2011 reported number	Rank
Certain conditions originating in the perinatal period (1-092)	P00-P96	906	1
Pneumonia (1-074)	J12-J18	751	2
Malaria (1-021)	B50-B54	397	3
Respiratory tuberculosis (1-005)	A15-A16	388	4
Meningitis (1-059)	G00-G03	356	5
Chronic lower respiratory diseases (1-076)	J40-J47	314	6
Remainder of diseases of the digestive system (1-081)	K00-K22, K28-K66, K80-K92	256	7
Diarrhoea and gastroenteritis of presumed infectious origin (1-003)	A09	244	8
All other external causes (1-103)	W20-W64, W75-W99, X10-X39, X50-X59, Y10-Y89	241	9
Anaemia	D50-D64	229	10

The top five leading causes of death for age groups 0–4 years, 5–14 years, 15–59 years and 60+ years were determined and are shown in Table 7, Table 8, Table 9 and Table 10 respectively.

Table 7: Ages 0–4 years, both sexes, top five causes of death

Rank	Cause of Death	Reported deaths (out of total # 2426)	Percentage
1	Pneumonia	526	21.7
2	Sepsis neonatal	293	12.1
3	Low birth weight, <2499g	273	11.3
4	Infectious diarrhoea, gastroenteritis, colitis	147	6.1
5	Birth asphyxia	129	5.3

Table 8 Ages 5–14 years, both sexes, top five causes of death

Rank	Cause of Death	Reported deaths (out of total of 420 deaths)	Percentage
1	Malaria (severe), (unspecified)	41	9.8
2	Other meningitis	35	8.3
3	Pneumonia	32	7.6
4	Infectious diarrhoea, gastroenteritis, colitis	27	6.4
5	Respiratory Tb	23	5.5

Table 9: Ages 15–59, both sexes top five causes of death

Rank	Cause of Death	Reported deaths (out of total 420 deaths)	Percentage
1	Respiratory TB	252	9.2
2	TB other parts of the body	149	5.4
3	Malaria (severe), (unspecified)	132	4.8
4	Pneumonia	129	4.7
5	Anaemia – all others	125	4.6

Table 10: Ages 60+ years, both sexes, top five cause of death

Rank	Cause of Death	Reported deaths (out of a total 911 deaths)	Percentage
1	Chronic obstructive pulmonary disease	138	15.2
2	Pneumonia	64	7.0
3	Respiratory TB	55	6.0
4	Cerebrovascular accident	54	5.9
5	Malaria (severe), (unspecified)	48	5.3

An interesting finding in the cause-of-death data was contraception sterilisation (ICD Z30). In this day and age, when women should not be dying from routine contraception procedures, there were three recorded deaths due to contraception-related procedures. To confirm this, one of the training participants spoke with an NHIS data entry officer, who confirmed that the women died as a result of tubal ligation procedure complications. This highlights a critical public health issue and more analysis will be done on data for 2012 onward, once they are entered in the NHIS.

The percentages of deaths caused by non-communicable diseases (NCDs) in specific age groups show that NCDs account for $\leq 10\%$ of deaths in the three age groups from 30 years to 69 years (Table 11). The data also show that NCDs are appearing in a younger age group, starting at 30–49 year-olds.

Table 11: Percentage of deaths caused by NCDs in selected age groups

Age Group	Females	Males	Total	Percentage (of deaths caused by NCDs in each age group)
30–49 years	39	42	81	6%
50–59 years	22	35	57	10%
60–69 years	28	34	62	9%

The number one cause of maternal deaths observed at health facilities (NHIS 2011, aggregate data) was due to complications during labour and delivery, followed in second place by an ill-defined category. This highlights the need to clearly define variables for data collection in the health information systems, and to build capacity in the coding of causes of death.

To conclude, it is important to note that the cause-of-death data must be used cautiously, given the very low reporting rates.

4) Identified Issues

a) Recording of unit data

In the NHIS, only aggregate data for deaths are available; individual records of births and deaths and the corresponding characteristics of these events are not captured. This is an issue, because it limits the usability of these data; especially the ability to analyse and develop important tabulations by various demographic and socio-economic characteristics. For example, as reported above, it was not possible to compute age-specific fertility rates, or the teenage fertility rate, because an important characteristic (age of mother) was not captured in the database. Furthermore, analysis that requires the age and sex of patients cannot be conducted, simply because those variables are not available at the national level. Lack of unit records further limits the ability to conduct data cleaning, as one is not able to identify or revise a faulty record.

At the health facility level, unit-record data are available. However, there is no clear process in place to collate and send that information to the provincial health office or to the National Department of Health for processing / analysis.

b) Data cleaning and revision processes

There are no clear procedures or requirements for cleaning and validating the data collected to ensure that they are accurate and of good quality. Lack of such procedures limits the reliability of the data and ultimately the need for its collection. It is important that the National Department of Health establishes clear roles and responsibilities pertaining to data validation and cleaning, including at which level the exercise should be undertaken (health facilities, provincial or national level), by who and at which points in the collection process.

c) Certification/ cause-of-death data

Papua New Guinea uses the ICD 10 Papua New Guinea shortlist for causes of deaths to code the deaths data. This version is a condensed version of the ICD 10. Using the example of typhoid; in the shortlist, typhoid is listed under just one code (A01), whilst the ICD 10 listing shows different sub-codes under A01 (A01.0–A01.09). In hindsight, the participants realised this cause-of-death data contained

available information on age and sex, still in aggregate form but it had the age and sex variables and could have been used during the training session that focussed on death data. However, in the course of writing this report, this information has been used to do some analysis.

A key observation is that there were a number of non-specific causes of death listed in the data. For example, septicaemia, which was listed among the main causes of death, could result from multiple causes of sepsis, which unfortunately were not stated in the data. From a health point of view, such records make it difficult to develop strategies to curb the specific cause. In general, there is a need to improve the recording (including the certification and coding) of the causes of death.

d) Public health concerns

While most of the issues identified here relate to the data quality and use (and subsequent need for system improvements), this preliminary analysis further highlighted a number of key public health issues which deserve further investigation. These health areas are: (i) the high number of deaths in <1 year olds; (ii) the high number of women dying from complications of labour and delivery; (iii) women dying from contraception/sterilisation procedures; (iv) early onset of NCDs (starting in the 30–49 years age group); and (v) the high number of deaths (both women and men) in this age group. Pneumonia, malaria (severe, unspecified), respiratory TB and chronic obstructive pulmonary disease are the leading causes of death in more than one age group.

5) Proposed actions and recommendations

The following recommendations and subsequent action plan have been developed, based on the findings outlined above. Included are the broad recommendations that need to be raised with the Senior Executive Management of the National Department of Health, along with a summarised action plan for the Department.

a) Continue efforts to strengthen the CRVS system

The data analysis course was aimed at supporting countries to analyse their birth, death and cause-of-death data, with a focus on encouraging the production of registration-based vital statistics. The latter is in accordance with regional commitments, such as the regional Action Framework on Civil Registration and Vital Statistics for Asia and the Pacific, to which Papua New Guinea has signed up to. Goal three of this framework commits Papua New Guinea to producing accurate, complete and timely vital statistics (including cause-of-death) based on registration records and dissemination of the same.

The data analysis course highlighted significant gaps in the health data analysed by the Papua New Guinea team, primarily the unavailability of some of the variables, as well as the lack of unit-record data. For a more robust analysis (allowing for development of the required important tabulations and demographic indicators) and to achieve the objectives of the course, it would have been ideal for the Papua New Guinea team to bring to the course records from the civil registration department as well as from the health data base and to undertake a consolidated analysis based on the two collections.

Recognising the important role that civil registration plays as a source of vital statistics, it is important that Papua New Guinea continues to prioritise efforts to strengthen the national civil registration system. Such efforts would include: (i) undertaking an assessment of the CRVS system; (ii) developing a national plan that would be used to guide systematic improvements in the system; (iii) reviving the

national CRVS committee;⁴ and (iv) most especially, strengthening the working relations between the civil registration office and the Department of Health. Technical support towards improving the CRVS system is available through the Brisbane Accord Group, under the leadership of SPC and Bloomberg.

b) Roll-out of the E–National Health Information System

The data analysis course highlighted a range of data quality issues that are a direct result of the E–National Health Information System’s design and operation. These issues were raised with the developers of the training. Both participants have since had a meeting with the developers, who showed that much of the feedback provided has been used to improve the system and, more generally, that nearly all the issues raised have been resolved. However, the issue of cleaning data is not yet fully resolved and needs to be discussed with the NHIS leadership team and clear procedures put in place. There is a need to make decisions around who in the NHIS will clean the E-NHIS, and the frequency of conducting data cleaning.

c) Engage with the National Statistics Office regarding the production of health and vital statistics as a component of the National Strategy for the Development of Statistics

Health records are an important source of data for computation of a wide range of health and demographic indicators, including indicators that measure morbidity, mortality and fertility based on events that occur in health facilities. It is therefore critical that such data are analysed and published routinely as part of a country’s statistical release schedule.

Papua New Guinea has not yet established a routine statistical release schedule for administrative data maintained by the Department of Health, as well as that maintained by the Civil Registry Office. It is important that this is looked into as a component of the National Strategy for the Development of Statistics (NSDS), and that the modalities for establishing such a release are worked out with the relevant line ministries and departments. The National Statistics Office (NSO) has a critical role to play in driving this work and providing technical guidance as required, as well as in embedding this work within the NSDS.

The Department of Health is currently reviewing the National Health Information System. It is envisaged that, working with NSO, health data will be used to analyse and produce national reports that are of good quality and that meet international reporting standards. The team at the Monitoring and Research Branch of the Department have already begun work on strengthening the system. The team is planning to conduct training for data collectors in a bid to collate good quality national health data.

d) Training for data collectors / written procedures

The data analysis training underlined the importance of ensuring that data collectors understand how the data are utilised. Exposing data collectors to the end product of the collection and to how the data are put into use is a useful way of improving the quality of the collection and of building awareness about the sensitivity of the data collection exercise. The staff of the Performance Monitoring and Research Branch of the Strategic Policy Division, together with Data4Health staff, are developing a

⁴ Papua New Guinea has previously formalised a national CRVS committee (composed of the Department of Health, the Civil Registration Office and the National Statistics Office) but this has not been active since 2014. Since the training in September, the acting Manager for Performance Monitoring and Research Branch has held meetings with the Deputy Secretary for National Planning and Director for NSO to establish dialogue to revive the CRVS committee.

training agenda for data collectors at the health facility level. It is also envisaged that similar training will be conducted for provincial health information officers and officers in charge of health facilities. As part of this work, written documentation in the form of standard operating procedures for data collection will be produced and disseminated to all health facilities.

e) Summary and next steps

The major issues identified during the training related to the way data are collated and reported in the national health information system.

Participants conducted analyses for births, deaths and cause-of-death using information from various sources, as described in this report. The analyses highlighted important public health issues, such as deaths due to contraception procedures (tubal ligation), the high number of deaths in the <1 year-old age group, the high number of deaths in the 30–49 year-old age group, and the appearance of NCDs in this age group.

It is important that the team that attended the Data Analysis and Report Writing course meets with the Civil Registration Office and provide a briefing about the course, including key lessons learnt from the analysis of the data available. The discussions would also explore the possibility of initiating analysis of Civil registration data, based on the training provided, with the support of SPC.

Publishing registration-based statistics is of critical importance to Papua New Guinea in the routine assessment and planning for health, both nationally and sub-nationally. Registration records help to fill a critical gap by providing data between census years in a cost-effective way. Registration-based statistics are also vital in meeting regional and international reporting commitments, especially those pertaining to monitoring the health indicators of the Sustainable Development Agenda.⁵

During the training, the Brisbane Accord Group, through SPC, reiterated their commitment to support the country in the development of the CRVS system and in the analysis of registration data (health and civil registration data). In this regard, it is important for the country to seek technical support from the Brisbane Accord Group where such assistance is needed. In the short term, it is important for the country to seek technical support from SPC in the form of facilitators to conduct a similar training to the one attended in Noumea on Data Analysis and Report Writing for National Department of Health managers of health programmes, and staff from the Civil Registration Office and follow-up support in producing a vital statistics report.

⁵ http://www.who.int/gho/publications/world_health_statistics/2016/EN_WHS2016_Chapter6.pdf?ua=1.