



Tonga National Vital Statistics Report

2013 - 2018



UNSW
SYDNEY



Pacific
Community
Communauté
du Pacifique



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MAIN INDICATORS

Indicators	2013-2015	2016-2018	Unit
2016 Census Population			
Total	100,651		
Male	50,255		
Female	50,396		
Fertility			
Total birth	8,610	7,230	
Average number of births	2,870	2,410	
Sex ratio at birth	111	105	
Total fertility rate	3.7	3.2	per woman
Crude birth rate	27.8	23.9	per 1,000
Adolescent birth rate	38.8	35.5	per 1,000
Mortality			
Total death	2,503	2,501	
Average number of deaths	834	834	
Crude death rate	8	8	per 1,000
Neonatal mortality rate	4	6	Per 1,000
Infant mortality rate	13	14	per 1,000
Under-5 mortality rate	16	19	per 1,000
Cause of Death			
Total natural deaths	1,811	1,679	
Total non-natural deaths	82	93	
Maternal mortality ratio	46.45	41.49	per 100,000

EXECUTIVE SUMMARY

Civil registration and vital statistics are crucial to Tonga's development and growth. The information generated is essential to planning, policy-making and monitoring the Sustainable Development Goals (SDGs), having direct links to Goal 3 focusing on maternal and Infant Mortality and Goal 16 on universal birth registration. This report is the third for Tonga, the first being in 2003 followed by 2004 and covers the years 2013 – 2018, with three-year comparisons within the 6-year period. It is expected that after this report an annual analytical report will be compiled to provide a continuous annual trend of civil registration and vital statistics.

Data from the Health Planning and Information Section and the Reproductive Health Section of the Ministry of Health, the office of the Registra General of Ministry of Justice and the population denominators from the Tonga Department of Statistics were consolidated and used to develop this report.

The 2016 Household and Population Census reported a total of 100,651. The life expectancy at birth for Tonga for both 2013 – 2015 and 2016 – 2018 was 68 years old for both men and women.

For each year an average of 2,870 births occurred during 2013-2015 and for 2016-2018 there was an average of 2,410 live births. Tonga's crude birth rate for 2013 – 2015 was 27.8 per 1,000 population and 23.9 per 1,000 for 2016 – 2018, indicating a relative decrease in the number of births over the years. In the two periods 2013-2015 and 2016-2018, most births occurred among women aged 25 to 29 years, followed by women aged 20 to 24 years.

The Total Fertility Rate (TFR) in Tonga for 2013 - 2015 was 3.7, indicating that a woman of reproductive age would give birth to 4 children on average during her lifetime. For 2016 – 2018 the TFR was lower at 3.2. The total number of live births to teen mothers was 7.8% in 2013-2015 and 8.4% in 2016-2018. The proportion of live births to teenage mothers from total live births varied from 6.5% to 8.4% over the period 2013-2018.

The average annual deaths for the period of 2013 – 2015 and 2016 – 2018 were 834 for both periods. For the under-5 mortality, the estimated rate for 2013 – 2015 was 16 deaths per 1,000 live births and for 2016 – 2018 it was estimated to be at 19 deaths per 1,000 live-births. The infant mortality rate for 2013 – 2015 and 2016 – 2018 was estimated to be at 13 deaths and 14 deaths per 1,000 live births respectively. A total of 80 neonatal deaths were recorded throughout 2013 – 2018, with the neonatal mortality rate estimated at 4 deaths per 1,000 live births for the period of 2013 – 2015 and for 2016 – 2018 it was 6 deaths per 1,000 live births. There was a total of 7 maternal deaths for the period of 2013 – 2018.

The leading cause of death in Tongan males between 2013 and 2018 was 'circulatory system diseases' (cardiovascular diseases) which accounted for 30% of all deaths in 2013-2015 and 28% in 2016-2018. Ischemic heart disease was the most common type of cardiovascular disease: accounting for 54% of cardiovascular disease deaths in 2013-2015 and 56% in 2016-2018. The second leading cause of death category in males was 'endocrine, nutritional, and metabolic diseases', 91% of which was diabetes. Neoplasms (including cancers) were the third leading cause of death category, accounting for 13-14% of male deaths over 2013-2018. For females, the leading cause of death between 2013 and 2018 was endocrine, nutritional and metabolic diseases, which accounted for around 27% of all deaths, 93-94% of which were due to diabetes. The second leading cause of death in females was circulatory system diseases which

accounted for 24-25% of all deaths over 2013-2018. Ischemic heart disease was the most common type of circulatory condition (34% of circulatory diseases) followed by hypertensive disease. The leading cause of death among children under-5 years was congenital abnormalities including conditions such as congenital heart diseases, accounting for 23% of deaths at a rate of 82 deaths per 100,000 children.

INTRODUCTION

Vital statistics for Tonga are collected and maintained by various ministries within its government. These statistics are used by the Government of Tonga and other government entities, to provide evidence to inform decisions on health policy and planning, and to evaluate the effectiveness of programs for the benefit of the people of Tonga.

This is the first Vital Statistics Report since 2004 which covers the years 2013 to 2018 in Tonga. The National Civil Registry Vital Statistics (NCRVS) Committee, which consists of various government agencies but mainly the Tonga Statistics Department (TSD), Ministry of Health (MOH) and Ministry of Justice (MOJ) compiled this report to assist with this initiative for planning and legislating necessary health assistance programs for its people. These programs, in essence, will help prevent infectious and non-communicable diseases which could sustainably affect birth and death rates.

Capturing information on births and deaths is important for two major reasons.

- 1. To confer individual rights of identity and health services, property and status.**

Birth Registration ensures access to key rights, such as education, citizenship and travel documents. Death registration facilitates legal processes for families, such as land titles and access to bank accounts, it is also critical from official government lists, such as electoral rolls. Live birth in the hospital ensures that the services required by individuals are provided accordingly.

- 2. To provide crucial statistical information for planning and policy decisions.**

The government of Tonga are required by policy to report on their relevant statistical indicators on the Tonga Strategic Development Framework (TSDF II) which allows the Kingdom of Tonga to monitor its development and report on the Sustainable Development Goals (SDG)

The Vital Statistics data is a compilation between the civil registry data of the MOJ, and the Live birth database, Death database and the Reproductive Nurses database from MOH. The creation of the unit records on births and deaths are initiated at the hospital after medical review for each event. These events are notified to the MOJ and citizens of Tonga are obliged by law to register both birth and deaths in the civil registra. The records are forwarded to the TSD to conduct the data compilation and validation of both datasets and uses the Tonga 2016 Census of Population and Housing data for analysis.

In the Census 2016, Tonga is comprised of six islands (Tongatapu, Vava'u, Ha'apai, 'Eua, Niuatoputapu, and Niuafo'ou) and had a population of 100,651. The majority of people live on the island of Tongatapu (74%) and only slightly more than 1,000 (2%) reside in the islands of Niuafo'ou and Niuatoputapu.

With the main hospital located on Tongatapu, people are compelled to relocate to the main island of Tongatapu. Pregnant women from the territory's outer islands also come to Tongatapu for medical care. There are some pregnant women give birth on the outer islands. However, these births are eventually captured by MOH or the Civil Registry when parents register their kids for a birth certificate to enter school as required by law.

Chapter 1. BIRTHS AND FERTILITY

Number of Births

According to the consolidated data, Table 1.1 shows a total of 15,840 live births in Tonga between 2013 and 2018. The largest number of births took place in 2013, with 2,887 births and the lowest number of births in 2018 with a 2,135. This highlights a drop of 26% in live births from the year 2013 to 2018. Figure 1.1 showcases births in 2013-2018, 52% were males and 48% were female births, though the proportion varied from 50% male and 54% female during 2013-2018, and 46% male and 50% female during 2016-2018.

Table 1.1: Total number of births by sex per year, 2013-2018.

Year	Female	Female %	Male	Male %	TOTAL
2013	1,393	48%	1,494	52%	2,887
2014	1,366	48%	1,509	53%	2,875
2015	1,318	46%	1,530	54%	2,848
2016	1,264	48%	1,368	52%	2,632
2017	1,239	50%	1,224	50%	2,463
2018	1,025	48%	1,110	52%	2,135
TOTAL	7,605	48%	8,235	52%	15,840

Table 1.2: Average number of births by sex, by three-year period, 2013-2018.

Period	Female Average	Male Average	Total Average
2013 - 2015	1,359	1,511	2,870
2016 - 2018	1,176	1,234	2,410

Table 1.2 showcases average average births of 2,870 births occurred during 2013-2015, for female live births it was an average of 1,359 and male was a 1,511. For the year 2016-2018, there was an average of 2,410 live births with an average of 1,176 for female and 1,234 for male. The sex ratio at birth for Tonga for the period 2013-2018 was 108.3. This means that for every 100 live female births, there were 108 male live births during 2013-2018.

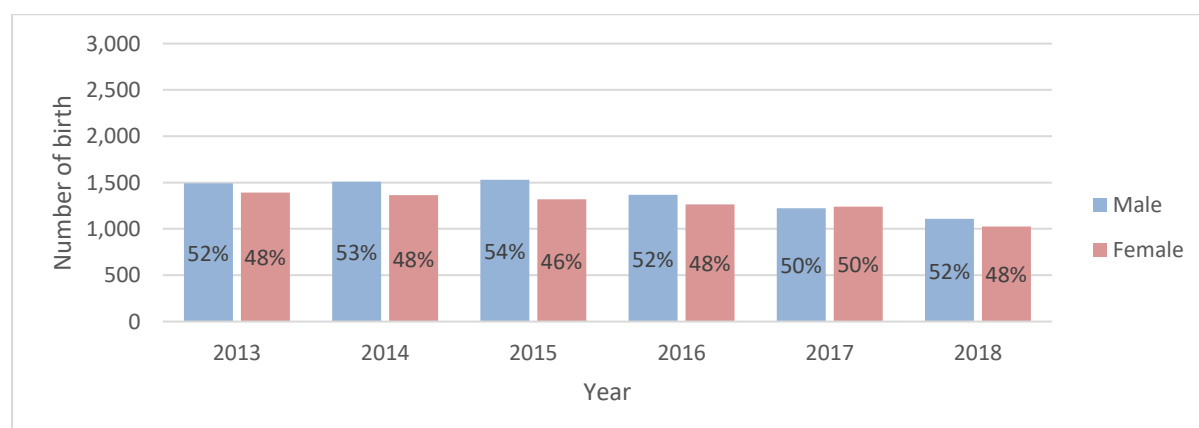


Figure 1.1: Number of birth by percentage by sex, 2013-2018

Age of Mother

The age of the mother is an important variable for calculating age-specific fertility rates and total fertility rates and monitoring reproductive health. Childbearing age is generally considered to be from 15 to 49 years of age. Babies born to mothers outside this age range are possible but not common. Very young or older mothers are at higher risk of pregnancy complications. Newborns and infants of adolescent mothers are also at higher risk of low birth weight and mortality. High numbers of births in mothers at younger ages are associated with shorter periods between generations and more rapid population growth.

In the two periods 2013-2015 and 2016-2018, most births occurred among women aged 25 to 29 years, followed by women aged 20 to 24 years (Table 1.3). Across the two periods, the percentage of births among women aged <29 years slightly decreased (Figure 1.2). The age-specific fertility rate is a better measure of the age pattern of fertility, that is, the relative frequency of births among women of different ages within the reproductive years, as it is not affected by differences in the age distribution among women of reproductive age. It should be noted that only the MOH provided data on the age of the mother.

Table 1.3: Percentage distribution of live births by age of mother by three-year period, 2013-2018.

Mothers' Age-group	2013 - 2015		2016 - 2018	
	Number	%	Number	%
<15	3	0	0	0
15-19	619	8%	581	8%
20-24	2,123	27%	1,795	26%
25-29	2,285	29%	1,883	27%
30-34	1,787	22%	1,600	23%
35-39	872	11%	833	12%
40-44	246	3%	222	3%
45+	11	0%	16	0%
TOTAL	7946	100	6930	100

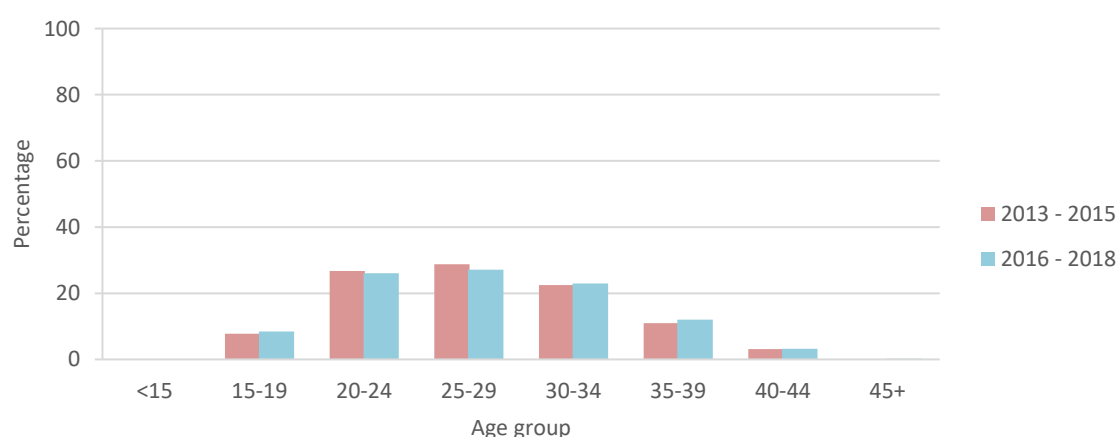


Figure 1.2: Percent distribution of births by age group of mother by three-year period, 2013-2018.

Teenage (or adolescent) Pregnancy

Teenage (or adolescent) mothers refer to births to women aged 15-19 years. The total number of live births to teen mothers was 7.8% in 2013-2015 and 8.4% in 2016-2018. The proportion of live births to teenage mothers from total live births varied from 6.5% to 8.4% over the period 2013-2018 (Table 1.4). Given the risks associated with childbearing at younger ages, the teenage fertility rate (see “Age-specific fertility rates” section) is an important indicator for determining sexual reproductive health services to young mothers and women and the effectiveness of programmes aimed at preventing unwanted teenage pregnancies.

Table 1.4: Teenage (aged 15-19 years) pregnancy (%) 2013-2018.

Teen Pregnancy	2013	2014	2015	2016	2017	2018	TOTAL
Mothers ^a	218	216	185	222	195	164	1200
Total live births ^b	2,887	2,875	2,848	2,632	2,463	2,135	15,840
Mothers of unknown age	251	231	182	61	150	89	964
Total live births	2,636	2,644	2,666	2,571	2,313	2,046	14,876
Proportion (%) ^c	7.6	7.5	6.5	8.4	7.9	7.7	7.6

^a number of adolescent mothers aged 15-19 per year; ^b Total live births to mothers of all ages per year; ^c Proportion of all live births per year which were to adolescent mothers aged 15-19 years

Place and island of birth

In this report, births that occurred in the hospital and the health centres are grouped into the ‘Hospital/Health centre’ category. The category ‘Home’ is for births in the community or at the mother’s home. During 2013-2018, 99% of births occurred at a health facility 82% occurred in Tongatapu (Table 1.5). Few mothers deliver outside a health facility with less than 1% in the largest island Tongatapu, 2-3% in other islands) 18% births took place in the outer islands..

Children born overseas to a Tongan parent (mother and/or father) are sometimes registered with the Ministry of Justice when the parent(s) return to Tonga with the child. It is assumed that Tongan parents overseas find it easier for their child to have a Tongan passport to facilitate easy travel to and from the country. However, overseas-born children (667 in total during 2013-2018) are excluded from this report.

Table 1.5: Distribution of births by place of occurrence and island, 2013-2018.

Island	Hospital / Health centre		Community setting/ Home		Total
	Number	Percentage (%)	Number	Percentage (%)	
Tongatapu	12,818	99%	102	1%	12,920
Vava'u	1,997	98%	49	2%	2,046
Ha'apai	503	97%	17	3%	520
Eua	343	98%	8	2%	351
Ongo Niua	2	*	1	*	3
Total	15,663	99%	177	1%	15,840

The islands of Ongo Niua are not represented well by the MoH and MoJ databases. It is assumed that almost all mothers in the Niua transfer to the main islands of Vava'u or Tongatapu to give birth due to the greater access to health services. The numbers shown in the table represent where the mother delivered her child, which is not necessarily her usual place of residence. * means zero

Crude Birth Rate

The crude birth rate (CBR) is the number of births per 1,000 population over a given period. The CBR can tell us how much the population is growing or decreasing, when subtracted from the crude death rate (refer to Chapter 3, section Summary Measures of Mortality), assuming there is no migration. The CBR is also useful for government planning infrastructure, transport, and provision of services, such as indicating how many children will be entering school in the coming years, or how many adults will be entering the workforce. The CBR is affected by changes in the population age structure over the period of interest.

The CBR for Tonga was 27.8 per 1,000 population during 2013-2015, and 23.9 per 1,000 live births during 2016-2018 (Table 1.6). The 2011 Census Population (n= 103,252) multiplied by 3 was used as the denominator population for the 2013-2015 period. The 2016 Census Population (n= 100,651) multiplied by 3 was used as the denominator population for the 2016-2018 period.

Table 1.6: CBR by three-year period, 2013-2018.

Period	Crude birth rate
2013 - 2015	27.8
2016 - 2018	23.9

95%CI calculated using the normal approximation to the binomial

Age-Specific Fertility Rates

Age-specific fertility rates (ASFR) are the number of live births occurring to mothers of a certain age group per 1,000 women in that age group in a given period. The ASFR is usually calculated for 5-year age groups of women of childbearing age. Table 1.7 identifies the adolescent fertility rate (AFR) for 2013-2015 was 39 and 2015-2018 was 38 live births per 1,000 women. In Figure 1.3 age 20-24, 25-29, 30-34 is the age trend for Tongan women to give birth with age 25-29 at the peak.

Table 1.7: Age-specific fertility rates, by three-year period, 2013-2018.

Mother's age group (years)	2013-2015 Rate (per 1,000 women)	2016-2018 Rate (per 1,000 women)
10-14	0	0
15-19	39	38
20-24	173	145
25-29	190	181
30-34	180	151
35-39	98	94
40-44	29	27
45-49	2	2

Calculated using the Fertility Calculation Tool (Taylor & Morrell 2015)

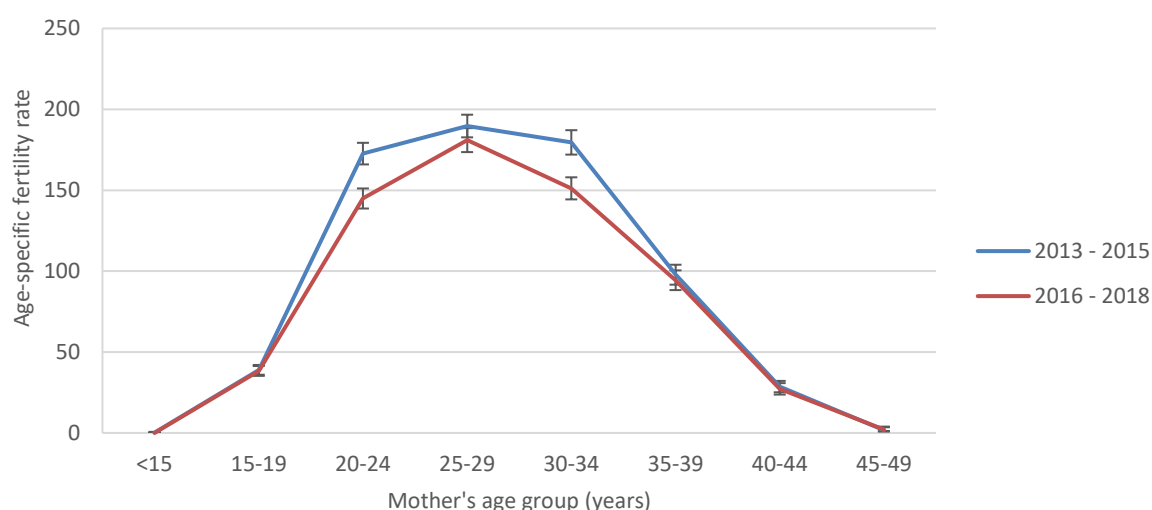


Figure 1.3: Age-specific fertility rates, by three-year period, 2013-2018.

Fertility among the age groups declined over the two periods 2013-2015 and 2016-2018 but followed a similar pattern throughout the years. This highlights that women have less number of live birth but the age trend for giving birth is still the same.

The AFR (live births per 1000 women aged 15-19 years) was 39 in 2013-2015 and 38 in 2016-2018. Fertility rates increased rapidly after the teenage years to 173 (2013-2015 period) and 144 (2016-2018 period) births per 1000 women aged 20-24. Rates peaked at 190 (2013-2015 period) and 179 (2016-2018 period) births per 1000 women aged 25-29, before falling to 180 (2013-2015 period) and 150 (2016-2018 period) births per 1000 women aged 30-34 (Age-specific fertility rates (ASFR) are the number of live births occurring to mothers of a certain age group per 1,000 women in that age group in a given period. The ASFR is usually calculated for 5-year age groups of women of childbearing age. Table 1.7 identifies the adolescent fertility rate (AFR) for 2013-2015 was 39 and 2016-2018 was 38 live births per 1,000 women. In Figure 1.3 age 20-24, 25-29, 30-34 is the age trend for Tongan women to give birth with age 25-29 at the peak.

Table 1.7, Figure 1.3).

The teenage fertility rates for both periods are considered ‘moderate’ (between 30 and 59 births per 1000 women aged 15-19 years) based on trendline analyses of the available fertility data from Pacific island countries and territories [Sorchik et al., 2019].

Total Fertility Rates

The total fertility rate (TFR) is the average number of children a woman (or per 1000 women) would give birth to during her lifetime if she were to pass through her childbearing years experiencing the prevailing age-specific fertility rates. The TFR is the most widely used fertility measure in program impact evaluations. Being derived from the age-specific fertility rate, it is unaffected by changes in the age-sex composition of the population.

For the period 2013-2015, based on reconciled live births from all sources, the TFR in Tonga was 3.7, which indicates that a woman of reproductive age would give birth to 4 children on average during her lifetime. The TFR in 2016-2018 was lower at 3.2. The TFR for both periods is considered ‘moderately high’ (greater than or equal to 3.0 but less than 4.0) based on trendline analyses of the available fertility data from Pacific island countries and territories [Sorchik et al., 2019].

The observed ASFR and TFR over 2013-2018 may reflect factors such as delayed marriage and childbearing, and out-migration of young women (particularly aged 20-34) pursuing work or higher education opportunities in Australia, New Zealand and the United States, among other countries.

Table 1.8: Total Fertility Rates, by three-year period, 2013-2018.

Period	Total Fertility Rate (TFR)
2013 - 2015	3.5
2016 - 2018	3.2

Calculated using the Fertility Calculation Tool (Taylor & Morrell 2015)

Chapter 2. MORTALITY

Number of Deaths

The archived records of deaths for Tonga were collected from the Civil registration, Medical death certificates, Community nursing reports and the Hospital discharge records. This resulted to a total of 5,004 deaths recorded for Tonga for 2013 to 2018, inclusive. There were more male than female deaths across all six years (Figure 2.1).

Table 2.1: Number of deaths recorded in each source, and when reconciled, 2013-2018a.

Year	Civil registration	Medical death certificates	Community nursing reports	Hospital discharge	Reconciled
2013	462	573	517 ^b	158	759 ^c
2014	588	722	660	188	939
2015	519	598	572	136	805
2016	541	645	579	125	830
2017	571	530	591	132	836
2018	556	597	601	104	835
Total	3,237	3,665	3,520	843	5,004

^a After deduplication. Excludes ^bThis figure is incomplete as the community nursing reports for six health centres in Tongatapu and the health centres in Ha'apai and Vava'u were not available. ^c This figure is likely to be an undercount of the number of deaths in 2013 due to unavailable community nursing reports.

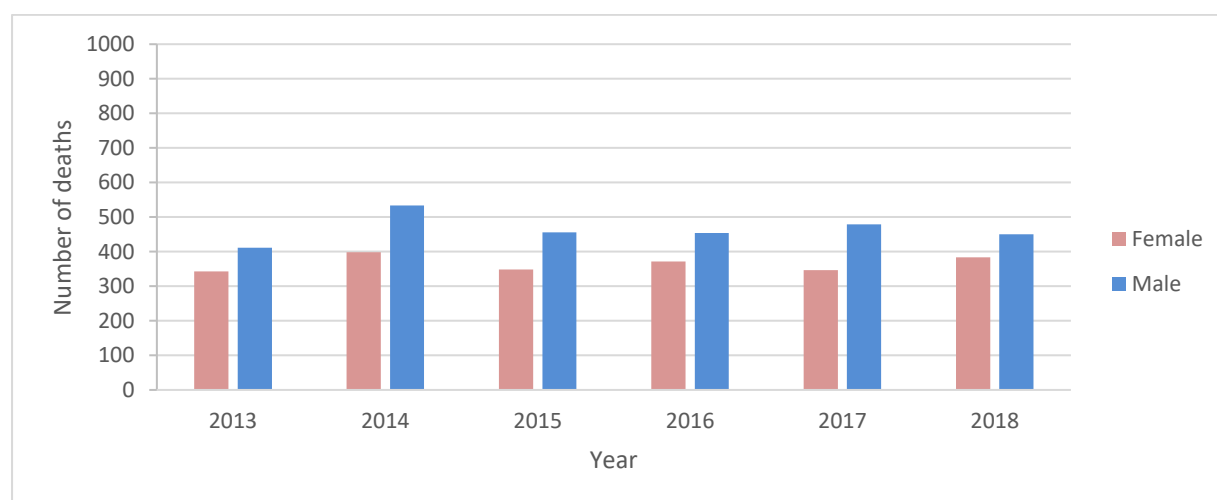


Figure 2.1: Number of deaths by year and sex, 2013-2018.

The average number of deaths per year was 834 for both male and female in 2013-2018 periods. The average number of male deaths was higher than that of females in both three-year periods.

Table 2.2: Average number of deaths per year, by three-year period, 2013-2018

Period	Male	Female	Total
2013-2015	469	365	834
2016-2018	463	370	834

Due to rounding, the average male and female deaths for each period do not equal the total

Summary Measures of Mortality

Crude Death Rate and Directly Age Standardised Mortality Rate

Table 2.3 presents both the crude death rate (CDR) (deaths per 1,000 population) and the direct age-standardised mortality rate in Tonga. Age-standardised mortality rates are one country's age-specific death rates applied to standard age distribution. Age-standardised rates allow the comparison of death rates over time or between different populations without the age structure of the populations influencing the death rates. This is important as a greater proportion of older people in the population structure (as health conditions improve and people live longer) would result in a higher number of deaths (as death is inevitable). Under identical health and social conditions, populations with a greater proportion of older people have higher crude death rates than populations comprised of a greater proportion of younger people.

Data has been age-standardised to the most recent period shown using the WHO World Standard Population (Appendix 2), resulting in an age-standardised mortality rate for Tonga of 11 deaths per 1000 population in 2013-2015 and 10 deaths per 1000 population in 2016-2018.

Table 2.3: Crude death rate and directly age-standardised mortality rate (per,1000 population), by three-year period, 2013-2018.

Period	Number of deaths	Crude death rate	Directly Age-standardised mortality rate
2013-2015	2,503	8.1	10.8
2016-2018	2,501	8.3	10.4

Crude death rates and directly age-standardised mortality rates have been calculated with the Direct Age-Standardisation Calculation Tool [Taylor & Morrell 2015] using the census populations as the denominator. The 2011 census population was multiplied by three to calculate an estimate of the total population over the period 2013-2015. Similarly, the 2016 census population was tripled to estimate the 2016-2018 total population [Tonga Statistics Department 2013, 2017]. Refer to Appendix 3 for population estimates.

Infant and Child Mortality

Neonatal Mortality

The neonatal mortality rate is the number of deaths in live-born infants during the first 28 days of life per 1,000 live births, over a specified period. Neonatal mortality accounts for a large proportion of child deaths and is considered a useful indicator of maternal and neonatal health and care. Generally, as infant deaths (deaths before 1 year of age) decrease (for example through major improvements in environmental hygiene, immunisation and nutrition), and fewer

deaths are attributed to infectious diseases and environmental influences, a greater proportion of infant deaths would be expected to occur in the neonatal period. The neonatal mortality rate, however, should not increase as this occurs.

In table 2.4 there were 80 neonatal deaths recorded in Tonga for the six years from 2013 to 2018. The year 2017 had the highest number of neonatal deaths recorded and 2014 and 2018 recorded the lowest. The neonatal mortality rate in Tonga between 2013-2018 was approximately 4-6 deaths per 1000 live births.

Table 2.4: Number of neonatal deaths (deaths in children aged ≤ 28 days), 2013-2018.

Year	Male	Female	Unknown sex	Total
2013	7	5	1	13
2014	6	2	2	10
2015	11	2	0	13
2016	8	6	1	15
2017	15	2	2	19
2018	3	6	1	10
Total	50	23	7	80

The neonatal mortality rate in Tonga between 2013-2018 was approximately 4-6 deaths per 1000 live births.

Table 2.5: Neonatal mortality rate (neonatal deaths per 1,000 live births), by three-year period, 2013-2018.

Period	Neonatal mortality rate
2013-2015	4.2
2016-2018	6.0

Calculated using the IMR and U5MR Calculation Tool [Taylor & Morrell 2015]

Infant Mortality

Infant deaths are deaths which occur before 1 year of age. There was a total of 216 infant deaths recorded in Tonga for the six years from 2013 to 2018. The highest number of infant deaths was recorded in 2017 with 44 deaths (Table 2.6), while 30 infant deaths were reported in 2013 and 2016. There were more male infant deaths than female infant deaths in general, particularly in 2015 and 2017.

Table 2.6: Number of infant deaths (deaths in children under age 1), 2013-2018.

Year	Male	Female	Unknown sex	Total
2013	16	12	2	30
2014	20	19	3	42
2015	25	14	0	39
2016	15	14	1	30
2017	26	13	5	44
2018	15	15	1	31
Total	117	87	12	216

The infant mortality rate (IMR) is the number of deaths in live-born infants during the first year of life per 1,000 live births, over a specified period. Table 2.7 shows the IMR for 2013-2015 as 13 deaths per 1,000 live births and 14 deaths per 1,000 live births in 2016-2018.

Table 2.7: Infant mortality rate (deaths in children under age 1 per 1000 live births), by three-year period, 2013-2018.

Period	Infant mortality rate
2013-2015	12.7
2016-2018	14.3

Calculated using the IMR and U5MR Calculation Tool [Taylor & Morrell 2015]

Under-five Mortality

Under-five mortality describes deaths which occur before a child reaches their fifth birthday. There was a total of 279 under-five deaths recorded in Tonga for the 2013 to 2018 period. The highest number of these deaths occurred in 2014 and 2017 and the lowest in 2013. In general, there were more male under-five deaths than female under-five deaths, particularly from the year 2015 (Table 2.8).

Table 2.8: Number of deaths in children aged under-five, by sex, 2013-2018.

Year	Male	Female	Unknown sex	Total
2013	19	17	2	38
2014	25	24	3	52
2015	28	19	0	47
2016	29	16	1	46
2017	32	16	5	53
2018	24	18	1	43
Total	157	110	12	279

The under-five mortality rate (U5MR) is the number of deaths in live-born infants before their fifth birthday per 1,000 live births, over a specified period. The U5MR for Tonga for 2013-15 is 16 deaths per 1000 births and in 2016-18 19 deaths per 1,000 births (Table 2.9).

Table 2.9: Under-five mortality rate (deaths in children under age 1 per 1000 live births), by three-year period, 2013-2018.

Period	Under-five mortality rate
2013-2015	15.9
2016-2018	19.1

Calculated using the IMR and U5MR Calculation Tool [Taylor & Morrell 2015]

Deaths by age and sex of the decedent

Table 2.10 below shows the number of deaths by age and sex of the deceased for 2013 to 2018. During the periods 2013-2015 and 2016-2018, the highest number of deaths for males occurred in the 70-74 years age group; and for females in the 85+ years age group.

Table 2.10: Deaths by age and sex of the deceased, by three-year period, 2013-2018a.

Age	2013 – 2015					2016 – 2018				
	Total deaths			(%)		Total deaths			(%)	
	Male	Female	Total	Male	Female	Male	Female	Total	Male	Female
Neonatal (<28 days)	27	9	36	1.9	0.8	29	15	44	2.1	1.4
28 days to <1 year	26	25	51	1.8	2.3	18	18	36	1.3	1.6
<1	11	13	24	0.8	1.2	14	11	25	1.0	1.0
1-4 years	11	15	26	0.8	1.4	29	8	37	2.1	0.7
5-9 years	11	6	17	0.8	0.5	7	4	11	0.5	0.4
10-14 years	10	3	13	0.7	0.3	8	10	18	0.6	0.9
15-19 years	18	5	23	1.3	0.5	23	10	33	1.7	0.9
20-24 years	28	11	39	2.0	1.0	21	12	33	1.5	1.1
25-29 years	16	8	24	1.1	0.7	27	12	39	1.9	1.1
30-34 years	27	17	44	1.9	1.6	27	10	37	1.9	0.9
35-39 years	29	19	48	2.1	1.7	30	23	53	2.2	2.1
40-44 years	41	34	75	2.9	3.1	38	35	73	2.7	3.2
45-49 years	90	58	148	6.4	5.3	73	57	130	5.3	5.1
50-54 years	90	48	138	6.4	4.4	104	76	180	7.5	6.8
55-59 years	106	82	188	7.5	7.5	116	89	205	8.3	8.0
60-64 years	123	89	212	8.7	8.1	119	79	198	8.6	7.1
65-69 years	135	120	255	9.6	11.0	118	96	214	8.5	8.6
70-74 years	181	108	289	12.9	9.9	162	102	264	11.7	9.2
75-79 years	154	122	276	10.9	11.1	160	119	279	11.5	10.7
80-84 years	128	111	239	9.1	10.1	123	126	249	8.8	11.3
85+ years	125	174	299	8.9	15.9	129	189	318	9.3	17.0
unknown	21	18	39	1.5	1.6	15	10	25	1.1	0.9
Total	1,408	1,095	2,503	100	100	1,390	1,111	2,501	100	100

^a Deaths of unknown sex were redistributed

Age-Specific Mortality

An age-specific mortality rate is the number of deaths per 1,000 people for a specific age or age group, in a specific period. The age-specific mortality rates for males (Table 2.11) fluctuated in the younger ages up to around 30-40 years of age, after which age-specific mortality steadily increased with increasing age, peaking in the 85+ age group. For females (

Table 2.12), age-specific mortality fluctuated in the younger ages up to around 30 years of age, after which age-specific mortality also steadily increased with increasing age, peaking in the 85+ age group.

Table 2.11: Male Age-Specific Mortality Rates (deaths per 1,000 males), by three-year period, 2013-2018.

Age (years)	2013-2015		2016-2018	
	Number of Deaths	Age-Specific Mortality Rate	Number of Deaths	Age-Specific Mortality Rate
<1	64	13.1	61	16.7
1-4	11	0.8	29	1.9
5-9	11	0.5	7	0.4
10-14	10	0.4	8	0.4
15-19	18	0.7	23	1.4
20-24	28	1.6	21	1.7
25-29	16	1.1	27	2.9
30-34	27	2.3	27	3.0
35-39	29	2.8	30	3.7
40-44	41	4.4	38	5.2
45-49	90	10.9	73	9.5
50-54	90	12.6	104	16.5
55-59	106	20.2	116	24.9
60-64	123	28.4	119	30.9
65-69	135	40.3	118	41.1
70-74	181	56.7	162	74.2
75-79	154	82.8	160	93.7
80-84	128	118.0	123	131.5
≥85	125	248.7	129	275.0
Total	1408		1390	

Table 2.12: Female Age-Specific Mortality Rates (deaths per 1,000 females), by three-year period, 2013-2018.

Age (years)	2013 – 2015		2016 - 2018	
	Number of Deaths	Age-Specific Mortality Rate	Number of Deaths	Age-Specific Mortality Rate
<1	47	11.7	44	12.6
1-4	15	1.0	8	0.5
5-9	6	0.3	4	0.2
10-14	3	0.2	10	0.6
15-19	5	0.3	10	0.7
20-24	11	0.9	12	1.0
25-29	8	0.7	12	1.2
30-34	17	1.7	10	1.0
35-39	19	2.2	23	2.6
40-44	34	4.0	35	4.3
45-49	58	8.9	57	7.4
50-54	48	8.5	76	12.6
55-59	82	17.0	89	17.8
60-64	89	23.1	79	19.0
65-69	120	36.0	96	30.3
70-74	108	41.2	102	39.6
75-79	122	68.0	119	59.2
80-84	111	93.8	126	103.3
≥85	174	228.6	189	204.3
Total	1095		1111	

Figure 2.2 and Figure 2.3 show the age-specific mortality rates of males between 2013 and 2018. The graphs show that for all ages 1 year and older, the age-specific mortality rate for males is higher than that for females in the same age category. For both males and females, age-specific mortality is relatively high in young infants under 1 year of age but decreases with age until reaching the lowest age-specific mortality rate in the 5-14 years age-groups. From around 15 years onwards, mortality increases with increasing age.

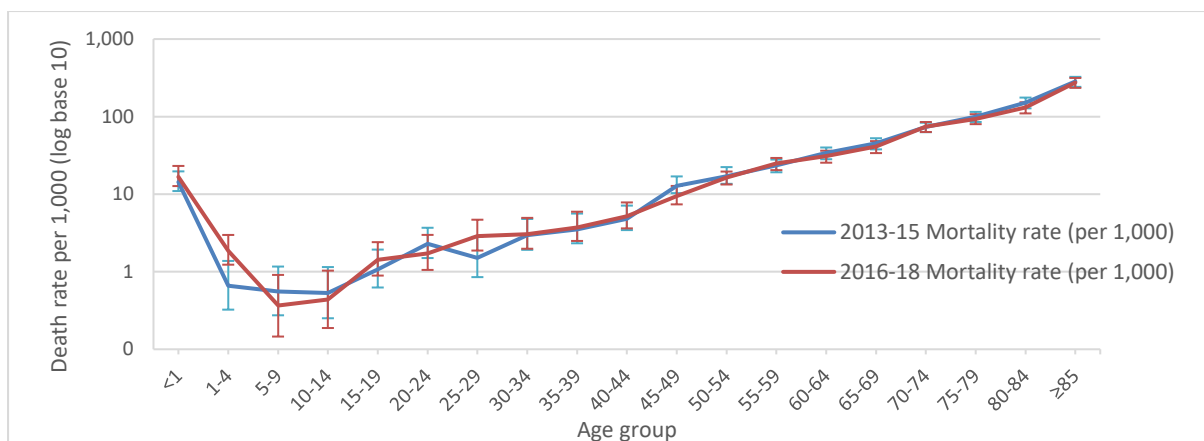


Figure 2.2: Male Age-Specific Mortality Rates (deaths per 1,000 people), by three-year period, 2013-2018.

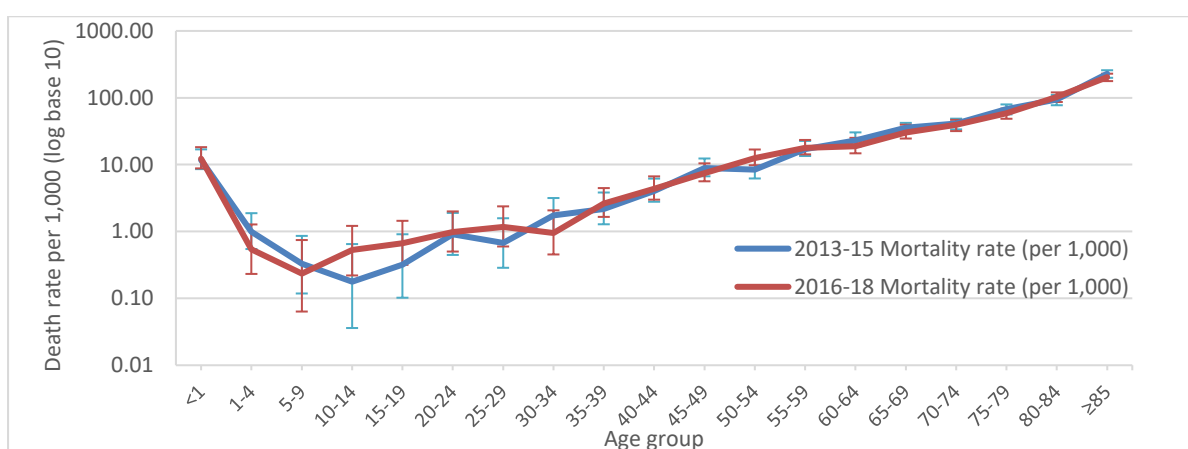


Figure 2.3: Female Age-Specific Mortality Rates (deaths per 1,000 people), by three-year period, 2013-2018.

Life Expectancy at Birth

Life expectancy at birth (LE_0) indicates the number of years a newborn would live, on average, if the current patterns of mortality at the time of its birth were to remain the same throughout its life.

The life expectancy values for 2013-2018 in Table 2.13 are based on the <1 to ≥85 years life table with 5-year intervals over 1 year. LE_0 for 2013-2018 for both sexes combined was 68.0 years. The LE_0 for females was approximately 71 which is higher than that for males at 65.4 years.

Table 2.13: Life Expectancy at Birth, by three-year period, 2013-2018.

Period	Male	Female	Total
2013-2015	65.4	70.8	68.0
2016-2018	65.4	70.9	68.0

Calculated using the Life Table and Probability of Dying Calculation Tool [Taylor & Morrell, 2015]. Life expectancy calculations were based on the <1 to ≥85 years life table with 5-year intervals over 1 year.

Premature mortality

Adult Mortality (15-59 years)

Adult mortality is often characterised as the probability of dying between the ages of 15 to 59 years inclusive, or the probability of a 15-year-old dying before reaching the age of 60. Table 2.14 below shows that the adult mortality rate during the period 2013-2018 was 29% for males and around 20% for females.

Table 2.14: Adult Mortality (%) by sex and three-year period, 2013-2018.

Period	Male	Female	Total
2013- 2015	29.4	19.9	24.7
2016-2018	29.1	21.6	25.3

Calculated using the Life Table and Probability of Dying Calculation Tool [Taylor & Morrell, 2015]

Life Expectancy at age 40

Life expectancy at 40 years of age is also an indicative measure of premature mortality. This is the number of years a person aged 40 would be expected to live, on average, if they continued to experience current mortality rates. Table 2.15 below shows that life expectancy at age 40 for the period 2013-2018 was approximately 29 for males and 33 for females. In other words, a male aged 40 during 2013-2018 could expect to live until 29 years of age, whilst a female aged 40 could expect to live until 33 years of age.

Table 2.15: Life Expectancy at 40 (LE40) by sex and three-year period, 2013-2018.

Period	Male	Female	Total
2013- 2015	28.9	33.2	31.0
2016-2018	29.6	33.5	31.5

Calculated using the Life Table and Probability of Dying Calculation Tool (Taylor R 2015) NB* Life expectancy calculations were based on the <1 to ≥85 years life table with 5-year intervals over 1 year [Taylor & Morrell, 2015]

Maternal Mortality

Maternal death is defined by the WHO as the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes.

The maternal mortality ratio (MMR) is the ratio of the number of maternal deaths during a given period per 100,000 live births during the same period. Live birth is defined by the WHO as the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of the pregnancy, which, after such separation, breathes or shows any other evidence of life - e.g. beating of the heart, pulsation of the umbilical cord or definite movement of voluntary muscles - whether or not the umbilical cord has been cut or the placenta is attached. Each product of such a birth is considered live born.

Table 2.16: Number of maternal deaths and maternal mortality ratio in 2013-2018a.

Period	Number of maternal deaths	Maternal Mortality Ratio
2013-2018	7	44.19

^a Based on Ministry of Health medically certified death certificates and reproductive health services' community nursing reports

Table 2.16 shows that 7 maternal deaths were reported in Tonga over 2013-2018. This figure should be interpreted with caution. Maternal deaths may be under-reported if the certifier is not aware of the pregnancy or the pregnancy is not mentioned on the death certificate. There is also a need to clearly distinguish between deaths from pregnancy-related complications (direct maternal deaths) versus from existing conditions exacerbated by pregnancy (indirect maternal deaths).

Table 2.17: Number of maternal deaths by year from 2013-2018.

Period	Number of maternal deaths
2013	2
2014	1
2015	1
2016	2
2017	1
2018	0

Maternal deaths provide an important insight into healthcare, access to services, and service use. Most maternal deaths are largely preventable. The target indicator set out in the Sustainable Development Goals is to reduce maternal mortality ratio to less than 70 deaths per 100,000 live births by 2030. It is important to ensure all maternal deaths are captured and reported accurately.

Chapter 3. CAUSES OF DEATH

Please note that all analyses in this chapter, except where indicated, are based on deaths for which a medical certificate of cause of death was issued (around 73% of all deaths in 2013-2018, see Table 3.1 in Chapter 3). The causes of death presented here are based on the underlying cause of death selected by Iris from among the conditions listed on the certificate. Certification errors and biases have not been corrected.

Natural and non-natural causes of death

Natural deaths refer to deaths from natural causes such as disease progressing to organ failure; non-natural deaths refer to deaths occurring due to accident, suicide, or homicide. Non-natural causes are classified in ICD-10 Chapter XX External causes of morbidity and mortality (codes V01-Y98); codes representing the nature of the injury are found in Chapter XIX, Injury, poisoning and certain other consequences of external causes (codes S00-T98). Natural causes are classified to all other valid codes for mortality in other ICD-10 chapters. Table 3.1 shows the annual number of natural and non-natural deaths with a medical certificate for the period 2013-2018; 3467 deaths (95%) were due to natural causes.

Table 3.1: Percentage distribution of natural and non-natural causes of death in 2013-2018.

Period	Number of natural deaths	%	Number of non-natural deaths	%	Total
2013	546	95	27	5	573
2014	692	96	30	4	722
2015	573	96	25	4	598
2016	609	94	36	6	645
2017	506	96	24	5	530
2018	564	95	33	6	597
Total	3490	95	175	5	3665

Source: Ministry of Health medical death certificates 2013- 2018

Leading underlying causes of death (all ages)

Based on deaths for which a medical death certificate was issued, the leading cause of death category in Tongan males between 2013 and 2018 was ‘circulatory system diseases’ (cardiovascular diseases) which accounted for 30% of all deaths in 2013-2015, and 28% in 2016-2018 (Table 3.2). Ischemic heart disease was the most common type of cardiovascular disease: accounting for 54% of cardiovascular disease deaths in 2013-2015 and 56% in 2016-2018. Ischemic heart disease results from impaired blood flow to the heart and includes acute myocardial infarction (heart attack) and chronic ischemic diseases, including coronary atherosclerosis. Cerebrovascular disease (stroke) caused 16% of cardiovascular disease deaths in 2013-2015 and 14% in 2016-2018. The second leading cause of death category in males was ‘endocrine, nutritional, and metabolic diseases’ (Table 3.2), 91% of which were diabetes. Neoplasms (including cancers) was the third leading cause of death category, accounting for 13-14% of male deaths over 2013-2018 (Table 3.2).

The leading cause of death category in females between 2013 and 2018 was endocrine, nutritional and metabolic diseases, which accounted for around 27% of all deaths during the period (Table 3.3), 93-94% of which were due to diabetes. The second leading cause of death category in females was circulatory system diseases which accounted for 24-25% of all deaths over 2013-2018. Ischemic heart disease was the most common type of circulatory condition (34% of circulatory diseases) followed by hypertensive disease (25%).

Leading causes of death for all ages is of limited use from a public health perspective as we are most interested in the causes of premature deaths.

Table 3.2: Ten Leading Medically Certified Causes of Deaths (by ICD chapter) in Males, by three-year period, 2013-2018.

List code ^a	Disease category	2013-2015		2016-2018	
		Number of deaths	%	Number of deaths	%
064	Circulatory system diseases	305	30	268	29
051	Endocrine, nutritional, and metabolic diseases	194	19	210	22
026	Neoplasms	142	14	122	13
072	Respiratory diseases	135	13	100	11
095	External causes	62	6	72	8
001	Infectious and parasitic diseases	46	5	41	4
078	Digestive system diseases	38	4	32	3
084	Genitourinary diseases	22	2	33	3
083	Musculoskeletal diseases	23	2	16	2
058	Nervous system diseases	15	1	19	2
	<i>All Other Causes</i>	<i>37</i>	<i>4</i>	<i>40</i>	<i>4</i>
094	Ill-defined conditions	58		33	
	Total	1077		986	
	Total minus ill-defined causes	1019	100.0	953	100.0

Source: Ministry of Health medical death certificates 2013- 2018

^a ICD-10 General mortality List 1 (103 causes) codes (Appendix 4)

^b percent distribution of deaths excludes ill-defined causes

Table 3.3: Ten Leading Medically Certified Causes of Deaths (by ICD chapter) in Females, by three-year periods, 2013-2018.

		2013-2015		2016-2018	
List code ^a	Disease category	Number of deaths	%	Number of deaths	%
051	Endocrine, nutritional, and metabolic diseases	204	27	199	27
064	Circulatory system diseases	185	24	188	25
026	Neoplasms	165	22	151	20
072	Respiratory diseases	67	9	54	7
001	Infectious and parasitic diseases	28	4	32	4
084	Genitourinary diseases	22	3	24	3
078	Digestive system diseases	24	3	22	3
095	External causes	20	3	21	3
082	Skin diseases	15	2	17	2
048	Blood- and immune-related diseases	10	1	13	2
	<i>All Other Causes</i>	<i>26</i>	<i>3</i>	<i>21</i>	<i>3</i>
094	Ill-defined conditions	50		44	
	Total	816		786	
	Total minus ill-defined causes	766	100.0	742	100.0

Source: Ministry of Health medical death certificates 2013- 2018

^a ICD-10 General mortality List 1 code (Appendix 4)

^b percent distribution of deaths excludes ill-defined causes

Underlying causes of death by key age groups

Mortality in Children Aged 0-4 years

Deaths amongst children aged 0-4 years are highest among infants. Based on deaths with a medical death certificate, the leading cause of death among children under-5 years was congenital abnormalities including conditions such as congenital heart diseases, accounting for 23% of deaths at a rate of 82 deaths per 100,000 children (Table 3.4).

Other leading causes of death in this age group were respiratory illnesses at 18%, infectious diseases including sepsis at 14%, and perinatal conditions at 11%.

Table 3.4: Cause-specific proportional mortality and mortality rates by ICD-10 (Infant and child mortality list 3) (deaths per 100,000 population), ages 0-4 years (both sexes combined), 2013-2018.

List code ^a	Disease category	2013-2018		
		Number of deaths	%	Cause-specific death rate ^b
049	Congenital abnormalities	17	23	82.2
031	Respiratory diseases	13	18	62.8
001	Infectious and parasitic diseases	10	14	48.3
037	Perinatal conditions	8	11	38.7
026	Nervous system diseases	6	9	29
060	External causes	5	7	24.2
	Other categories	18	24	87
	Total	74	100	

Source: Ministry of Health medical death certificates 2013- 2018 ^a Infant and child mortality list 3 code (Appendix 5) ^bTo derive the cause-specific death rate, the number of deaths in the population by cause was estimated by applying the proportional mortality by cause (per cent distribution) to the total deaths in the age group (see Table 3.2 in Chapter 3), then dividing this number by the age-specific population multiplied by 100,000.

Mortality in Children Aged 5-14 years

Children aged between 5-14 years have the lowest age-specific death rates in Tonga. Still, deaths in this age group are often preventable. Table 3.5 shows that the leading cause of death (based on medically certified death certificates) was external causes, including transport accidents and drowning.

Table 3.5: Cause-specific proportional mortality and mortality rates by ICD-10 chapter (deaths per 100,000 population), 5-14 years of age (both sexes combined), 2013-2018.

List code	Disease category	Number of deaths	%	Cause-specific death rate
095	External causes	9	35	13.9
072	Respiratory diseases	4	15	6.17
	Other categories	13	50	20.1
	Total	26	100	

Source: Ministry of Health medical death certificates 2013- 2018

^aICD-10 General mortality List 1 code (Appendix 4)

Mortality in Adults Aged 15-59 years

Based on deaths with a medically certified death certificate, the leading cause of death category among men aged 15–59 years was circulatory system diseases (Table 3.6), which were responsible for 26% of the deaths in 2013-2018. Specifically, ischemic heart disease, cerebrovascular disease and hypertensive disease were the most common types of circulatory causes, accounting for 62%, 10%, and 8% of certified deaths within this cardiovascular disease category in males aged 15-59 years over 2013-2018 respectively. It should be noted that 16% of cardiovascular deaths in men aged 15-59 years were assigned to “other heart diseases”, of which 86% were non-specific causes including cardiac arrest, heart failure, or unspecified heart disease.

The second leading cause of death among men aged 15-59 years was ‘endocrine, nutritional and metabolic disorders’ accounting for 18% in 2013-2015, and 23% in 2016-2018 (Table 3.6). Diabetes accounted for approximately 90% of deaths in this category. Other leading causes of death in adult men shown in Table 3.6 were: external causes (injuries) commonly transport accidents and drowning; neoplasms, commonly of the lung; and, certain infectious diseases commonly viral hepatitis.

Table 3.7 shows the leading causes of death for women aged 15-59 years. Based on medically certified deaths, the leading cause of death category in this group was ‘neoplasms’ (33%) at a rate of 114 deaths per 100,000 females in 2013-2015 and 126 deaths per 100,000 in 2016-2018, mostly malignancies and most commonly of the breast (around 10%). The second leading cause of death category was ‘endocrine, nutritional and metabolic disorders’ with 20% in 2013-2015, and 28% in 2016-2018. Diabetes accounted for around 92% of deaths in this category over 2013-2018. Other leading causes of death in adult women shown in Table 3.7 were: circulatory diseases (around 16%) commonly ischaemic heart diseases and cerebrovascular diseases, and genitourinary diseases (around 5%).

Age-standardised mortality rates enable comparison of mortality rates over time and across countries as previously described in Chapter 3 in the section ‘Crude Death Rate and Directly Age Standardised Mortality Rate’. Table 3.6 and Table 3.7 show age-standardized death rates by sex for the major causes in adults aged 15-59 years, using the WHO World Standard Population for 2000-2025 (Appendix 2). Using this standardization, for every 100,000 men aged 15-59 years approximately 123 died from circulatory diseases, 86 died from endocrine, nutritional and metabolic disorders (predominantly diabetes), 62 from external causes (injuries), and 70 from neoplasms (mainly cancers) in 2013-2015. Rates from injuries were higher than cancers in 2016-2018 compared to 2013-2015. In women, age-standardised mortality rates from cancers and diabetes were higher than mortality rates from circulatory diseases over 2013-2018.

Table 3.6: Cause-specific proportional mortality and mortality rates for adult males aged 15-59 years by ICD chapter (deaths per 100,000 male population), by 3-year periods in 2013-2018.

		2013-2015				2016-2018			
List code ^a	Disease category	No.	%	Crude rate	Age-Standardized Rate ^c	No.	%	Crude rate	Age-Standardized Rate ^c
064	Circulatory system diseases	92	26	142.7	123.2	89	25	144.6	126.3
051	Endocrine, nutritional, and metabolic diseases	64	18	99.3	85.7	79	23	128.3	112.1
095	External causes	46	13	71.3	61.6	58	17	94.2	82.3
026	Neoplasms	52	15	80.6	69.6	40	11	65	56.7
001	Infectious and parasitic diseases	26	7	40.3	34.8	20	6	32.5	28.4
072	Respiratory diseases	21	6	32.6		23	7	37.4	
078	Digestive system diseases	16	5	24.8		8	2	13	
084	Genitourinary diseases	9	3	14		10	3	16.2	
058	Nervous system diseases	9	3	14		8	2	13	
	Other cause categories	14	4	21.7		15	4	24.4	
094	Ill-defined conditions	10				4			
	Total	359				354			
	Total minus ill-defined causes	349	100			350	100		

Source: Ministry of Health medical death certificates 2013- 2018 ^a ICD-10 General mortality List 1 code (Appendix 4)

^b excluding ill-defined causes ^c age-standardised rates calculated for the five leading causes of death due to small numbers

Table 3.7: Cause-specific proportional mortality and mortality rates for adult females aged 15-59 years by ICD chapter (deaths per 100,000 female population), by 3-year periods in 2013-2018.

		2013-2015				2016-2018			
List code ^a	Disease category	No.	%	Crude rate	Age-Standardized Rate	No.	%	Crude rate	Age-Standardized Rate
026	Neoplasms	75	34	114.1	119.6	78	32.5	125.9	113.3
051	Endocrine, nutritional, and metabolic diseases	45	20	68.4	71.8	66	27.5	106.6	95.9
064	Circulatory system diseases	35	16	53.2	55.8	38	15.8	61.4	55.2
084	Genitourinary diseases	10	5	15.2	15.9	13	5.42	21	18.9
001	Infectious and parasitic diseases	9	4	13.7	14.4	12	5	19.4	17.4
095	External causes	8	4	12.2		11	4.6	17.8	
072	Respiratory diseases	12	5	18.3		5	2.1	8.07	
078	Digestive system diseases	6	2.7	9.13		4	1.67	6.46	
048	Blood- and immune-related diseases	5	2.25	7.6		3	1.25	4.8	
	Other cause categories	17	7.66	25.9		10	4.17	16.1	
094	Ill-defined conditions	5				4			
	Total	227				244			
	Total minus ill-defined causes	222	100			240	100		

Source: Ministry of Health medical death certificates 2013- 2018

^a ICD-10 General mortality List 1 code (Appendix 4)

^b excluding ill-defined causes

Mortality in Older Adults (Aged 60+ Years)

Table 3.8 and Table 3.9 show that the leading cause of death category among adults aged 60 years and above were circulatory diseases, most commonly ischemic heart diseases, cerebrovascular diseases and hypertensive diseases. Endocrine, nutritional and metabolic diseases (93% being diabetes) was the second leading cause of death category. Respiratory diseases were the third most significant cause of death in men, while it was the fourth for women; most were chronic lower respiratory diseases in men, while pneumonia and other acute lower respiratory infections was common in women. Neoplasms, predominantly malignancies (89% of female neoplasm deaths and 90% of male neoplasm deaths), was ranked the fourth leading cause of death in men, and the third in women.

Table 3.8: Cause specific proportional mortality and mortality rates in Adult Males Aged 60 and Older by ICD-10 chapter (deaths per 100,000 male population), by 3-year periods in 2013-2018.

		2013-2015			2016-2018		
List code ^a	Disease category	No.	%	Crude rate	No.	%	Crude rate
064	Circulatory system diseases	213	33	2,362.8	179	31	2,105.7
051	Endocrine, nutritional, and metabolic diseases	129	20	1,431	129	23	1,517.5
072	Respiratory diseases	110	17	1,220.2	72	13	847
026	Neoplasms	89	14	987.3	78	14	917.6
078	Digestive diseases	20	3	221.9	24	4	282.3
084	Genitourinary diseases	13	2	144.2	23	4	270.6
001	Infectious and parasitic diseases	17	3	188.6	16	3	188.2
083	Musculoskeletal diseases	20	3	221.9	12	2	141.2
082	Skin diseases	9	1	99.8	15	3	176.5
095	External causes	11	2	122	11	2	129.4
	Other cause categories	11	2	122	14	2	164.7
094	Ill-defined conditions	47			29		
	Total	689			602		
	Total minus ill-defined causes	642	100		573	100	

Table 3.9: Cause specific Mortality in Adult Females Aged 60 and Older by ICD-10 chapter (deaths per 100,000 female population), by 3-year periods in 2013-2018.

		2013-2015			2016-2018		
List code ^a	Disease category	No.	%	Crude rate	No.	%	Crude rate
064	Circulatory system diseases	148	28	1,510	149	31	1,602.
051	Endocrine, nutritional, and metabolic diseases	159	30	1,622	133	28	1,431
026	Neoplasms	89	17	908	73	15	785
072	Respiratory diseases	51	10	520	45	9	484
001	Infectious and parasitic diseases	17	3	174	18	4	194
078	Digestive system diseases	17	3	174	17	4	183
082	Skin diseases	13	2	133	12	2	129
084	Genitourinary diseases	11	2	112	11	2	118
095	External causes	8	2	82	8	2	86
	Other cause categories	10	2	102	18	4	193.6
094	Ill-defined conditions	44			39		
	Total	567			523		
	Total minus ill-defined causes	523	100		484	100	

Underlying causes of death by Island group

Understanding the distribution of deaths by place of occurrence is useful for public health planning of available health infrastructure, resource allocation, and indicating regions that may require additional attention. Table 3.10 shows the leading causes of death by Island groups, based on medically certified cause of death certificates.

Table 3.10: The ten leading causes of death by Island Groups in both sexes, 2013-2018.

List code ^a	Cause category	Tongatapu	Vava'u	Eua	Ha'apai	Total
064	Circulatory system diseases	734	110	45	44	946
051	Endocrine, nutritional, and metabolic diseases	618	102	39	41	807
026	Neoplasms	459	80	17	20	580
072	Respiratory diseases	250	59	18	27	356
095	External causes	133	27	7	6	175
001	Infectious and parasitic diseases	111	25	5	6	147
078	Digestive system diseases	85	16	4	9	116
084	Genitourinary diseases	84	10	1	6	101
082	Skin diseases	43	14	3	4	64
083	Musculoskeletal diseases	39	8	4		53
	<i>All other causes</i>	104	18	8	4	135
094	<i>Ill-defined conditions</i>	109	49	11	9	185
	Total	2769	518	162	176	3665
	Total minus ill-defined causes	2660	469	151	167	3480

Source: Ministry of Health medical death certificates 2013- 2018

^a ICD-10 General mortality List 1 code (Appendix 4)

Adult Mortality from Non-Communicable Diseases (NCDs)

Non-communicable diseases (NCDs) are the leading cause of death globally, and in the Pacific Islands region account for up to 75% of all deaths, most are premature (under 70 years of age). The World Health Organization recommends that countries monitor and report on the mortality from, and the associated risk factors of, four primary NCDs: Cardiovascular disease (ICD-10 codes I00-I99), Cancer (C00-C97), Diabetes (E10-E14), and Chronic respiratory disease (J40-J47). The WHO considers the risk of premature death from the target NCDs as an outcome indicator of the impact of NCDs on populations and it is calculated as the probability of dying between ages 30 and 70 years from these four NCDs. Estimates of mortality from any of these NCDs for this age group are reported here for comparison with international reporting. These are outlined in Table 3.11.

For men aged 30 years or older, the probability of dying from either cardiovascular disease, cancer, diabetes, or chronic respiratory disease before reaching age 70 was 50% in 2013-2015 and 43% in 2016-2018. This was slightly lower in women, with a 30-year-old woman having 37% risk in 2013-2015 and 34% in 2016-2018.

Table 3.11: Probability of dying (%) from selected NCDs between ages 30 and 69 years (inclusive) by sex, (2013-2018).

Disease	Male		Female	
	2013-2015	2016-2018	2013-2015	2016-2018
Circulatory system diseases ^a	19.9	17.0	8.3	7.3
Diabetes mellitus ^b	14.1	14.7	13.8	15.2
Cancer ^c	12.0	7.4	13.9	10.7
Chronic lower respiratory diseases ^d	4.5	4.0	0.9	0.7
Total	50.4	42.8	36.9	33.9

Source: Ministry of Health medical death certificates 2013- 2018 ^aICD-10 General Mortality List 1, code 064 ^bICD-10 General Mortality List 1, code 052 ^cICD-10 General Mortality List 1, codes 027 to 046 ^dICD-10 General Mortality List 1, code 076

A review of the certification of NCD deaths is underway. A separate more detailed report of indicators of adult mortality from NCDs will provide a better understanding of the impact of NCDs and an improved ability to target and monitor interventions.

Chapter 4. METHODOLOGY

A retrospective approach and analysis of existing data sources was used to generate the vital statistics for this report. The methodology involves three key steps.

1. Cleaning Line Ministry/Department individual data sources (live births and deaths)
2. Consolidating and validating live births and death data from Ministry of Justice and Ministry of Health.
3. Analysis of vital statistics (births, fertility and mortality)

The data for this retrospective analysis is for the period 2013-2018.

Data Compilation

Duplicate birth and death records relating to the same individual within or between the Ministry of Health and Ministry of Justice birth and death datasets were identified using an automated record linkage process, The Link King v9.0 (*Link King*) (www.the-link-king.com).¹ The process for automated identification of duplicates incorporates two main types of record linkage: deterministic and probabilistic. Deterministic record linkage is based on agreement of several matching variables, e.g. same name, same date of birth, same date of death. It includes partial agreement such as names with minor spelling variations or phonetic similarity. Probabilistic linkage is based on a likelihood score reflecting the degree of similarity between each matching variable. The scores are calculated from ‘weights’ calculated for each variable. Weights reflect how strong a variable is in determining duplicates; e.g. name is stronger than gender in identifying a person. The weights assigned to a variable are adjusted by scaling factors based on rarity; e.g. in the Tongan context the scaling factor for a rare last name such as “Kaifoto” would be much larger than that for a very common last name such as “Fifita”. Records with high scores have higher likelihoods of representing the same person; above a cut point, these records can be classified as the same person (definite duplicates). Records with low scores have lower likelihoods; below a cut point, they can be classified as not the same person (non-duplicates). Pairs/sets² of records which are not automatically classified into the upper or lower cut-point categories require manual review to be classified as a duplicate or not.

Matching variables

Matching variables are selected based on their consistency and completeness within a dataset. The matching variables used to deduplicate the Tonga birth datasets (each dataset, and when both sources were reconciled) were: name (first, middle, last, mother’s name, father’s name); sex; date of birth; and island group of birth. For the Ministry of Justice birth dataset, and for the reconciled Ministry of Health and Ministry of Justice birth dataset, ‘Place of birth’ was used as a matching variable where mother’s or father’s name was not provided. For the Ministry of Health death dataset, the matching variables were: name (first, middle, last, mother’s name); sex; date of birth; date of death; and island group of death. For the Ministry of Justice death dataset, and for the reconciled Ministry of Health and Ministry of Justice death dataset the matching variables were: name (first, middle, last, mother’s name);

¹ *Link King* is a software package available free of charge, however, SAS statistical software suite is required to run the *Link King* package. A SAS licence is required (at significant cost) and expertise in operating in SAS.

² Most often duplicate pairs (two records) were identified in the Tonga datasets, however in some cases a set of up to four duplicate records were identified for the same unique/individual event (birth or death)

sex; age; date of death; and island group of death. 'Place of death' was used as a matching variable where mother's name was not provided.

Dataset preparation

Variables used for matching in the Ministry of Health and Ministry of Justice datasets were cleaned and standardised prior to data processing. This included: formatting dates (as MM-DD-YYYY); removing commas, punctuation marks, and other special characters; and identifying missing names or invalid names (e.g. Rev., Jr.).

Dataset processing

Firstly, duplicate records were identified, reviewed and removed where appropriate from the Ministry of Health birth and death datasets, and then the Ministry of Justice birth and death datasets. The deduplicated Ministry of Health and Ministry of Justice datasets were then processed through *Link King* as reconciled annual datasets for births and deaths to identify duplicate records across the two sources, e.g. an individual with a birth or death record in both the Ministry of Health and Ministry of Justice datasets.

For birth records of the same person found in both Ministry of Health and Ministry of Justice, the Ministry of Health record was retained because the Ministry of Health also collects information on mother's age (the Ministry of Justice does not) which is used for calculating age-specific fertility rates (Chapter 2).

Data sources

Ministry of Health

1. Live births database
2. Death database
3. Medical records (hospital discharge)
4. Reproductive Nurses' database

Ministry of Justice

1. Live births database
2. Death database

Tonga Statistic Department

1. Census 2016 Population Structure
2. Census 2016 Population data
3. Census 2016 Population Projection

The initial step of the retrospective analysis of existing data is to identify and compile the raw datasets for the data analysis. The datasets must then be 'cleaned' to remove duplicates and identify synchronous variables for consolidation in the second step. These data are then collected Ministry of Health and Ministry Justice datasets were reviewed and cleaned prior to consolidation and analysis.

There are three main organisations in Tonga directly related to the compilation, collection and analysis of vital statistics: 1) The Ministry of Health has four databases used for the vital statistics, Firstly, the live births database

there is one officer allocated to enter the data from the 'Certificate of Live Birth' into an electronic database. Secondly, the deaths database there is one medical mortality coder and one officer allocated to enter the data from the 'Medical Certificate of Cause of Death' into an electronic database. Thirdly, the medical records (hospital discharge) is entered by nurse in charge when a patient is being discharged. Lastly is the Reproductive Nurses' database which is used for the Vaiola hospital's Reproductive Health Nurse Report. 2) The Ministry of Justice (Civil Registry), has two databases. The Ministry of Justice Registry System Database (MOJRS) archives both births and deaths registration is under the Vital Statistics Unit of the office of Registrar General. The Ministry of Justice is the Secretariat for the National Civil Registration and Vital Statistics Committee (NCRVS) which oversees and monitors activities linked to national vital statistics like amnesty policies, national vital statistics indicators, etc.

3) The Statistics Department, being Tonga National Statistics office, they conduct census for every 5 years. These figures are also used to project future populations for the years that do not conduct surveys. The figures from these censuses are used for denominators for not just the vital statistics analysis, but also the Gender Analysis, Sample designs and many others.

Limitations and Opportunities

Although Tonga's data collection process or system is simple and easy to follow, there are still some key quality that needs to be addressed in order to improve the current system. The NCRVS committee, consisting of the agencies meet annually to ensure the processes are effective. It is also committed to ensure that the processes and information collected from NCRVS are precise and consistent. All members are fully aware of the issues and their contribution effectively minimize errors.

The datasets used for this report analysis a compilation of datasets from three government entities. The Ministry of Health's, their birth and death database, hospital discharge and the reproductive Nurses' database. The Ministry of Justice, with its birth and death registration database. The Tonga Statistics Department provides the Census database. All databases are properly secured and archived in the respective headquarters.

There is also the need to improve the quality of information collected, this concerns data validation during data entry. The merging of datasets identifies that not all live birth and deaths in tonga are registered, along with duplication of records within two datasets. This is dependent on the parents (birth) and next of kin (death) for registration is required by law for birth only and not death. There is also the issue of duplicated records identified on both datasets.

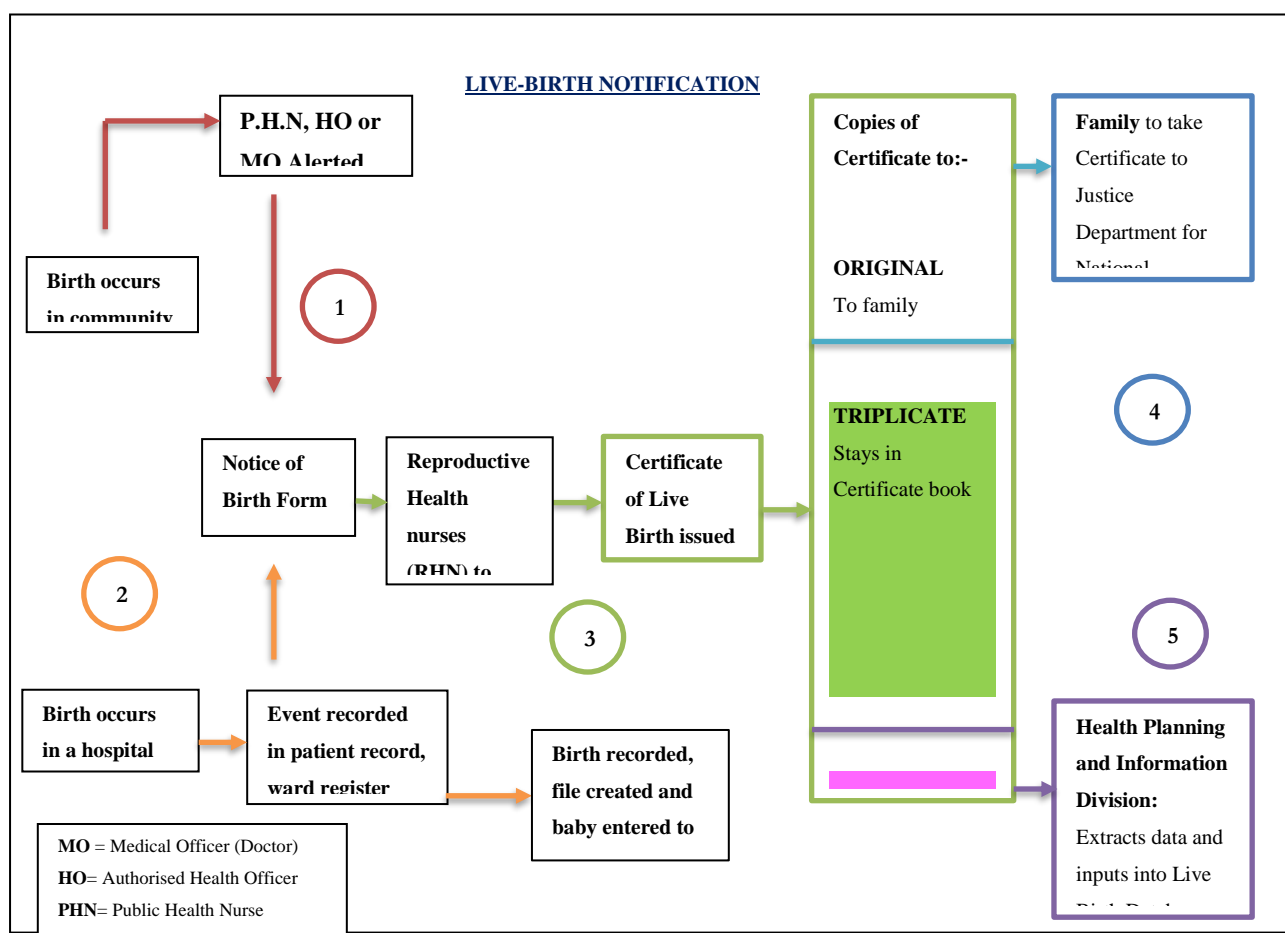


Figure 4.1: Diagram of the reporting and registration processes for births.

Figure 4.1 illustrates the reporting and registration processes for live births in Tonga. The registration process is divided into 5 key phases (numbers within the circles) correlating to the coloured arrows and boxes.

The reporting and registration process as illustrated in Figure 1 corresponds to the following:

1. Births in the Community

When a birth occurs in the community, the Public Health Nurse or Community Health staff (Medical Officer or Health Officer) are alerted of the birth. The Community Health staff then either follow-up with the parent(s) or vice versa. Once confirmed, the Health Staff issue the Notification of Birth Certificate which is then sent to the Reproductive Health nurse section. The Reproductive Health nurse section then register the birth.

2. Births in the Hospital³

Births within the wards get issued a notification of birth, which is then sent to the Reproductive Health nurses who register the birth. Legitimate cases of married couples require a married certificate, divorce certificate and mother's birth certificate to register their child at the hospital. Illegitimate cases can register with a mother's birth certificate only.

³ Includes births occurring within an ambulance or vehicle headed for the Hospital or Health Facility

3. Notification and Certification of Birth

The notification of live birth is used to issue a certificate of live birth. There are triplicate copies of the certificate produced. The original copy is given to the family of the child born; the duplicate is sent to the Health Planning and Information Division to enter into the live births database; and the triplicate is kept in the Live Birth Registry Book. Certificates of live birth are issued from the Hospital on Tuesdays and Thursdays every week. It should be noted that registration of births is free, however the issuance of the birth certificate costs 10 pa'anga. Reissuing live birth certificates is free of charge and a copy of the certificate is given with a note on the copy stating that it is a reissued copy.

4. Registration with the Civil Registry

During the issuing time of live birth certificates (Tuesday and Thursday) at the Hospital, a clerk from the Ministry of Justice is present to facilitate registration of births in the civil registry. Parents may also present directly to the Civil Registry to register their child's birth using the certificate of live birth issued from the hospital.

5. Statistical Database / Health Planning and Information Division

The duplicate copy of the certificate of live birth is sent to the Health Planning and Information Division to enter the variables into the live births electronic database.

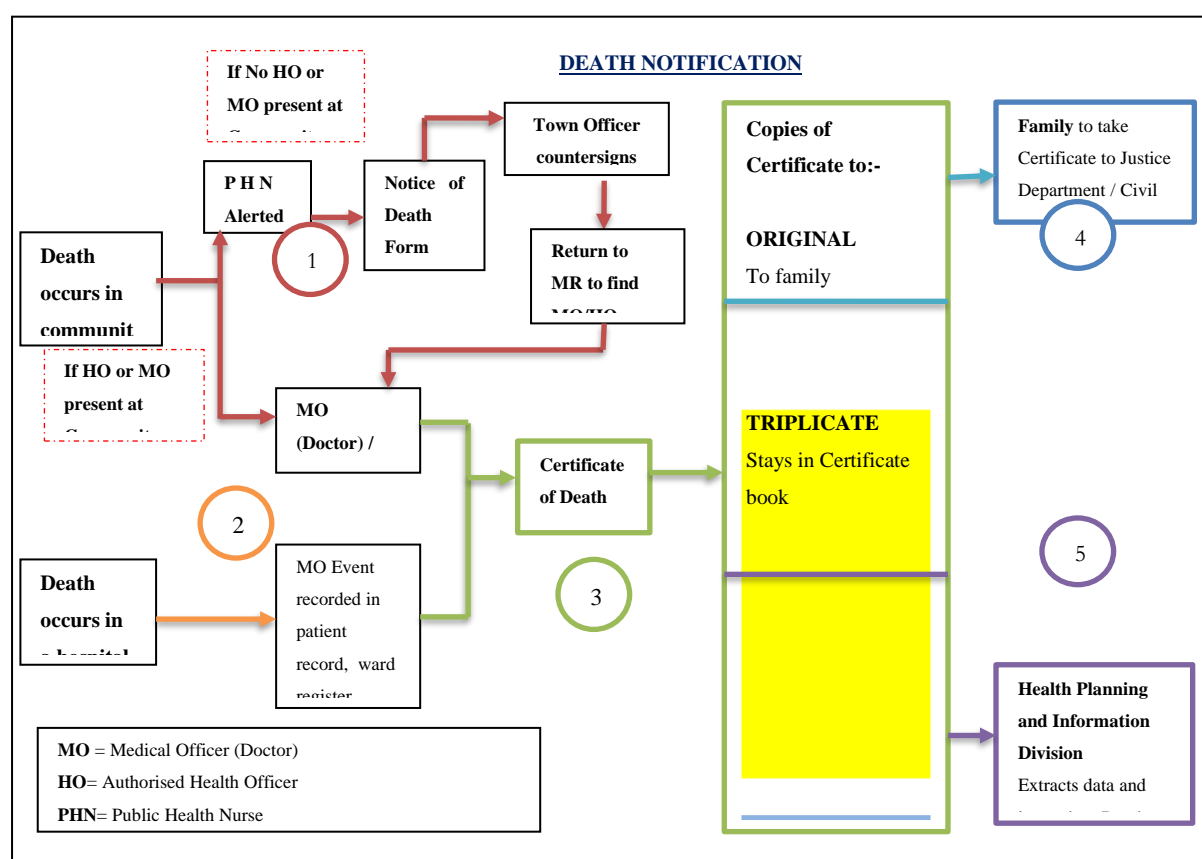


Figure 4.2: Diagram of the reporting and registration processes for deaths.

Figure 4.2 illustrates the reporting and registration processes for deaths in Tonga. The registration process is divided into 5 key phases (numbers within the circles) correlating to the coloured arrows and boxes.

The reporting and registration processes as illustrated in Figure 2 correspond to the following:

1. Deaths in the Community

When a death occurs in the community or at home, the Public Health Nurse, doctor or Health Officer at the respective Community Health Centre is notified of the event. If a doctor or Health Officer is present, a death certificate can be completed and signed off. If there is no doctor or Health Officer present, the Public Health Nurse must issue a Notification of Death, which must be signed by the Town Officer of the district in which the deceased resided. The notification is then sent to the medical records office to locate a doctor or Health Officer to complete and sign off a Death Certificate for the notification.

2. Deaths in the Hospital

For deaths that occur in a hospital, a death certificate should be completed and signed off by the attending doctor. It should be noted that deaths occurring within an ambulance or vehicle headed for a hospital or health facility are considered a death in the Hospital. The deceased is thus entered into the ward register, then discharged from the hospital as deceased.

3. Notification and Certification of Death

Once a doctor or Health Officer has completed and signed off the death certificate, the original is given to the family, and a duplicate is sent to the Medical Records Office to be mortality coded and entered into the Health Information System, and then filed in a binder in the Medical Records Office. A copy of the duplicate is also sent to the Health Planning and Information Division.

4. Registration with the National Civil Registration

The original copy of the death certificate is taken by the family / next of kin and required to be presented to the Civil Registry to register the death.

5. Statistical Database / Health Planning and Information Division

The duplicate copy from the Medical Records is again copied, which has the final diagnosis and the coded death. The ICD-10 coded death certificate is entered into the Health Information System. The coded copy of the death certificate is then collected by the Health Planning and Information Division to register the deceased with the variables in the certificate into the Death Database. The Health Planning and Information Division must periodically check-up with the Medical Records on a weekly to bi-weekly basis to collect the coded death certificates. This process is outlined in the Diagram below (Figure 4.3).

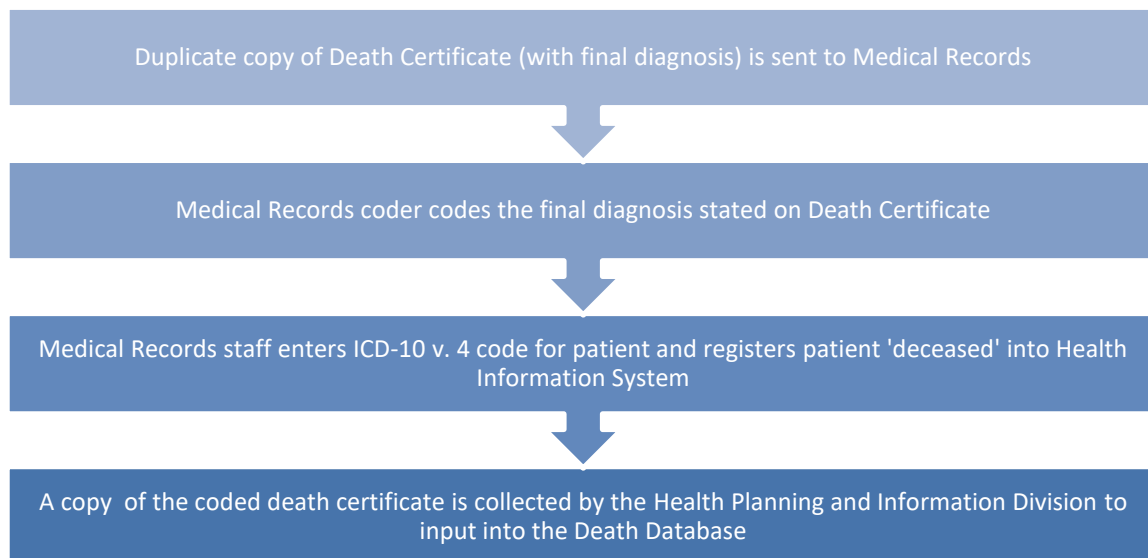


Figure 4.3: Diagram of the death registration and coding process in the Ministry of Health.

APPENDICES

Appendix 1: Ministry of Justice Process for Issue of Birth Certificate

BIRTH

How do I register a birth?

All parents should register the birth of their child within the first 3 months as stipulated by the Birth, Death and Marriages Registration Act. Registration is free of charge and its being dealt with the Office of the Registrar General of the Ministry of Justice. The Registrar General's Office is located at the ground floor of the Ministry of Justice main office, corner of Kausela and Lavinia Roads, Fasi mo e Afi and can be contacted directly at Telephone number 7400813.

How do I register a Birth after the 3 months grace period?

Any registration made after the 3 months stipulated grace period lapsed would require parents to submit in an application for late registration of births at the Office of the Registrar General's Office. Applications can be lodged at any day of the week and will be dealt with by sub-registrars within 3 working days.

Late registration of Births would require a fee of \$16.00TOP for the application, a search fee of \$10.00TOP to confirm whether the child has been registered or not and the following paperwork in support:

- ☒ Application letter by either parent
- ☒ Affidavit in support by parent applying (*Drafted by a lawyer*)

Must include the following:

- Full name of child, date of birth, place of birth, gender
- Full name of parents and places of birth
- Date of marriage of parents
- How many children/ what number is the child/name and date of birth of child immediately older and younger (if any)
- What level in school (if still in school)
- Date of Baptism/Blessing (if any, if not, please state)
- Reason for failure to register on time
- ☒ Original Marriage certificate of parents
- ☒ Original Birth certificate of child's immediate older and younger siblings (if any)
- ☒ Certificate of Live Birth (original or re-issued)
- ☒ Certificate of Baptism (if any – if child has not been baptized, must be stated on affidavit or Church Membership record to be filed instead)
- ☒ Search fee receipt from RGO - \$10
- ☒ Supporting letter from town officer or reliable source
- ☒ Supporting letter from school (if child has started school) or employment (if subject has work)
- ☒ Additional information which may be lodged in support such as Immunization record or hospital records

What else do I need to know about Birth Registration in Tonga?

Births in the outer islands of 'Eua, Ha'apai, Vava'u and the Niuaus can be registered in their respective sub-registries. Grace periods and fees remain the same.

If a Certificate of Live Birth is unavailable from the hospital, a support letter from the Ministry of Health can be provided with which it would enlister the birth details. Failing that, an affidavit should be provided from the home owner of the premises on which the birth occurred or from a relative, friend or a neighbor who saw the mother and child shortly after the birth and can give a fair estimation of the date of birth.

Further evidence for late registrations of older children can be supported by letters from the town officer, their school or Church Minister.

Further information can be obtained from the Office of the Registrar General upon request.

Source: Tonga Ministry of Justice, 2019. Accessed 25th November 2019 from: <http://www.justice.gov.to/birth/>

Appendix 2: WHO World Standard Population Distribution.

Table 4. WHO World Standard Population Distribution (%), based on world average population between 2000-2025	
Age group	World Average 2000-2025
0-4	8.86
5-9	8.69
10-14	8.60
15-19	8.47
20-24	8.22
25-29	7.93
30-34	7.61
35-39	7.15
40-44	6.59
45-49	6.04
50-54	5.37
55-59	4.55
60-64	3.72
65-69	2.96
70-74	2.21
75-79	1.52
80-84	0.91
85-89	0.44
90-94	0.15
95-99	0.04
100+	0.005
Total	100

Source: World Health Organization, AGE STANDARDIZATION OF RATES: A NEW WHO STANDARD, GPE Discussion Paper Series: No.31, EIP/GPE/EBD; 2011

Appendix 3: Population estimates, 2013-2018.

Age (years)	2013-2015 ^a		2016-2018 ^b	
	Male	Female	Male	Female
<1	4332	3897	3570	3267
1-4	16923	15345	15750	14910
5-9	20013	18606	19251	17208
10-14	19083	17172	18417	17229
15-19	17025	15876	16347	15159
20-24	12390	12297	12318	12384
25-29	10725	12045	9486	10401
30-34	9282	9951	8982	10581
35-39	8349	8916	8112	8823
40-44	8667	8592	7419	8148
45-49	7104	6642	7800	7743
50-54	5388	5763	6387	6063
55-59	4566	4911	4713	5049
60-64	3660	3924	3891	4197
65-69	3030	3399	2904	3186
70-74	2508	2667	2205	2598
75-79	1560	1824	1725	2025
80-84	855	1203	945	1230
≥85	447	774	474	933
unknown	30	15	69	54
Total	155937	153819	150765	151188

^aThe 2011 census population (Tonga Statistics Department, 2013) in each age group was multiplied by three to calculate an estimate of the total population over the period 2013-2015, as the denominator for the mortality rates.

^bThe 2016 census populations in each age-group (Tonga Statistics Department, 2017) were tripled to estimate the 2016-2018 total population.

Appendix 4: General Mortality List 1: 103 Cause List.

List code	Disease	ICD Codes
1-001	Certain infectious and parasitic diseases	A00–B99
1-002	Cholera	A00
1-003	Diarrhoea and gastroenteritis of presumed infectious origin	A09
1-004	Other intestinal infectious diseases	A01–A08
1-005	Respiratory tuberculosis	A15–A16
1-006	Other tuberculosis	A17–A19
1-007	Plague	A20
1-008	Tetanus	A33–A35
1-009	Diphtheria	A36
1-010	Whooping cough	A37
1-011	Meningococcal infection	A39
1-012	Septicaemia	A40–A41
1-013	Infections with a predominantly sexual mode of transmission	A50–A64
1-014	Acute poliomyelitis	A80
1-015	Rabies	A82
1-016	Yellow fever	A95
1-017	Other arthropod-borne viral fevers and viral haemorrhagic fevers	A90–A94, A96–A99
1-018	Measles	B05
1-019	Viral hepatitis	B15–B19
1-020	Human immunodeficiency virus [HIV] disease	B20–B24
1-021	Malaria	B50–B54
1-022	Leishmaniasis	B55
1-023	Trypanosomiasis	B56–B57
1-024	Schistosomiasis	B65
1-025	Remainder of certain infectious and parasitic diseases	A21–A32, A38, A42–A49, A65–A79, A81, A83–A89, B00–B04, B06–B09, B25–B49, B58–B64, B66–B94, B99
1-026	Neoplasms	C00–D48
1-027	Malignant neoplasm of lip, oral cavity and pharynx	C00–C14
1-028	Malignant neoplasm of oesophagus	C15
1-029	Malignant neoplasm of stomach	C16
1-030	Malignant neoplasm of colon, rectum and anus	C18–C21
1-031	Malignant neoplasm of liver and intrahepatic bile ducts	C22
1-032	Malignant neoplasm of pancreas	C25

1-033	Malignant neoplasm of larynx	C32
1-034	Malignant neoplasm of trachea, bronchus and lung	C33–C34
1-035	Malignant melanoma of skin	C43
1-036	Malignant neoplasm of breast	C50
1-037	Malignant neoplasm of cervix uteri	C53
1-038	Malignant neoplasm of other and unspecified parts of uterus	C54–C55
1-039	Malignant neoplasm of ovary	C56
1-040	Malignant neoplasm of prostate	C61
1-041	Malignant neoplasm of bladder	C67
1-042	Malignant neoplasm of meninges, brain and other parts of central nervous system	C70–C72
1-043	Non-Hodgkin's lymphoma	C82–C85
1-044	Multiple myeloma and malignant plasma cell neoplasms	C90
1-045	Leukaemia	C91–C95
1-046	Remainder of malignant neoplasms	C17, C23–C24, C26–C31, C37–C41, C44–C49, C51–C52, C57–C60, C62–C66, C68–C69, C73–C81, C88, C96–C97
1-047	Remainder of neoplasms	D00–D48
1-048	Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	D50–D89
1-049	Anaemia	D50–D64
1-050	Remainder of diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	D65–D89
1-051	Endocrine, nutritional and metabolic diseases	E00–E88
1-052	Diabetes mellitus	E10–E14
1-053	Malnutrition	E40–E46
1-054	Remainder of endocrine, nutritional and metabolic diseases	E00–E07, E15–E34, E50–E88
1-055	Mental and behavioural disorders	F01–F99
1-056	Mental & behavioural disorders due to psychoactive substance use	F10–F19
1-057	Remainder of mental and behavioural disorders	F01–F09, F20–F99
1-058	Diseases of the nervous system	G00–G98
1-059	Meningitis	G00, G03
1-060	Alzheimer's disease	G30
1-061	Remainder of diseases of the nervous system	G04–G25, G31–G98
1-062	Diseases of the eye and adnexa	H00–H59
1-063	Diseases of the ear and mastoid process	H60–H93

1-064	Diseases of the circulatory system	I00–I99
1-065	Acute rheumatic fever and chronic rheumatic heart diseases	I00–I09
1-066	Hypertensive diseases	I10–I13
1-067	Ischaemic heart diseases	I20–I25
1-068	Other heart diseases	I26–I51
1-069	Cerebrovascular diseases	I60–I69
1-070	Atherosclerosis	I70
1-071	Remainder of diseases of the circulatory system	I71–I99
1-072	Diseases of the respiratory system	J00–J98
1-073	Influenza	J10–J11
1-074	Pneumonia	J12–J18
1-075	Other acute lower respiratory infections	J20–J22
1-076	Chronic lower respiratory diseases	J40–J47
1-077	Remainder of diseases of the respiratory system	J00–J06, J30–J39, J60–J98
1-078	Diseases of the digestive system	K00–K92
1-079	Gastric and duodenal ulcer	K25–K27
1-080	Diseases of the liver	K70–K76
1-081	Remainder of diseases of the digestive system	K00–K22, K28–K66, K80–K92
1-082	Diseases of the skin and subcutaneous tissue	L00–L98
1-083	Diseases of the musculoskeletal system and connective tissue	M00–M99
1-084	Diseases of the genitourinary system	N00–N99
1-085	Glomerular and renal tubulointerstitial diseases	N00–N15
1-086	Remainder of diseases of the genitourinary system	N17–N98
1-087	Pregnancy, childbirth and the puerperium	O00–O99
1-088	Pregnancy with abortive outcome	O00–O07
1-089	Other direct obstetric deaths	O10–O92
1-090	Indirect obstetric deaths	O98–O99
1-091	Remainder of pregnancy, childbirth and the puerperium	O95–O97
1-092	Certain conditions originating in the perinatal period	P00–P96
1-093	Congenital malformations, deformations and chromosomal abnormalities	Q00–Q99
1-094	Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	R00–R99
1-095	External causes of morbidity and mortality	V01–Y89
1-096	Transport accidents	V01–V99
1-097	Falls	W00–W19
1-098	Accidental drowning and submersion	W65–W74
1-099	Exposure to smoke, fire and flames	X00–X09
1-100	Accidental poisoning by and exposure to noxious substances	X40–X49

1-101	Intentional self-harm	X60–X84
1-102	Assault	X85–Y09
1-103	All other external causes	W20–W64, W75–W99, X10–X39, X50–X59, Y10–Y89
1-901	SARS	U04

Sourced from International Statistics Classification of Diseases and Related Health Problems, 10th Revision (ICD-10, 2010 edition)

Appendix 5: Infant and child mortality List 3: 67 causes.

List code	Disease	ICD Codes
3-001	Certain infectious and parasitic diseases	A00–B99
3-002	Diarrhoea and gastroenteritis of presumed infectious origin	A09
3-003	Other intestinal infectious diseases	A00–A08
3-004	Tuberculosis	A15–A19
3-005	Tetanus	A33–A35
3-006	Diphtheria	A36
3-007	Whooping cough	A37
3-008	Meningococcal infection	A39
3-009	Sepsis	A40–A41
3-010	Acute poliomyelitis	A80
3-011	Measles	B05
3-012	Human immunodeficiency virus [HIV] disease	B20–B24
3-013	Other viral diseases	A81–B04, B06–B19, B25–B34
3-014	Malaria	B50–B54
3-015	Remainder of certain infectious and parasitic diseases	A20–A32, A38, A42–A79, B35–B49, B55–B94, B99
3-016	Neoplasms	C00–D48
3-017	Leukaemia	C91–C95
3-018	Remainder of malignant neoplasms	C00–C90, C96–C97
3-019	Remainder of neoplasms	D00–D48
3-020	Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	D50–D89
3-021	Anaemia	D50–D64
3-022	Remainder of diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	D65–D89
3-023	Endocrine, nutritional and metabolic diseases	E00–E88
3-024	Malnutrition and other nutritional deficiencies	E40–E64
3-025	Remainder of endocrine, nutritional and metabolic diseases	E00–E34, E65–E88
3-026	Diseases of the nervous system	G00–G98
3-027	Meningitis	G00, G03
3-028	Remainder of diseases of the nervous system	G04–G98
3-029	Diseases of the ear and mastoid process	H60–H93
3-030	Diseases of the circulatory system	I00–I99
3-031	Diseases of the respiratory system	J00–J98

3-032	Pneumonia	J12–J18
3-033	Other acute lower respiratory infections	J00–J11, J20–J22
3-034	Remainder of diseases of the respiratory system	J30–J98
3-035	Diseases of the digestive system	K00–K92
3-036	Diseases of the genitourinary system	N00–N99
3-037	Certain conditions originating in the perinatal period	P00–P96
3-038	Fetus and newborn affected by maternal factors and by complications of pregnancy, labour and delivery	P00–P04
3-039	Disorders relating to length of gestation and fetal growth	P05–P08
3-040	Birth trauma	P10–P15
3-041	Intrauterine hypoxia and birth asphyxia	P20–P21
3-042	Respiratory distress of newborn	P22
3-043	Congenital pneumonia	P23
3-044	Other respiratory conditions of newborn	P24–P28
3-045	Bacterial sepsis of newborn	P36
3-046	Omphalitis of newborn with or without mild haemorrhage	P38
3-047	Haemorrhagic and haematological disorders of fetus and newborn	P50–P61
3-048	Remainder of perinatal conditions	P29, P35, P37, P39, P70–P96
3-049	Congenital malformations, deformations and chromosomal abnormalities	Q00–Q99
3-050	Congenital hydrocephalus and spina bifida	Q03, Q05
3-051	Other congenital malformations of the nervous system	Q00–Q02, Q04, Q06–Q07
3-052	Congenital malformations of the heart	Q20–Q24
3-053	Other congenital malformations of the circulatory system	Q25–Q28
3-054	Down syndrome and other chromosomal abnormalities	Q90–Q99
3-055	Other congenital malformations	Q10–Q18, Q30–Q89
3-056	Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	R00–R99
3-057	Sudden infant death syndrome	R95
3-058	Other symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	R00–R94, R96–R99
3-059	All other diseases	F01–F99, H00–H59, L00–L98, M00–M99
3-060	External causes of morbidity and mortality	V01–Y89
3-061	Transport accidents	V01–V99
3-062	Accidental drowning and submersion	W65–W74
3-063	Other accidental threats to breathing	W75–W84
3-064	Exposure to smoke, fire and flames	X00–X09

3-065	Accidental poisoning by and exposure to noxious substances	X40–X49
3-066	Assault	X85–Y09
3-067	All other external causes	W00–W64, W85–W99, X10–X39, X50–X84, Y10–Y89
3-901	SARS	U04

KEY CONCEPTS AND DEFINITIONS

Adult Mortality: The probability of dying between the ages of 15 – 59 inclusive, that is, the probability of a 15-year-old dying before reaching the age of 60, if subject to current age-specific mortality rates between those ages.

Age-specific fertility rates: The number of births occurring to mothers of a certain age group per 1,000 women in that age group in a given period of time.

Age Specific Mortality Rate: The number of deaths per 1,000 people of a given age group in a given time period.

Age Standardised Death Rates: The number of deaths that would occur if subject to the same age structure as the standard population and the age-specific rate; one country's age specific death rates applied to a standard age distribution.

Crude Birth Rate (CBR): The annual number of births occurring per 1000 mid-year populations.

Crude Death Rate (CDR): The annual number of deaths occurring per 1000 mid-year population

Infant Mortality Rate (IMR): The number of deaths in infants under age 1 per 1000 live births in a given period.

Life Expectancy: The average number of additional years a person could expect to live if current mortality trends were to continue for the rest of that person's life.

Live birth: The complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of the pregnancy, which, after such separation, breathes or shows any other evidence of life - e.g. beating of the heart, pulsation of the umbilical cord or definite movement of voluntary muscles - whether or not the umbilical cord has been cut or the placenta is attached. Each product of such a birth is considered live born.

Maternal death: The death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes.

Maternal mortality ratio (MMR): The ratio of the number of maternal deaths during a given time period per 100,000 live births during the same time-period.

Neonatal mortality rate: The number of deaths in live-born infants aged less than 28 days per 1,000 live births over a specified time period.

Rate of Natural Increase: Rate at which a population grows (increase/decrease) during a given year, as the result of a surplus/deficit of births over deaths; expressed as a percentage of the base population.

Sex Ratio: Number of men per 100 women. Sex ratios over 100 indicate that there are more males than females, and sex ratios under 100 indicate more females than males.

Total Fertility Rate (TFR): The average number of children a woman would give birth to during her lifetime if she were to pass through her childbearing years experiencing the present-day age-specific fertility rates.

Under 5 Mortality Rate: The number of deaths in children under age 5 per 1,000 live births in a given period.

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