NIUE
VITAL STATISTICS REPORT
2012–2016

PREPARED BY:
STATISTICS AND IMMIGRATION OFFICE
MINISTRY OF FINANCE AND PLANNING
GOVERNMENT OF NIUE

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SUMMARY OF MAIN INDICATORS 2012–2016

INDICATORS	VALUE/TOTAL	UNIT
2017 Population, residents only *(provisional)*	1591	
Birth registration completeness	100.0	%
Death registration completeness	100.0	%
Total number of births, 2012–2016	**131**	
Sex ratio at birth (male:female), 2012–2016	115	
Crude birth rate (CBR), 2012–2016	17.2	per 1,000
Total fertility rate (TFR), 2012–2016	2.7	per woman
Total number of deaths, 2012–2016	**49**	
Crude death rate (CDR), 2012–2016	6.4	per 1,000
Under 5 mortality rate (U5M), 2012–2016	0	per 1,000
Infant mortality rate (IMR), 2012–2016	0	per 1,000
Life expectancy at birth, 2012–2016		
• *Males*	71.8	Years
• *Females*	75.7	Years
Adult mortality rate		
• *Males*	17.3	%
• *Females*	4.5	%
Adult mortality from Non-communicable disease mortality, 2012–2016	18.5	%
Leading causes of death, 1996–2016		
• *Under 5*	Perinatal conditions	
• *15–59*	External causes	
• *60+*	Heart diseases	

EXECUTIVE SUMMARY

Civil registration and vital statistics data are particularly important in Niue in the context of policy-making and planning and for meeting international commitments to monitor progress towards the 2030 Sustainable Development Goals. This includes tracking improvements in maternal and child health, understanding low life expectancies (which have had limited improvements over the last 20 years), and evaluating the success of programmes to combat non-communicable diseases as a major public health emergency in the region.

This is the second analytical report for Niue's vital statistics based on civil registration data. The report covers the years 2012–2016, with comparisons made to previous years to show a continuous trend. There has been no annual analytical report, as it was decided that a report be compiled every five years, given the small number of events and the population.

The 2017 Household and Population Census reported a total of 1,719 people, of whom 1591 considered Niue to be their usual place of residence.

For the period 2012–2016, Niue had a total of 131 births and 49 deaths. The crude birth rate for the period was 17.2 births per 1,000 population (95% CI: 8.7–24.9) and the crude death rate was 6.4 per 1,000 population (95% CI: 2.9–11.6). There was an average of 26 births and 10 deaths per year. This equates to a natural increase rate for Niue's population of 1.00%, which represents Niue's overall population growth if migration were not included. This is an increase from the 2011 vital statistics report, which showed a natural increase of 0.75%. The sex ratio for births was 115 males to every 100 females.

Niue's current total fertility rate (TFR) for 2012–2016 is estimated to be 2.7 births per woman (95% CI: 1.6–3.7). This is similar to the TFR of 2.2 births per woman reported in the 2011 census and the 2.7 recorded in the first vital statistics report of 2011.

Life expectancy at birth for men is estimated to be 71.8 (95% CI: 63.4–80.1), while that for women is estimated at 75.7 (95% CI: 67.9–83.4), although both measurements are subject to significant uncertainty due to small population size.

There was no infant mortality or under-five mortality recorded for the period 2012–2016. There has also never been a maternal death recorded since 1987.

The leading causes of deaths for Niueans were heart diseases for the combined years of 1997–2001 (21.5%), 2002–2006 (23.8%) and 2007–2011 (27%). The most recent combined years, 2012–2016, recorded the leading cause for the population to be diabetes, with 20.4% of deaths attributed to diabetes. However, when disaggregated into age groups and sex for the past 20 years (1996–2016) the leading cause of deaths in males aged 15–59 is external causes (accidents and injuries), most of which were due to intentional self-harm. Even though the number covers 20 years, based on the population size, this represents a significant public health issue. Some female deaths in the 15–59 age group were also recorded as due to external causes, although cancer has increased in the rankings as a cause of death for this age group.

INTRODUCTION

This report is the second demographic report on vital statistics and causes of death in Niue from 2012–2016, with comparisons to previous years as recorded in the first report, *Niue Vital Statistics 1987–2011*. The data for this report were provided by records kept by the Ministry of Health; The civil registration office which is under the Department of Justice, Lands and Survey and the National Statistics Office. The main purpose of this report is to make available the vital statistics for Niue, as derived from locally collected data.

Civil registration is the system by which a government records the births and deaths of individuals within the government's jurisdiction. These records are maintained by the government. The statistical information derived from these records is not only used by government and public health departments to provide evidence-based policies and to make decisions, but also to evaluate how effective their programmes are. These statistics are the cornerstone of public health systems today.

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

1. *To confer individual rights of identity, 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. Death registration is also critical for removing people from official government lists, such as electoral rolls.
2. *To provide critical statistical information for planning and policy decisions.* This includes identifying service needs and measuring the health of a population, which require population numbers; most importantly the number of births and deaths.

Vital statistics play an important role in shaping the economic and social development of a country and can be directly linked to development. Therefore, we cannot overemphasise their importance in policy and decision-making for the needs of the population.

The objectives of this report are:

- to present statistics on live births and deaths by selected socio-demographic and geographic characteristics for the years 2012–2016;
- to present trends in mortality for almost 30 years, 1987–2016; and
- to present the causes of death for 2012–2016 based mainly on the underlying causes of death.

Since the first report, Niue has adopted the implementation of the International Standards of Cause of Death Coding (ICD), shortened to the General Mortality list. This was practical, given the small number of events, and it provides enough detail for policy- and decision-makers. It also avoids disaggregating data to such small numbers that they would have no meaning whatsoever. The use of the ICD list of 103 causes is still comparable internationally with countries with full ICD-10 coding. As advised at the workshop on data analysis and report writing held in Fiji in May 2018, Niue will adopt the full ICD 10 coding format to capture the specific causes of death but will still report from the ICD 10 General Mortality list.

As recommended in the first vital statistics report, this report includes the analysis of the baby's birth weight (Chapter 1), maternal mortality (Chapter 2), and natural and non-natural causes of deaths (Chapter 3).

CHAPTER 1: BIRTHS AND FERTILITY

Number of births

The total number of births from 2012 to 2016 was 131, of which 70 were boys and 61 were girls. 2012 recorded the highest number, with 33 live births, whilst 2014 recorded the lowest number, 20 live births. The sex ratio at birth for the period, was 114.7. This means that for every 100 live female births, there were approximately 115 live male births over the same period.

Table 1.1: Total number of births by sex per year, 2012–2016

Year	2012	2013	2014	2015	2016	5 year total
Males	17	15	9	15	14	70
Females	16	10	11	11	13	61
Total	**33**	**25**	**20**	**26**	**27**	**131**

The analysis below shows the five-year rolling average of births by sex of child. It shows the trend line for both sexes, declining from 1989 to 1997, which reflects the substantial outward migration of the population. The trend line for male births continues to decline until 2001 before it increases again through to 2009, where it surpasses female births through to 2014. Female births stay constant from 1997 to 2003 and then fluctuate through to 2014 with a slight downward trend.

Table 1.2: Average number of births per year by five-year periods, 1987–2016

Five-year period	1987–1991	1992–1996	1997–2001	2002–2006	2007–2011	2012–2016
Males	23	18	12	12	12	14
Females	23	16	14	16	12	12
Total	**46**	**34**	**27**	**28**	**25**	**26**
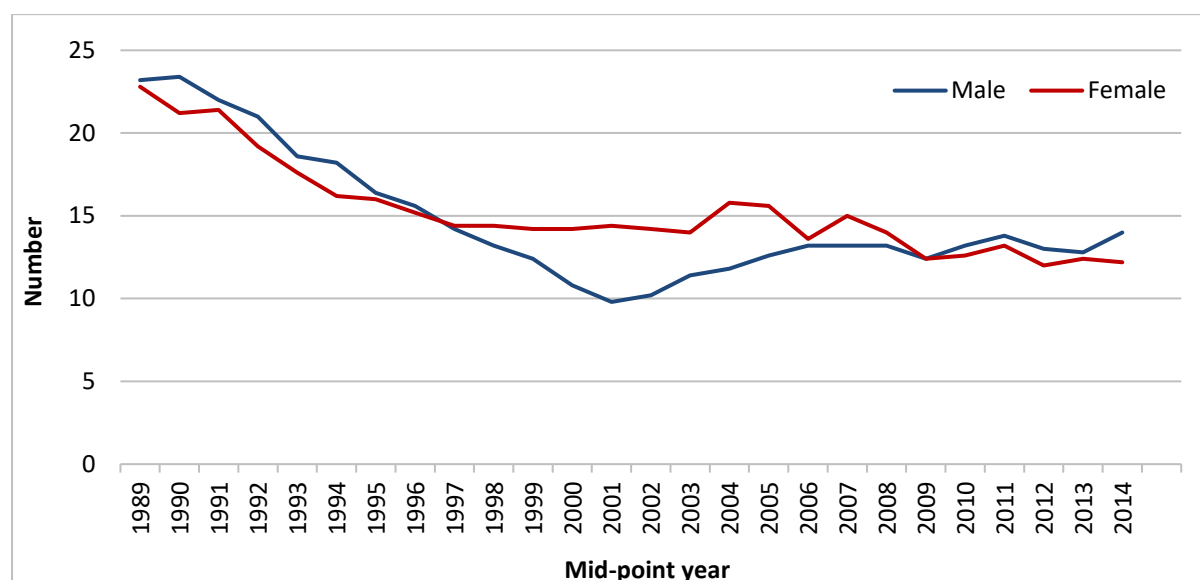
Figure 1.1: Average births per year (rolling average by five-year period and sex): 1987–2016

Place of birth

Niue is very fortunate to have access to medical care in New Zealand. As New Zealand citizens, indigenous Niueans have access to specialised healthcare during pregnancy in New Zealand with the option to deliver their babies in a New Zealand hospital. Other Niuean residents may also be referred to New Zealand for specialised care under the medical referral scheme if warranted.
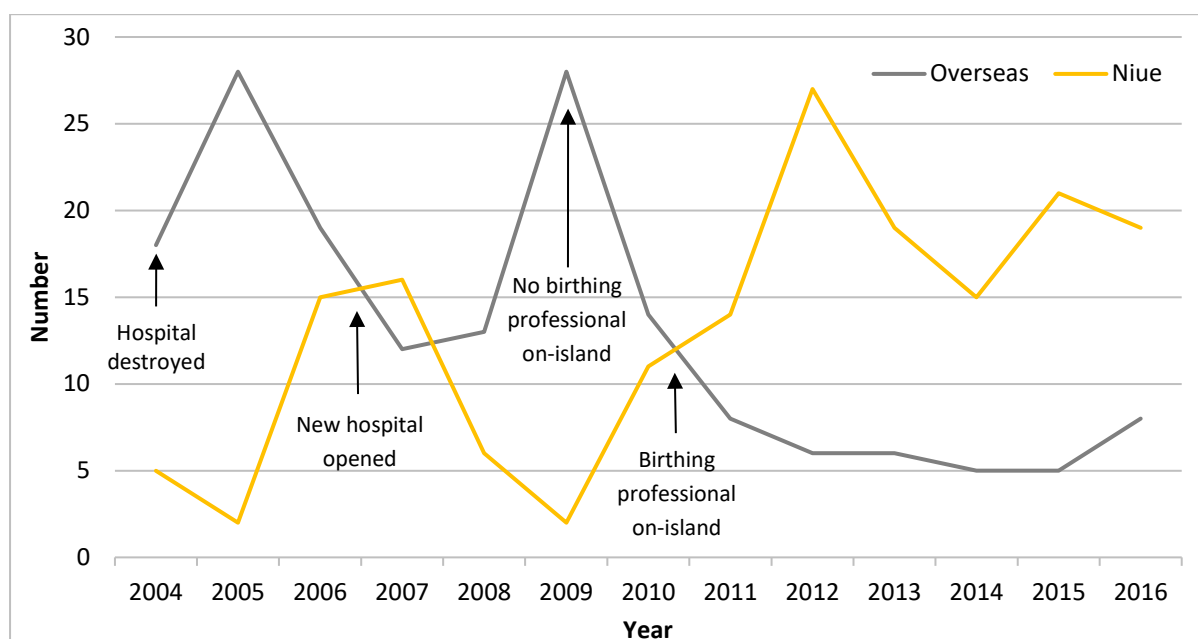
Figure 1.2: Total births by place of birth (Niue or overseas), 2004–2016

Figure 1.2 shows the pregnancy healthcare history of residents of Niue from 2004 to 2016. In early 2004, Cyclone Heta hit Niue and destroyed the only hospital on the island. As a result, a makeshift hospital was developed at the Niue Youth Centre and named the Niue Health Centre. For two years, 2004 and 2005, pregnant women were referred overseas (i.e. Niueans to New Zealand and Tongans to Tonga) due to inadequate facilities and lack of equipment for safe deliveries and the health of both the mother and child.

The new hospital, Niue Foou, was officially opened in 2006 and provided a maternity unit that was fully equipped for deliveries and had an operating theatre for caesarean section (surgery) for complicated and high-risk cases. The newly appointed Director of Health had a background in obstetrics and gynaecology, which allowed women to give birth in Niue safely.

Referrals increased once again in 2009, as there was no obstetrician on the island to attend cases of complications during labour, delivery and post-delivery. A directive was verbally issued by the then Minister for Health to refer pregnant mothers to New Zealand for a safer delivery until the department was able to recruit a new obstetrician or a doctor with skills and experience in caesarean section. Locums with these skills were appointed in 2010, and a senior medical officer skilled in obstetrics and caesarean section was appointed in 2012. From then on, only emergency cases were given an overseas referral.

Births by age of mother

Child-bearing 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.

Table 1.3: Percentage distribution of births by age of mother, 1987–2016

Age groups	1987–1991	1992–1996	1997–2001	2002–2006	2007–2011	2012–2016
Less than 15	0	0	1	1	0	0
15–19	13	6	11	10	5	8
20–24	27	25	22	27	24	12
25–29	29	35	32	25	25	32
30–34	21	18	20	23	27	27
35–39	7	11	11	12	15	18
40–44	3	5	4	1	3	2
45–49	0	0	1	0	1	0

Table 1.3 shows the proportion of births by the age of the mother, aggregated in five-year intervals from 1987 to 2016. Up until the period 2002–2006, births from mothers aged 24 and below accounted for approximately 30–40% of all births, with this figure dropping to 29% for the period 2007–2011, suggesting that women in Niue nowadays are tending to wait a little longer before giving birth.
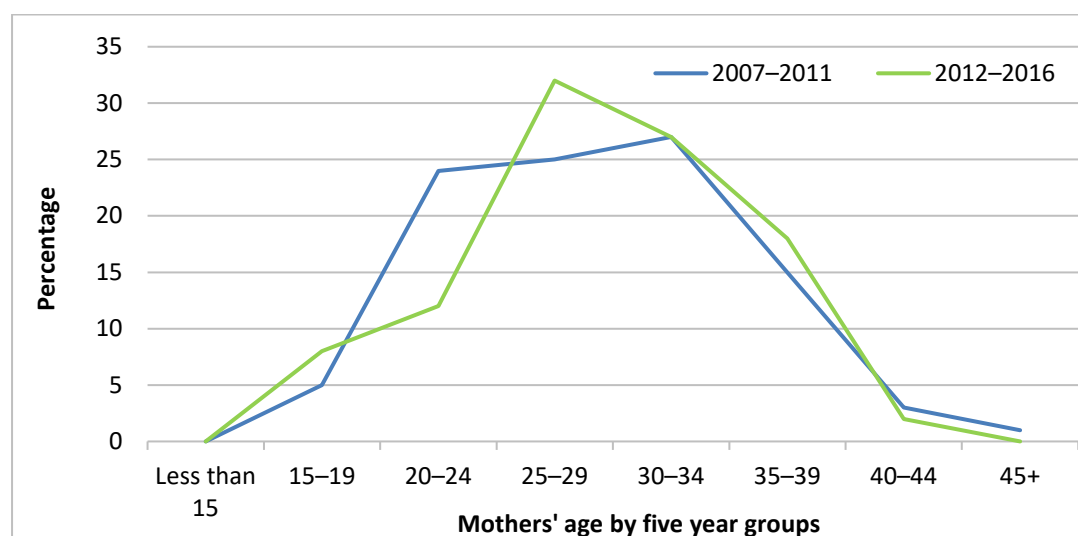
Figure 1.3: Percentage distribution of births by age of mother, 2007–2016

Figure 1.3 compares the last two five-year periods and further illustrates the point that women in Niue are deferring having babies until they are a little older. The peak age has shifted from the 30–34 to 25–29 age group, which is largely due to the shift in women who gave birth in the 20–24 age groups declining significantly from 24% to 12% contributing to the increase in the 25–29 age group from 25% to 32%.

Birth by birth weight

An important predictor of a baby's health at birth and thus its chance of survival is its weight at birth. A low birth weight rate can indicate a public health problem, such as long-term maternal malnutrition, ill health of the mother and poor health care.

Birth weight is the weight of the foetus or new-born baby obtained after birth. For live births, birth weights should ideally be measured within the first hour of life before significant postnatal weight loss occurs. Low birth weight is defined as a weight less than 2.5 kg (2,500 grams) irrespective of the gestational age. Foetal macrosomia, a medical term for a larger than average baby, describes babies weighing 4.5 kg or over. A large baby increases the risk of complications for both mother and child. One of the most influential factors contributing to macrosomia is gestational diabetes or pre-existing diabetes.

Table 1.4: Percentage distribution of births by birth weight category, 2012–2016

Year	Born in Niue					Number of overseas births
	Number of births	Birth weights (Percentage distribution)				
		<2.5	2.5–4.5	>4.5	Total	
2012	27	0%	96%	4%	100%	6
2013	19	11%	89%	0%	100%	6
2014	14	0%	100%	0%	100%	6
2015	21	19%	81%	0%	100%	5
2016	19	5%	84%	11%	100%	8
Total	**100**	**7%**	**90%**	**3%**	**100%**	**31**

Table 1.4 shows the percentage distribution of births by birth weights for the period 2012–2016, with a focus on births that took place in Niue (100 out of 131). The table shows that the majority of babies born in Niue are within the average weight range (90%) with a few babies under the standard WHO 2.5 kg weight for low birth weights (7%) and even fewer weighing above 4.5 kg (3%).

The average birthweight for babies during the period 2012–2016 was 3.4 kg.

Crude birth rate

The crude birth rate (CBR) is the number of births per 1,000 population over a given period. It can inform us how much our population is growing or decreasing.

Table 1.5 shows that the CBR was highest in 1987–1991, at 19.9 births per 1,000 population, and reached its lowest point in the period 1997–2001, when it was reported at 13.4 births per 1,000 population. To access the accuracy of these estimates, a 95% confidence interval has been generated in both Table 1.5 and Figure 1.4. This analysis indicates that, whilst there is a trend that shows a decline in CBR from the period 1987–1991 to 1997–2001 and then starts rising again until the period 2012–2016, there is no statistically significant difference between CBR values for each period.

A contributing factor to there being no statistically significant difference in the CBR over the six five-year periods is that, whilst the population of Niue has declined significantly during this time, especially up until the period 1997–2001, the number of births has also decreased over this period.

Table 1.5: Crude birth rate with 95% confidence intervals (lower, L, and upper, U) by five-year period, 1987–2016

Five-year period	Crude birth rate	L 95% CI	U 95% CI
1987–1991	19.9	10.1	27.9
1992–1996	15.7	7.3	23.1
1997–2001	13.4	5.9	20.1
2002–2006	16.0	8.0	23.7
2007–2011	15.8	7.3	23.1
2012–2016	17.2	8.7	24.9
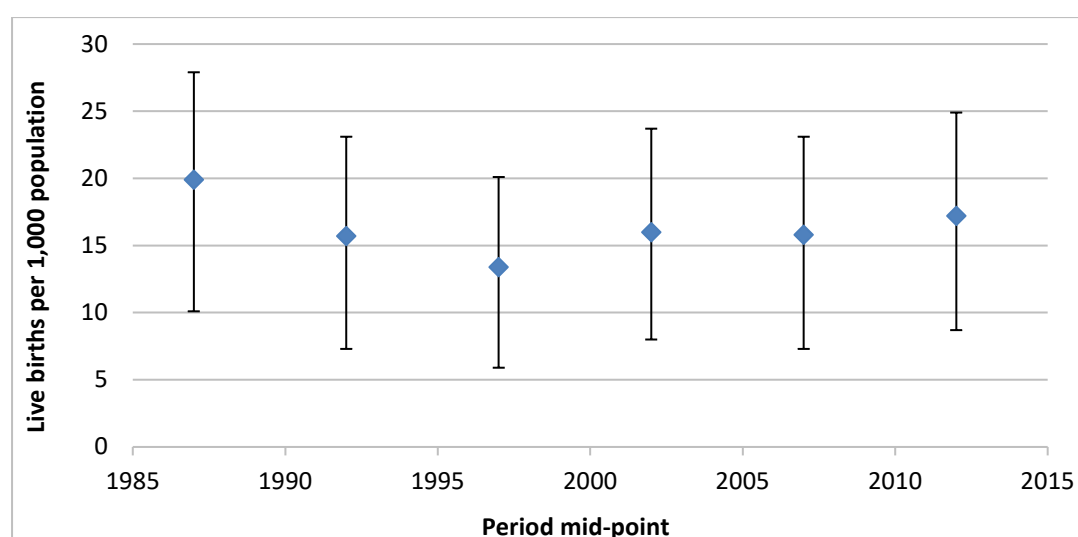
Figure 1.4: Crude birth rate over five-year periods with 95% confidence intervals, 1987–2016

Total fertility rates

The total fertility rate (TFR) is 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.

Table 1.6: Total fertility rates with 95% confidence intervals, 1987–2016

Five-year period	Total fertility rate	L 95% CI	U 95% CI
1987–1991	3.2	2.3	4.1
1992–1996	2.7	1.8	3.5
1997–2001	2.3	1.4	3.2
2002–2006	2.6	1.6	3.6
2007–2011	2.8	1.7	3.9
2012–2016	2.7	1.6	3.7
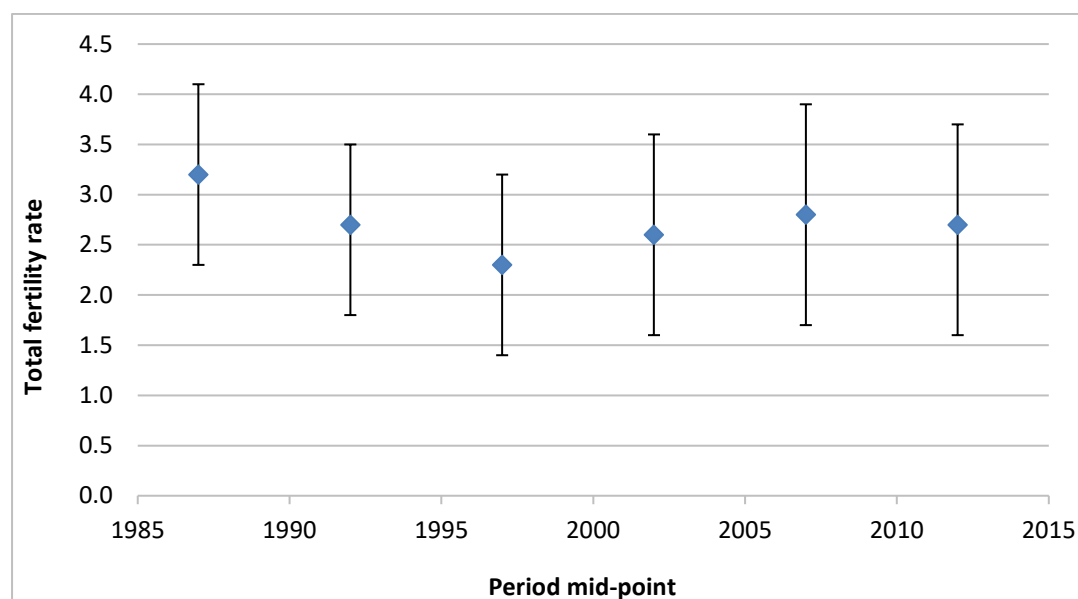
Figure 1.5: Total fertility rates with 95% confidence intervals, 1987–2016

The fertility rate in Niue remained roughly the same from 1987 to 2016, recording the number of births per woman during her life to be two to three. This is also reflected in the 95% confidence intervals for each five-year period. The steady fertility rates indicate that the continuing decline in Niue's population in the years 1987 to 2012 was not due to the falling number of births.

The 2011 census recorded a TFR of 2.2, slightly lower than the recent 2.7 (95% CI: 1.6–3.7) calculated for the 2012–2016 period.

CHAPTER 2. MORTALITY

Deaths by selected variables

Number of deaths

The total number of deaths from 2012 to 2016 was 49, of which 28 were males and 21 were females. Four out of the 49 deaths occurred overseas and are included in this total as they were residents of Niue seeking medical aid overseas and their details were captured upon the body being returned to Niue for burial. There were more male deaths than female deaths, except in 2016, when there were more female deaths.

2015 had the highest number of deaths in the 2012 to 2016 period, with a total of 16 deaths.

Table2.1: Total number of deaths year, 2012–2016[1]

Year	2012	2013	2014	2015	2016	Total
Total	**8**	**13**	**5**	**16**	**7**	**49**

The analysis in Table 2.2 and Figure 2.1 shows the five-year rolling average of deaths by sex. It shows the trend line for both sexes has remained below ten for males with the exception of 1997, and less than eight for females. The analysis also shows that the average number of deaths has decreased significantly in the most recent five-year period. This may be the result of the bodies of Niueans who died overseas not being returned for burial and so not being captured.

Table 2.2: Average number of deaths by five-year period, 1987–2016

Five-year period	1987–1991	1992–1996	1997–2001	2002–2006	2007–2011	2012–2016
Males	8	10	8	9	8	6
Females	8	4	7	7	5	4
Total	**15**	**14**	**17**	**17**	**13**	**10**
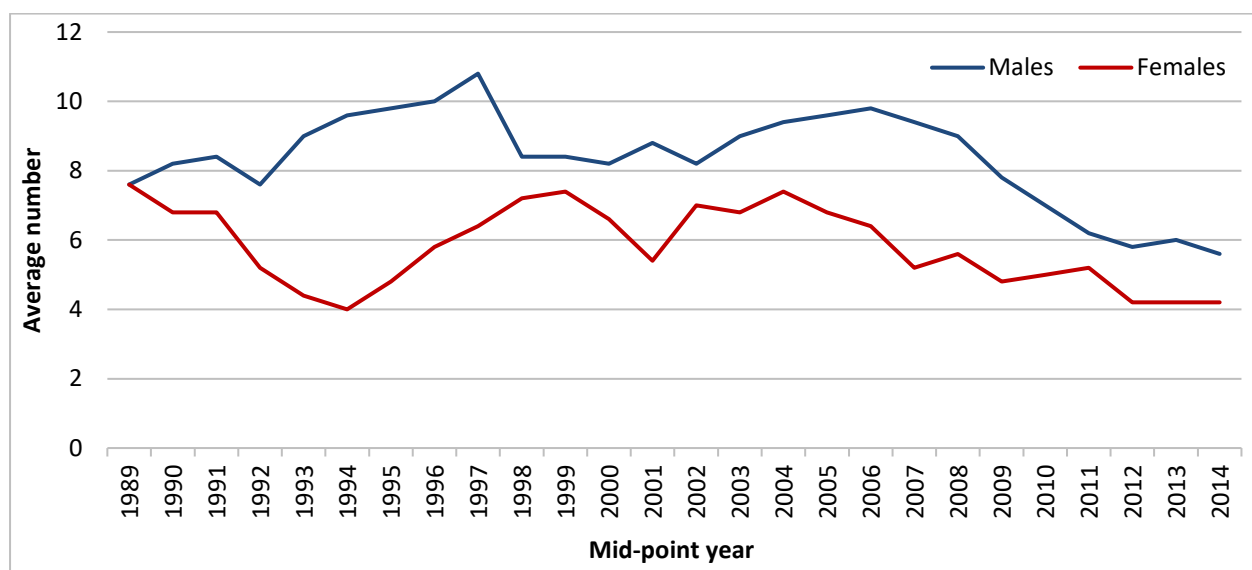
Figure 2.1: Average deaths per year (rolling average by five-year period): 1989–2014

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[1] *The numbers are too small and identifiable when disaggregated by sex.*

Summary measures of mortality

Crude death rate and age-standardised mortality rate

Table 2.3 and Figure 2.2 present both the crude death rate (deaths per 1,000 population) and the age-standardised mortality rate. Age-standardised death rates are a country's age-specific death rates applied to a standard age distribution. Age-standardised rates allow the comparison of death rates over time or between two 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 everyone must eventually die). Populations with a greater proportion of older people have higher crude death rates than populations comprised of young people under identical health and social conditions. Data have been age-standardised to the most recent period shown, using the WHO World Standard Population. The number of deaths for the five-year periods was totalled and averaged to a single year before the calculation of crude death rate (CDR) and age-standardised mortality rate (ASMR).

Table 2.3: Crude death rate (CDR) and age-standardised mortality rate (ASMR) by five-year periods and 95% confidence intervals, 1987–2016

Five-year groups	CDR	L 95% CI	U 95% CI	ASMR	L 95% CI	U 95% CI
1987–1991	**6.6**	*3.6*	*10.7*	**8.4**	*4.1*	*13.8*
1992–1996	**6.3**	*3.2*	*10.3*	**6.3**	*3.6*	*13.0*
1997–2001	**8.2**	*4.3*	*12.8*	**8.7**	*4.6*	*14.7*
2002–2006	**9.9**	*5.4*	*15.4*	**11.5**	*6.5*	*18.0*
2007–2011	**8.3**	*4.1*	*13.8*	**8.3**	*4.1*	*13.8*
2012–2016	**6.4**	*2.9*	*11.6*	**4.6**	*2.0*	*8.3*
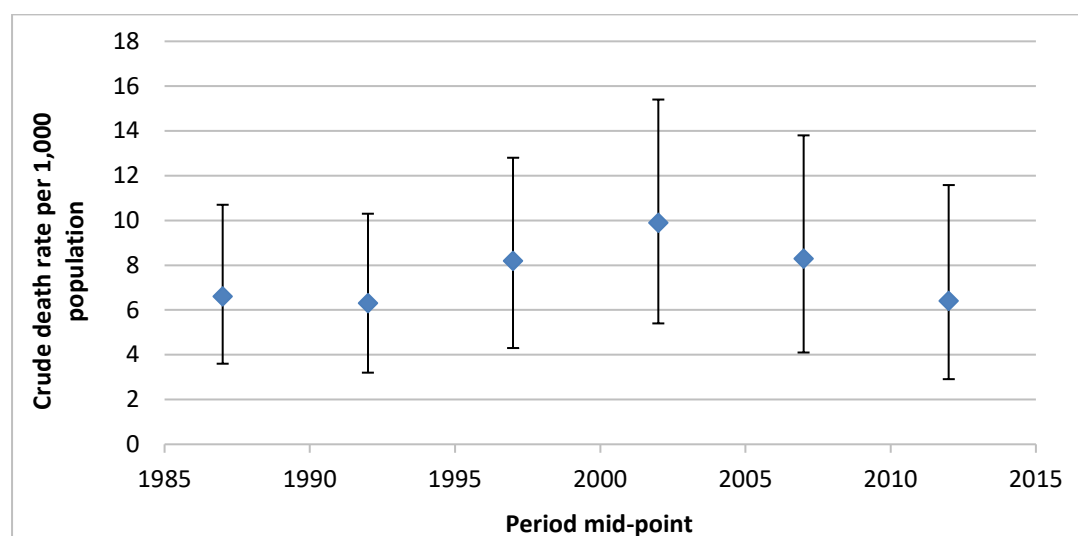
Figure 2.2: Crude death rate by five-year periods and 95% confidence intervals, 1987–2016

Table 2.3 shows that the crude death rate (CDR) was highest in 2002–2006 at 9.9 deaths per 1,000 population and was at its lowest in 1992–1996 at 6.3 deaths per 1,000 population. To access the accuracy of these estimates, a 95% confidence interval has been generated in both Table 2.3 and Figure 2.2. This analysis shows that, although there is a decline in the CDR from the period 2007–2011 to 2012–2016, there is no statistically significant difference between the CDR values for each period.

Both the CDR and ASMR were high in the 2002–2006 period, but this increase was not sustained and, given the uncertainty of these figures (as reflected in the 95% confidence intervals), this is likely to reflect random variation due to the small population size, despite the aggregation of data over several years.

Life expectancy at birth

Life expectancy at birth indicates the average number of years a new-born infant would live if the current patterns of mortality at the time of its birth were to remain the same throughout its life.

Table 2.4 shows the life expectancy from birth for an average resident of Niue, as calculated directly from recorded deaths, through five-year periods, beginning in 1987.

Table 2.4: Life expectancy at birth (LE$_0$) by five-year periods and 95% confidence intervals, 1987–2016

Five-year period	Male	L 95% CI	U 95% CI	Female	L 95% CI	U 95% CI	Total	L 95% CI	U 95% CI
1987–1991	71.1	67.8	74.3	76.2	74.1	78.3	73.4	71.4	75.5
1992–1996	68.2	65.5	72.0	77.1	75.3	79.0	72.2	70.7	74.7
1997–2001	67.2	63.4	71.0	73.9	70.1	77.7	70.3	67.6	73.0
2002–2006	67.8	63.8	71.8	74.0	70.9	77.1	70.8	68.1	73.4
2007–2011	70.1	63.8	71.8	76.3	72.9	79.7	73.1	70.4	75.8
2012–2016	71.8	63.4	80.1	75.7	67.9	83.4	73.6	67.9	79.4

Life expectancy for 2012 to 2016 is estimated to be 71.8 (95% CI: 63.4–80.1) for males and 75.7 (95% CI: 67.9–83.4) for females. This is slightly lower than the recorded estimated life expectancy reported in the 2011 census: 72.5 for males and 75.2 for females.

The life expectancy for the period 2012–2016 is similar to that of 1987–1991, although the confidence intervals are wider, given the uncertainty when dealing with so few deaths occurring in this period. Although the improvement is small, the estimates for life expectancy must be interpreted with great care, given the high level of uncertainty (as demonstrated in the age-specific mortality rates in the following section).

Infant and child mortality

Infant mortality

The infant mortality rate (IMR) shows the number of infant deaths (deaths in children under one year old) a year per 1,000 live births for a given period.

No infant death occurred between 2012 and 2016.

There are no overall trends apparent in IMR over the 30 years examined. Niue's IMR was substantially higher in the years 1997 to 2011 than the periods before, with an IMR of 30.2 deaths per 1,000 live births. However, this is likely to reflect natural variation due to the small population size, as there were four infant deaths between 1997 and 2001. Generally sitting below 15 deaths per 1,000 live births (except in 1997–2001), the IMR was fairly low. See Table 2.5 and Figure 2.3.

Table 2.5: Infant mortality rates (IMR) with 95% confidence intervals, 1987–2016[2]

Five-year period	IMR	L 95% CI	U 95% CI
1987–1991	13.0	0.0	80.1
1992–1996	11.6	0.0	107.2
1997–2001	30.2	0.0	138.7
2002–2006	14.5	0.0	133.7
2007–2011	8.1	0.0	148.8
2012–2016	0.0	0.0	0.0

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[2] Total deaths for each five-year period was less than or equal to five.
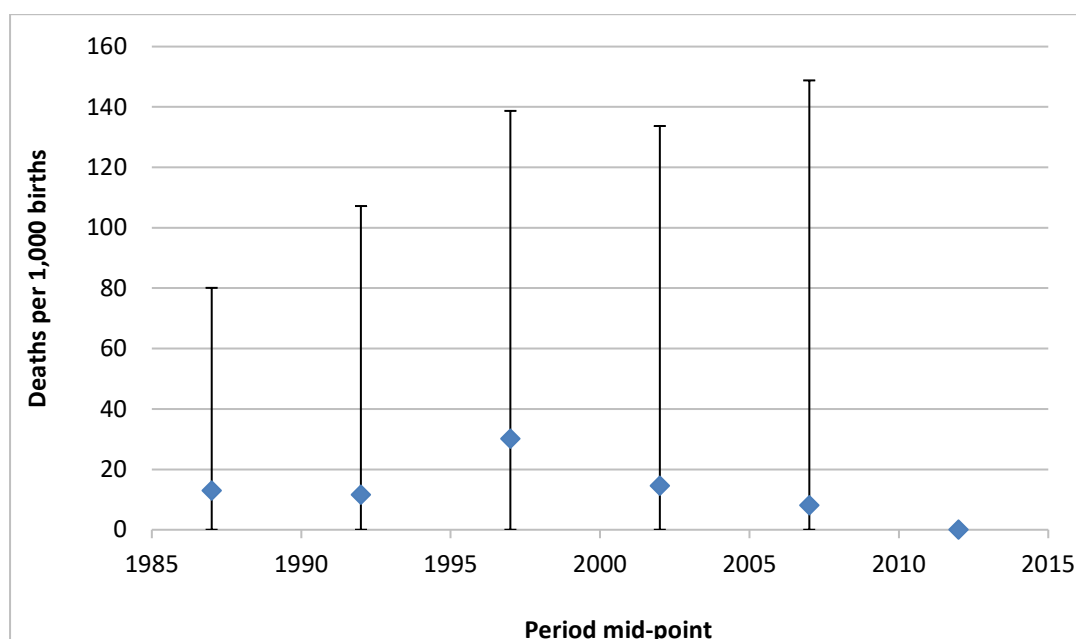
Figure 2.3: Infant mortality rates with 95% confidence intervals, 1987–2016

The 2011 census recorded an IMR of 10.5 deaths per 1,000 live births or at least one infant death within a five-year period. The substantial difference in the reported IMRs can be explained by the different case definitions used in the two reports, as in this study, only births to resident mothers have been included in the denominator, rather than all registered births.[3]

Under-five mortality rate

The under-five mortality (U5M) rate is measured as the number of deaths in children under age five per 1,000 live births in a given period.

Table 2.6 and Figure 2.4 show the number of deaths and the under-five mortality rates for residents of Niue for five-year periods beginning in 1987. The rates and confidence intervals illustrate the uncertainty of small numbers, as reflected in the period 1997–2001, when there was a total of five deaths occurring to those under five years of age, a rate of 37.6 deaths per 1,000 live births. It is important to interpret these numbers with great care, given the small number of events occurring on the island.

There were no deaths of children under the age of five in the recent five-year period, 2012–2016.

Table 2.6: Under-five mortality rates with 95% confidence intervals, 1987–2016[4]

Five-year period	U5M	L 95%CI	U 95%CI
1987–1991	13.0	2.7	38.1
1992–1996	11.6	1.4	42.0
1997–2001	37.6	12.2	87.7
2002–2006	21.7	4.5	63.5
2007–2011	16.1	2.0	58.3
2012–2016	0.0	0.0	0.0

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[3] *Niueans who give birth overseas are also able to register the birth of their child in Niue when they return, up to the age of two years, as stated in the Births and Deaths Regulation of 1984, section 12.1.*

[4] *Total deaths for each five-year period was less than or equal to five.*
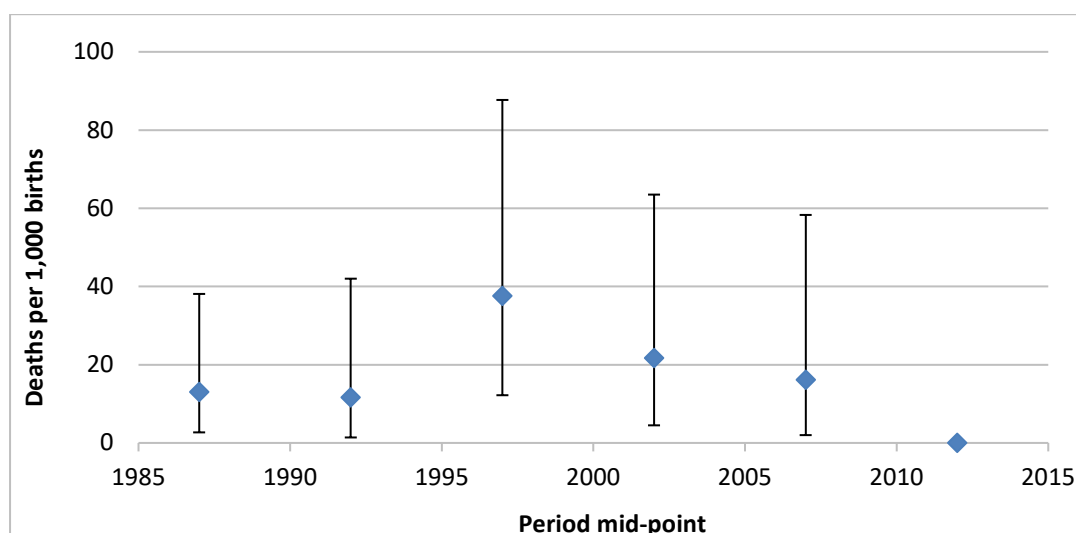
Figure 2.4: Under-five mortality rates with 95% confidence intervals, 1987–2016

With regard to the Sustainable Development Goals, with no deaths occurring under the age of five years, Niue is on target to achieve goal number 3.2 by 2030, ending preventable deaths of new-borns and children under five years of age and aiming to reduce neonatal mortality to at least as low as 12 per 1,000 live births and under-five mortality to at least as low as 25 per 1,000 live births.

Age-specific mortality

An age-specific mortality rate is the number of deaths per 1,000 people of a given age group in a given time period. As a general rule, in all settings, mortality rates are high during infancy and early childhood and fall to their lowest levels between the ages of 5 and 14 years. Subsequently, mortality rates rise as the age increases and they increase exponentially beyond the age of 65 years.

There is usually a small increase in the 15–34 age groups for both males and females. For males this is due to external factors and for females it is due to maternal deaths. However, there has never been a maternal death recorded in Niue, as seen in the causes of deaths, Chapter 3.

The age-specific mortality rates for Niue are shown in Table 2.7 (1987–2016), and Figure 2.5 (2007–2016). Figure 2.6 shows the age-specific mortality rates by sex, 2012–2016.

Table2.7: Age-specific mortality rate (deaths per 1,000 people) by five-year periods, 1987–2016

Age groups	1987–1991	1992–1996	1997–2001	2002–2006	2007–2011	2012–2016
0–4	1.9	2.0	5.5	4.0	3.2	0.0
5–14	0.7	1.2	0.5	0.0	0.0	0.7
15–24	1.0	1.8	0.7	0.7	1.6	1.1
25–34	0.7	0.0	4.7	4.5	2.5	1.0
35–44	3.8	0.9	0.9	2.1	1.1	2.3
45–54	1.7	8.5	5.0	2.6	3.0	5.2
55–64	7.0	10.5	13.6	18.8	9.5	9.4
65–74	31.9	21.8	27.5	24.4	25.7	8.4
75+	118.6	95.2	96.5	191.7	122.7	57.9
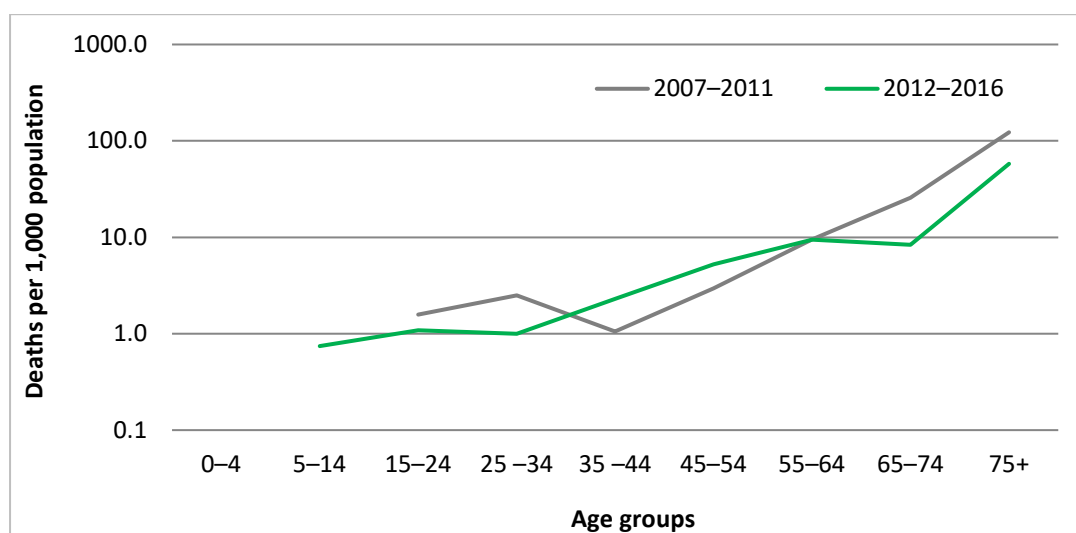
Figure 2.5: Age-specific mortality rates for two five-year periods, 2007–2016
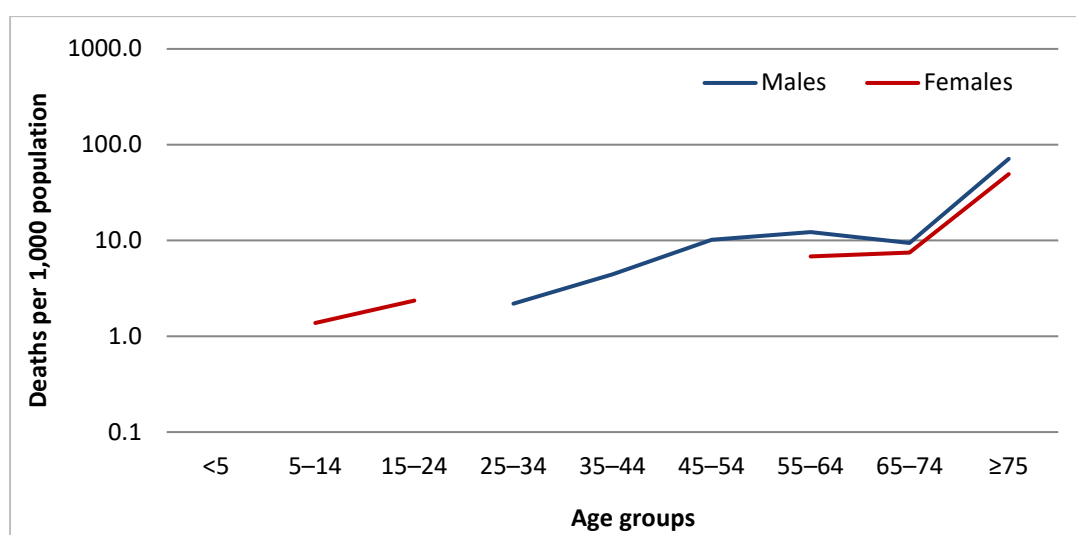
Figure 2.6: Age-specific mortality rates by sex, 2012–2016

As noticeable in Figures 2.5 and 2.6, the small population size, and subsequent low number of deaths (even when aggregated over five years) mean that it is not possible to obtain stable age-specific mortality rates for all age groups and great care must be taken when using these rates to calculate life tables. Despite this, the data show a plausible pattern in the age-specific mortality rate graphs. Figure 2.5 shows the 2007–2011 and 2012–2016 trend, while Figure 2.6 illustrates the 2012–2016 age-specific mortality rate by sex. Although Figure 2.6 does not show a complete age-specific trend, there is still a pattern to emerge from the data given. The trend shows higher rates of mortality for males than for females in the age group 55 onwards. Comparison with earlier age groups is not very clear, given the incomplete trends.

Adult mortality

Adult mortality is the probability of dying between the ages of 15 and 59 inclusive, or the probability of a 15-year-old dying before reaching the age of 60. Table 2.8 shows the probability in percentage of males and females dying between the ages of 15 and 59 inclusive, with 95% confidence intervals.

Table2.8: Adult mortality (%) by five-year periods and sex with 95% confidence intervals, 1987–2016

Five-year periods	Males (%)	L 95% CI	U 95% CI	Females (%)	L 95% CI	U 95% CI
1987–1991	12.6	4.8	25.9	3.6	0.4	13.0
1992–1996	18.7	8.9	33.9	5.2	1.1	15.3
1997–2001	18.9	9.0	34.6	9.9	3.4	21.9
2002–2006	32.8	17.6	54.8	4.0	0.5	14.6
2007–2011	17.0	7.0	33.5	6.6	1.3	19.4
2012–2016	17.3	7.4	33.7	4.5	0.5	16.4

For the most recent years, 2012–2016, the probability of dying between 15 and 59 years of age for males was 17.3%. This means that for males aged 15 years old, 17 out of every 100 would not make it to 60 years of age. This equates to an 82.7% probability of surviving. This is very high, when compared to females, who have a 4.5% probability of dying between the ages of 15 and 59, with a 95.5% chance of surviving. Overall there is no clear decrease or increase over time for either sex.

The premature mortality in males remains very high and should be further examined.

Maternal mortality

A maternal death is defined by the World Health Organization (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 time period per 100,000 live births during the same period. A live birth is defined by 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.

No maternal mortality cases were reported for Niue during the period 1996 to 2016. This reflects Niue's target to achieve Sustainable Development Goal 3.1 – to reduce the global maternity mortality ratio to less than 70 per 1,000 live births by 2030.

CHAPTER 3: CAUSES OF DEATH

Natural and non-natural causes of death

According to the ICD–10 codebook, all causes of death from chapters 1 to 18 of ICD–10 are classified as natural causes and chapter 20 (V01–Y98) as non-natural causes. The analysis in Table 3.1 and Figure 3.1 show the number and percentage distribution of natural and non-natural deaths in Niue by year of death for the period 1987 to 2016.

Table 3.1: Number of natural and non-natural deaths, 1987–2016

Five-year period	Total			
	Natural	Non-natural	Not defined	Total
1987–1991	0	0	76	76
1992–1996	10	2	56	68
1997–2001	55	10	14	79
2002–2006	72	7	5	84
2007–2011	54	6	3	63
2012–2016	47	2	0	49
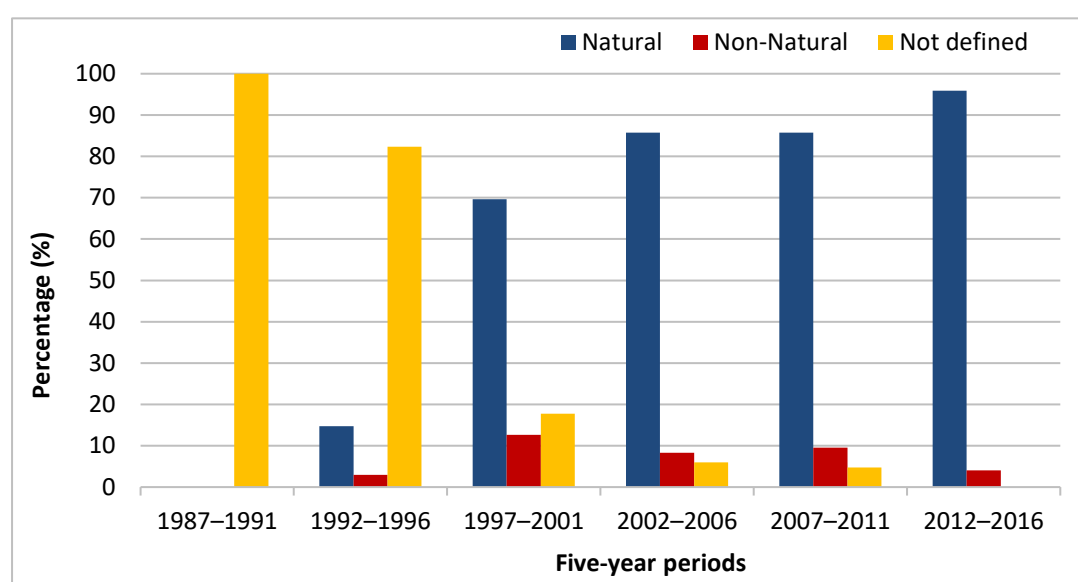
Figure 3.1: Percentage distribution of natural and non-natural causes of death by five-year periods, 1987–2016

Figure 3.1 shows the decline in the 'not defined' deaths for the period 1987–2016 from having no information available for the cause of death to a completely defined cause of death in the recent years 2012–2016. This may be the result of doctors acknowledging the importance of capturing causes of deaths in recent years.

Where there is information available on the causes of death, it is very clear there is a high proportion of deaths due to natural causes. There are not many non-natural deaths occurring throughout the years.

Leading underlying natural causes of death (all ages)

Leading causes of deaths provide an overview of the most prevalent diseases and external events contributing to mortality in a country. Tables 3.2 to 3.6 show the top five leading causes of death by percentages for every five-year period from 1992 to 2016.

Over time, the most dominant causes of death for Niue have been non-communicable diseases, with heart diseases, respiratory diseases, and cancer all ranked in the top five causes of death for each five-

year period and diabetes in the rankings for 1997 to 2016. Infectious diseases replaced external causes in the most recent five-year period, 2012–2016, in the top five cause-of-death rankings.

The years 1992–1996 should be analysed with care, as 82.4% of the causes of deaths were categorised as 'not available' (NA).

Table 3.2: Five leading causes of death (by ICD General Mortality List 1) by Sex, 1992–1996

Code	Cause of Death	Males	Females	Total
1-026	Cancer	4.4	2.9	7.4
1-094	Abnormal findings	2.9	1.5	4.4
1-095	External Causes	2.9	0.0	2.9
1-064	Heart diseases	1.5	0.0	1.5
1-072	Respiratory diseases	1.5	0.0	1.5

Table 3.3: Five leading causes of death (by ICD General Mortality List 1) by sex, 1997–2001

1997–2001				
Code	Cause of Death	Males	Females	Total
1-064	Heart diseases	10.1	11.4	21.5
1-026	Cancer	8.9	3.8	12.7
1-095	External causes	10.1	2.5	12.7
1-072	Respiratory diseases	7.6	3.8	11.4
1-051	Diabetes	2.5	6.3	8.9

Table 3.4: Five leading causes of death (by ICD General Mortality List 1) by sex, 2002–2006

2002–2006				
Code	Cause of Death	Males	Females	Total
1-064	Heart diseases	10.7	13.1	23.8
1-026	Cancer	10.7	8.3	19.0
1-072	Respiratory diseases	10.7	2.4	13.1
1-051	Diabetes	6.0	4.8	10.7
1-095	External causes	7.1	1.2	8.3

Table 3.5: Five leading causes of death (by ICD General Mortality List 1) by sex, 2007–2011

2007–2011				
Code	Cause of Death	Males	Females	Total
1-064	Heart diseases	15.9	11.1	27.0
1-072	Respiratory diseases	12.7	9.5	22.2
1-026	Cancer	12.7	3.2	15.9
1-051	Diabetes	4.8	4.8	9.5
1-095	External causes	7.9	1.6	9.5

Table 3.6: Five leading causes of death (by ICD General Mortality List 1) by sex, 2012–2016

2012–2016				
Code	Cause of Death	Males	Females	Total
1-051	Diabetes	14.3	6.1	20.4
1-064	Heart diseases	6.1	10.2	16.3
1-072	Respiratory diseases	12.2	4.1	16.3
1-026	Cancer	6.1	8.2	14.3
1-001	Infectious diseases	2.0	4.1	6.1

Figure 3.2 shows the five-year rolling average of causes of death in groups according to infectious and acute respiratory diseases, non-communicable diseases (NCDs), external causes and all other diseases (including not applicable and ill-defined deaths).
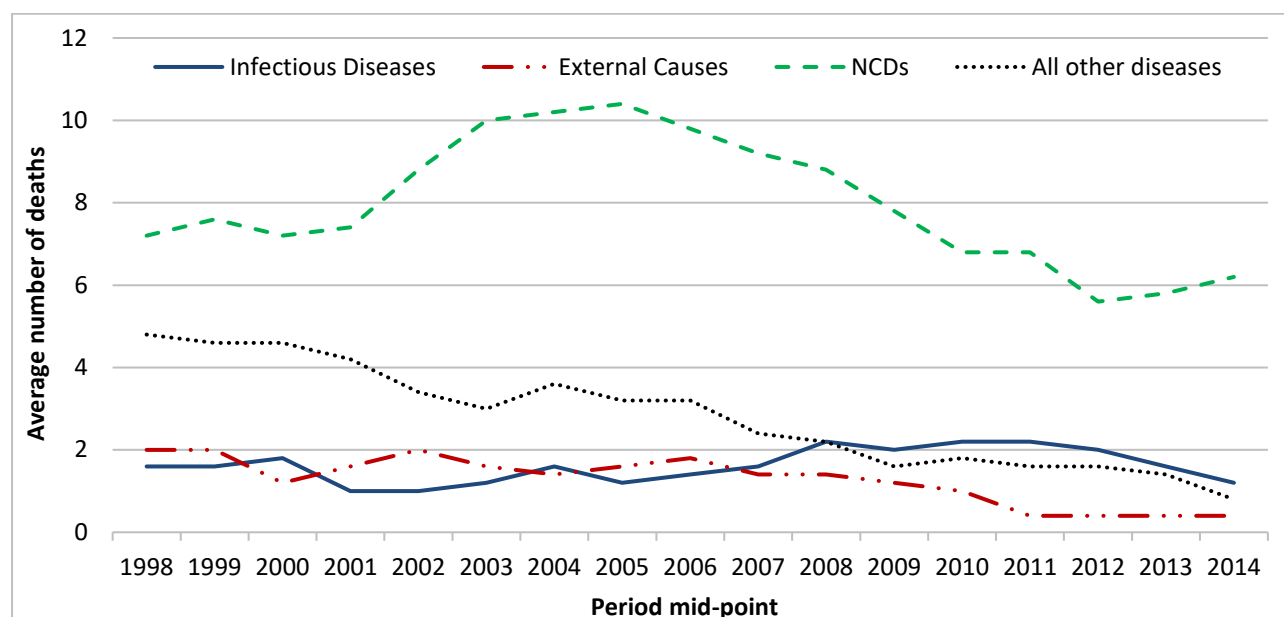
Figure 3.2: Rolling average of causes of death, (ICD General Mortality List 1), 1996–2016

'All other disease' includes deaths where no cause of death information was recorded.

As shown in Figure 3.2, the leading causes of death were NCDs. The trend reached its peak in 2005, started to decline, but slightly increased in recent years.

Deaths from 'other diseases' show a declining trend. This is most likely the result of a decrease in the number of records not available (NA) and ill-defined deaths throughout the years, reflecting improvements in medical certification of death, as also reflected in Figure 3.1.

Deaths due to infectious diseases and external causes both appear stable over time but it is important to note that causes of death in all ages may be misleading, as the leading causes of death differ by the ages of the deceased, as shown in the next section of the report.

The analysis above does not include years before 1996, as there was no cause of death in the records before 1996.

Underlying natural causes of death by key age groups

Cause of death by age group is reported for 1996 to 2016, combined due to the small number of deaths and the level of disaggregation required.

Causes of death for children aged 0–4 years[5]

There was a total of ten deaths in the age group 0–4 years. The leading cause of death in this age group was due to perinatal conditions, reflecting the fact that most under-five mortality occurs as infant mortality and the most vulnerable stage of a child's life is the first 28 days. Perinatal conditions, as captured here, are primarily linked to prematurity. This was followed by external causes, infectious diseases, respiratory diseases and congenital abnormalities.

There were no deaths in this age group in the recent five-year period, 2012–2016.

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[5] *Numbers are too small and identifiable when disaggregated by cause of death.*

Causes of deaths for children aged 5–14 years

Only three deaths were recorded in the 5–14-year-old age group over the period 1996–2016. Two were due to external causes and the other has no available information on the cause of death.

Causes of death in adults aged 15–59 years

Table 3.7: Total cause-specific mortality by ICD {Chapter or General Mortality list 1} for 15–59-year-old males, 1996–2016

Code	Cause of death	Total
1-095	External causes	17
1-064	Heart diseases	7
1-001	Infectious diseases	5
1-078	Digestive diseases	5
Other diseases		11
NA		3
Total		**48**

Other diseases[6] include cancer, respiratory diseases, congenital abnormalities, diabetes, psychological diseases, and nervous system diseases.

Table 3.7 shows the causes of death for males aged 15 to 59 years. It is clear from the table that the main cause of death is due to external causes, followed by heart diseases and infectious diseases. Deaths due to external causes for males were found to be suicide, with six deaths recorded in the 1996–2016 period, see Appendix table 1.15. Although the absolute numbers of deaths are small, at a population level, more attention by the Department of Health and government is warranted.

There were 13 deaths in this age group for females.[7] Cancer and external causes were tied as the main cause of death, followed by respiratory diseases, infectious diseases, and heart diseases.

Non–communicable diseases are featured highly amongst the causes of death in this age group, for both males and females, contributing to premature adult mortality.

Mortality in older adults (aged 60+ years)

As expected, the leading causes of death in adults aged over 60 years are non-communicable diseases. For males, the leading causes of death were cancer, followed by respiratory diseases and heart diseases. For females, the leading groups of diseases (at ICD level) were heart diseases, cancer and diabetes. However, when aggregated to more specific categories for both males and females, diabetes tops the list of individual cases for this age group.

Table 3.8: Cause-specific mortality by ICD {chapter or General Mortality list 1} for male adults aged 60 and older, 1996–2016

Code	Cause of death	Total
1-026	Cancer	27
1-072	Respiratory diseases	26
1-064	Heart diseases	24
1-051	Diabetes	16
Other diseases		12
NA		5
Total		**110**

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[6] *There were fewer than five deaths for each cause of death classified in the 'other diseases' category.*

[7] *Numbers are too small and identifiable when disaggregated by cause of death.*

Other diseases[8] include abnormal findings, infectious diseases, genitourinary diseases, external causes, nervous system diseases, and skin diseases.

Table 3.9: Cause-specific mortality by ICD {chapter or General Mortality list 1} for female adults aged 60 and older, 1996–2016

Code	Cause of death	Total
1-064	Heart diseases	31
1-026	Cancer	15
1-051	Diabetes	15
1-094	Abnormal findings	12
1-072	Respiratory diseases	10
Other diseases		11
NA		10
Total		**104**

Other diseases[9] include infectious diseases, blood diseases, digestive system diseases, genitourinary diseases, external causes, nervous system diseases, and skin diseases.

Adult mortality from non-communicable diseases (NCDs)

WHO Indicator: Probability of dying among adults aged 30–69 years (inclusive) from designated NCDs

The probability of dying among adults aged 30–69 years (inclusive) from specific causes has recently been introduced by WHO as an outcome indicator for the impact of NCDs. Estimates of mortality from selected NCDs for this age group are therefore reported here for comparison with international reporting. These are outlined in Tables 3.10 and 3.11. This indicator does not include deaths from diseases of the liver (code 1-080), which are included in the earlier indicators, as most deaths in these four categories (see Table 3.10) are due to chronic diseases that are occurring in the Pacific region.

NCDs are the leading cause of mortality in the world and the Pacific region. As highlighted earlier, NCDs feature prominently in the leading cause of death for the 15–59 age group in Niue, contributing to premature mortality.

Table 3.10: Selected non–communicable diseases (NCDs) for reporting against international targets by ICD General Mortality List 1

Code	Disease	ICD Codes
1-026	Neoplasms	C00–D48
1-052	Diabetes mellitus	E10–E14
1-064	Diseases of the circulatory system	I00–I99
1-076	Chronic lower respiratory diseases	J40–J47

Table 3.11: Deaths from selected NCDs in 30–69-year olds (inclusive) by sex, 1996–2016

Code	Diseases	Males	Females	Total
1-026	Neoplasms	10	7	17
1-052	Diabetes mellitus	9	4	13
1-064	Diseases of the circulatory system	12	8	20
1-076	Chronic lower respiratory diseases			5
TOTAL		**34**	**21**	**55**

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[8] *There were fewer than five deaths for each cause of death classified in the 'other diseases' category.*

[9] *There were fewer than five deaths for each cause of death classified in the 'other diseases' category.*

As seen in Table 3.11, 20 deaths were attributed to heart diseases, 17 to cancer (neoplasms) and 13 to diabetes. Only five deaths resulted from chronic respiratory diseases.[10]

Table 3.12: Probability of dying (%) from selected NCDs in 30–69 year-olds (inclusive) by sex, with 95% confidence intervals, 1997–2016

Five-year period	NCD Probability	L 95% CI	U 95% CI
1997–2001	13.0	6.4	23.1
2002–2006	21.6	12.6	34.1
2007–2011	12.0	5.3	23.2
2012–2016	18.5	9.9	31.2

The probability of dying from these diseases is calculated using life table methods and is shown in Table 3.12. This is the probability that a person aged 30 will die from the selected disease before reaching their 70th birthday. For the most recent five-year period, 2012–2016, the probability of dying from NCDs for those aged 30–69 was 18.5%. This means, 18 or 19 out of every 100 persons aged 30–69 years will not survive to 70 as a result of NCD-related diseases. This equates to a 71.5% chance of survival. This has increased from the last reported five-year period of a 12.0% chance of dying and an 88.0% chance of surviving. When comparing with 95% confidence intervals, there is no statistical significance in the changes over time.

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[10] *Numbers are too small and identifiable when disaggregated by sex.*

CONCLUSION, POLICY IMPLICATIONS AND RECOMMENDATIONS

Births

The maternal age at birth is being delayed to the older age groups in recent years. This can be attributed to two main factors, the first of which is that the current generation of women are more ambitious and career focused, and the other is that there is smaller population in the peak reproductive ages of Niue, i.e. early to mid–twenties (see Appendix 1 table 1.3).

This does not, however, affect the CBR, 17.2 per 1,000 live births, and the TFR, 2.7 children per woman, for the past 30 years. These rates on their own show an increase and decrease respectively compared to the previous five-year period (2007–2011). The confidence intervals, however, illustrate that there has not been any significant change over the period 1987–2016.This also shows that the increase or decline of the population is not due to the natural increase of the population but rather to migratory factors.

The inclusion of the birth weights analysis into this 2012–2016 report is important, as over time we can capture the health and wellbeing of the population and track the trends. In Niue, the majority of babies born were within the normal weight range, with 7% considered underweight and 3% categorised as large babies according to international standards. It will be interesting to see if the figures for the next five-year period show either an increase or a decrease in the weight of babies born.

Deaths

The most recent crude death rate, 2012–2016, was 6.4 deaths per 1,000 population. This has declined from the previous five-year period of 8.3 deaths but, when computing the 95% confidence intervals, there is no significant statistical change in the rates.

On the other hand, the age-standardised mortality rate has declined by almost 50%, from 8.3 per 1,000 population in the period 2007–2011 to 4.6 per 1,000 population in the 2012–2016 period, indicating that, over the ten-year period, the rate of death due to all causes has declined. This could reflect a comparably higher ageing population of Niue.

No infant or under-five mortality occurred in Niue in the period 2012–2016. This reflects in general the success of infant and child health programmes (including immunisation), underlining the importance of maintaining achievements and standards.

It is important to note also that there have been no maternal deaths recorded since 1996.

Life expectancy for Niue remains reasonably high for males, 71.8 years, and females, 75.7 years. However there has been no significant improvement seen in the past 30 years, and this may warrant further investigation. It may be the effect of NCDs on premature adult mortality, as seen also in the wider Pacific region.

Causes of death

The majority of deaths in Niue are due to natural causes, with the leading cause for the recent period being diabetes, heart diseases and respiratory diseases. When disaggregated by age group and sex, however, the cause of deaths for specific ages and sex varies. There is no main cause of death for the 0–4 and 5–14 age groups, as there have been no deaths in these age groups in the period 2012–2016.

The 60+ age group continues to report NCDs as the main cause of death.

The high proportion of deaths from external causes for both males and females in the age group 15–59 should be a priority for government, especially as intentional self-harm contributed to most external causes of death for males. Cancer has increased as the main cause of death for females in the

same age group, which further supports the increase in premature mortality caused by NCDs in the 30–59 age group.

The WHO indicator for premature adult mortality remains higher for males (34) compared to females (21). Combating non-communicable diseases, particularly diabetes, heart diseases and related lifestyle diseases, should attract more prominent attention. Policy measures should include more concerted efforts with regard to the promotion of healthy eating habits and nutrition programmes, regular exercise, and maintaining a hygienic and safe living environment.

Recommendations

Statistical updates on vital statistics are still being produced annually by the Niue Statistics Office. Only raw numbers are reported, however, with no analysis of mortality and fertility indicators or evaluation of trends overtime. It was recommended that a vital statistics analytical report be done every five years, given the small number of events that occur within the population.

Following this report and the inclusion of recommended items from the last analytical vital statistics report, it is noted that there is still opportunity for improvement in reporting vital events. This includes additional information to be collected. Four such items of information are listed below.

1. **The gestation period of babies before birth** – Capturing this information is important because those born earlier than 37 weeks are at risk of health complications and require intensive care, along with specialised staff and equipment that can deal with the multiple problems faced by premature births. There are also long-lasting medical complications, which may eventually lead to infant mortality.

2. **The number of births medically attended** – Although it is assumed that all births in Niue are medically attended, quantitative evidence and reporting of this can reflect a positive outcome for Niue. This information should be recorded at all times.

3. **Ethnicity, for both births and deaths** – This is becoming increasingly important, given the high levels of migration and policy implications for immigration. It is even more important with regard to future planning of the medical referral programme.

4. **Village, for both deaths and births** – This information has been recorded going back as far as 1987. While the population numbers are small when disaggregated by village even more so by sex and village, it is important to capture this information for planning purposes, especially with regard to the mother's usual residence.

CHAPTER 4: METHODOLOGY

Methodology and data analysis

Methodology

Data for 1987 to 2016 were obtained from the records that were kept at the Statistics Office and the Civil Registry in the Department of Justice Lands and Survey. Birth records from the Statistics Office were compared with the records of the Civil Registrar. Unfortunately, in 2004, Cyclone Heta destroyed the only hospital in Niue, Lord Liverpool Hospital, as well as the Department of Justice Lands and Survey. Some records kept at the old Department of Justice, Lands and Survey were destroyed also.

Some birth and death records and certificates survived, however, and the database was updated for this report. Data collection procedures are outlined in the next section.

All birth and deaths in Niue are required to be registered at the Civil Registrar at the Department of Justice, Lands and Survey. Births that occur off-island are also non-compulsorily registered up to the age of two years.

Data from the civil registry and health were reconciled by the Statistics Officer. Upon request, all births, deaths and marriage data are sent from the Civil Registrar to the Statistics Office every six months for the usual vital statistics reporting. In order to ensure that no known deaths are missed, all data are reviewed for quality by examining for gaps in the data over time, age-specific mortality patterns, and reviewing ill-defined deaths.

Population data by age and sex were derived from the censuses in 2001, 2006 and 2011, with data for 2000–2010 extracted from SPC population table (SPC, 2011). Because there were no existing population projections by age and sex for the years between 1987 and 2000, estimates were generated using exponential growth rates interpolated from the census in 1988, 1991 and 2001 for each five-year age group by sex. The proportion of the population in each sub-category was then multiplied by the projected total population (SPC, 2011) for these years to obtain population by age and sex. These were the population estimates for the years 1987–2011.

The 2012–2016 annual population projections were calculated using a simple interpolation over the six-year intercensal period, splitting the six-year change – growth or decline – in single ages. The data provided for this were from the 2011 and 2017 census.

For this analysis, only events in the resident population have been counted. This has been done as the population of primary interest to decision-makers are the people who usually live in Niue and therefore use government services and are affected by the prevailing social, economic and environmental conditions in Niue. In other words, this is the population that is affected by government policies and that is in need of government services. Resident births and deaths are defined as described below.

Resident births

Legally, all births in Niue are required to be registered. Niueans who give birth overseas are also able to register the birth of their child in Niue when they return, up to the age of two years, as stated in the Births and Deaths Regulation of 1984, section 12.1. There have also been several cases where a baby born overseas has been adopted by parents in Niue and the birth subsequently re-registered under the adopted parent.

As mentioned before, analysis for this report are the events that occur in the resident population. Resident births have therefore been defined in this report as all registered births, where the child was either born in Niue, or where the mother had lived in Niue at the time she became pregnant and the child returned to Niue within 12 months of birth.

A total of six births were excluded from the registered 2012–2016 data, as they were re-registered when mothers gave birth overseas before returning to reside in Niue and adoptions.

Reporting procedures are currently being reviewed to use immunisation records to identify off-island births to resident mothers who have chosen not to register the birth in Niue (as this is optional) in order to ensure that all births to the resident population are captured. This, however, has not been done for inclusion in this data set.

Resident deaths

Similar to births, this analysis focused on deaths in the resident population of Niue. All deaths in Niue are registered but there may also be a significant proportion of deaths of the resident population that occur overseas. Most medical referrals are to New Zealand. Nearly all residents of Niue who die overseas are returned to Niue for burial and are therefore re-registered. In some cases, a Niuean who dies after living overseas for many years may be returned to Niue for burial and subsequently be registered.

This analysis has included all registered deaths (both on- and off-island), excluding registered deaths where the person died overseas and had been out of the country for more than 12 months prior to death, unless sent on medical referral. Niue keeps a population register by which it is possible to check this information, starting in the 2011 Population and Household Census.

Niuean residents who die overseas (perhaps having been referred to New Zealand for medical treatment) but who are not returned for burial have not been included in this analysis, as the deaths are difficult to track and the information is not made available. Suggestions were made to request data from New Zealand, but Statistics New Zealand has noted that the place of residence is often not recorded well in their collection. For example, the place of residence may be recorded as 'a relative's place' rather than their permanent home in Niue. For this reason, it is not possible to use the New Zealand data to accurately monitor deaths of Niue residents in New Zealand. However, an MOU with the Department of Internal Affairs in New Zealand will allow Niue attachment to their system to capture deaths for those where the country of birth is stated as Niue, rather than the usual place of residence. Reporting processes in Niue are still being reviewed to establish whether some of these deaths can be tracked through the medical referral programme but, as most residents are buried in Niue, the discrepancy between the total number of deaths of residents of Niue and those who are ultimately registered as deaths in Niue should be very small.

The revised definitions mean that numbers of births and deaths may vary slightly from previously published analysis.

Analysis

Birth and death data in the first two chapters (respectively) are analysed by levels and trends, and cross-tabulated by selected socio-demographic variables, mainly age and sex. The second section of each chapter presents key demographic indicators. The section on causes of death was computed by ranking the underlying causes of death and providing the proportions of deaths due to specific causes.

In order to minimise instability in the figures due to the small size of Niue's population and subsequently the risk of misleading interpretation, data have been aggregated over five-year periods for calculation of all rates and trend analyses. Rolling averages have also been presented to examine trends over time. Confidence intervals are presented to highlight the uncertainty in the data. These were calculated using Poisson distributions for all rates, due to the small number of events.

Age-standardisation for mortality was done using the most recent five-year period (2007–2011) as the standard, in order to examine changes in mortality trends separately from any changes in the population age structure.

Life tables were calculated using empirical data [Chiang 1968], and were also smoothed for missing data using Modmatch, which uses the WHO modified logit system of model life tables (Murraya *et al.* 2003). Although a number of the life tables had missing values (i.e. no deaths recorded in specific age groups) when tabulated by five-year period and sex, work on small area calculations of life expectancy from the UK has indicated that missing values have a minimal effect on final estimates, provided that

the missing values do not occur in the oldest age groups (Williams & Eayres 2004). Confidence intervals, based on the variance of probability of surviving, were also calculated using the Chiang Method (Chiang 1967).

Cause of death data were extracted from the medical certificate of death and tabulated by Department of Health staff and the Statistics Office using the General Mortality list 1 (103 causes) of the International Classification of Diseases v10 (WHO, 2012), seen in Appendix 2.

Data sources

The key institutions involved are the Ministry of Health; the Civil Registry Office of the Justice, Lands and Survey Department; and the Statistics Niue Office, Ministry of Finance and Planning. Registration is required by law under the Births and Death Regulations of 1984 and the information is collected and reported every six months. Key reporting processes for births and deaths in Niue are described below.

BIRTH REPORTING PROCESS

For births, a notification of birth is completed at the hospital and taken by health staff to the Civil Registry. The information on the notification includes the sex of the child and the parents' names. This information is also entered into a hardcopy register at the hospital. The parents are then required to complete the registration processes at the Civil Registry Office, Department of Justice, Lands and Survey (DJLS). There is no charge to register a child but there is a NZD 28.00 charge for a birth certificate.

Essentially, all births in Niue occur in hospital. There have been a few births on the island that occurred outside the hospital, mainly at home and on the way to the hospital. In 2012, an obstetrician was appointed in Niue, which significantly reduced the proportion of women travelling to New Zealand to give birth. Prior to this, there were very few births on-island, with most women either referred through the health service or self-referring to New Zealand.

For a child born overseas, parents may choose to register the birth in Niue (in addition to the original birth registration) until the child is two years of age. This, however, is optional as information can still be captured from immigration arrival cards.

Event of Birth: At the hospital	Event of Birth: Elsewhere in Niue	Event of Birth: Overseas
	↓	↓
	Mother and child taken to hospital	Parents deliver birth certificate to Civil Registry Office to be eligible for the "Baby Incentive Grant"
↓	↓	
The birth is registered in hospital records and a notification is sent to the Civil Registration Office		
↓		↓
The birth is registered at the Civil Registry Office and family records are updated		
↓		
Information is requested by the Statistics Office for reporting purposes		

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

DEATH REPORTING PROCESS

A death in the resident population that occurs overseas (such as a patient who is referred for medical treatment and subsequently dies) is not captured, unless the body is returned to Niue for burial. These deaths are inherently difficult to track, and this is an issue for many countries in the Pacific region.

When the body is returned to Niue, it is accompanied by a death certificate from the place of death, which goes directly to the Civil Registry Office on arrival. The overseas death certificate is retained on file (with the medical certificates for deaths that occurred locally) and is re-registered into the log book at The Civil Registry Office.

The National Statistics Office also maintains a 'statistics card' for each resident, which is essentially a basic population register. It includes any date when the person has entered or left the island, date and place of birth, and (when applicable) date of death and registry number.
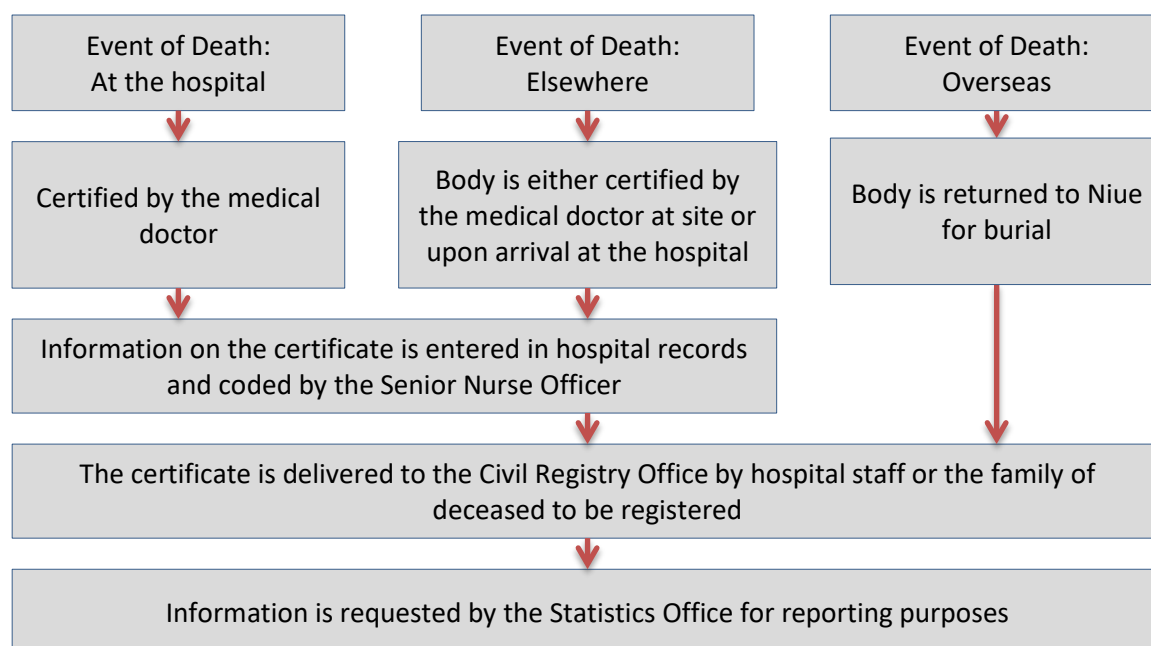
Figure 4.2: Diagram of the reporting and registration processes for deaths

Challenges, opportunities, and areas for improvement in the CRVS environment

Although Niue's data collection process or system is simple and easy to follow, there are still some key quality issues that need to be addressed in order to improve the current system.

First and foremost is for the three leading agencies responsible for capturing and collating the data to make sure that all information is captured, regardless of its significance in the report, as the information may be useful in future. There have been discussions about a centralised electronic link system for civil registration and vital information storage. This would help minimise the missing information and ensure that all three agencies have the same information available to them.

There is also a need to improve the coding system and to code using the full International Causes of Death Book, not only the summary that we are currently capturing. The Senior Nurse Officer is now aware of this and it is on the agenda of issues to be resolved, following the last workshop in Nadi, Fiji, in 2018.

Births and deaths occurring overseas are also an issue, as some events happening to a resident of Niue are not captured. Resident births overseas have been resolved with the introduction of the 'Baby Incentive Grant' introduced in October 2016, where the mother has to register the baby in Niue in order to receive the grant two weeks after her return within a three-month period. Capturing the death of a resident overseas is still an ongoing issue but an MOU with the Department of Internal Affairs will enable the Niuean agencies to access the New Zealand deaths database to capture the deaths of people where the place of birth is noted as 'Niue'. This will formally capture residents of Niue if they die whilst in New Zealand and not returned to Niue for burial.

There have also been discussions to renew the Births and Deaths Regulation of 1984 to keep up with the present demands.

Among these issues are challenges within each department. One issue is capacity-building and the need to train others to continue the work that has been established by the current Civil Registry and vital statistics team. Another issue is the fact that the current officers involved in the collection are not solely focused on civil registration and vital statistics; they have other commitments and priorities to manage in their respective office.

There are also strengths with the current system. The process of collecting the data is simple and all agencies involved are aware of the importance of collecting the data. With the small population and the small number of events that occur on Niue, the information that may not be gathered will usually be followed up on, as everyone knows each other. This strength is unique to Niue, as most other Pacific nations have large populations, which would constrain them from being able to capture information this way. This also helps in the sharing of information between the agencies involved when they know that the data are incomplete.

The CRVS committee, consisting of the agencies and the Director General of the Ministry of Social Services, meets annually to ensure the processes are effective. Niue's CRVS committee is also committed to ensure that the processes and information collected from the CRVS are precise and consistent. All members are fully aware of the issues and their contributions effectively minimise errors.

Coverage and completeness of the civil registration system

Coverage and completeness levels are essential measures of how well the CRVS system is functioning.

Completeness is achieved when every vital event that has occurred to the members of the population of a particular country (or area), within a specified time period, has been registered in the system, i.e. has a vital event registration record. Completeness is measured by the proportion of vital events that are legally registered out of those that actually occurred within the country.

Coverage refers to the total geographical area covered by the civil registration system. Ideally, the civil registration system should capture vital events occurring in every geographical area and in every population group of the country.

Coverage and completeness levels are essential in the interpretation of vital statistics and enable their comparability, nationally as well as internationally.

In order to estimate the completeness of Niue's civil registration system, the number of births and deaths captured in Niue's civil registration database were compared to events recorded in the hospital database, since the latter is assumed to capture all birth and deaths within Niue. Events that occurred overseas were not included in the calculation, as it is expected that these are registered in the country where they occur and would therefore not be a primary responsibility of the Civil Registration Office of Niue.

Tables 4.1 and 4.2 show the measure of completeness for the registered births and deaths from 2012 to 2016. All births and deaths occurring on-island are registered at the Civil Registration Office as shown with the 100% completion rate for both births and deaths.

Table 4.1: Birth registration completeness (%) by period, 2012 to 2016

Year	Number of events at hospital	Number of registered births (Niue only)	Completeness (%)
2012	27	27	100
2013	19	19	100
2014	15	15	100
2015	21	21	100
2016	19	19	100
Total	**101**	**101**	**100**

Table 4.2: Death registration completeness (%) by period, 2012 to 2016

Year	Number of events at hospital	Number of registered deaths (Niue only)	Completeness (%)
2012	8	8	100
2013	13	13	100
2014	5	5	100
2015	14	14	100
2016	5	5	100
Total	**45**	**45**	**100**

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APPENDICES

Appendix 1: Statistical tables

POPULATION ESTIMATES

Appendix table 1.1: Population estimates by age group: 2011–2017

Age groups	2011	2012	2013	2014	2015	2016	2017
0–1	24	28	26	22	27	28	21
0–4	138	144	146	144	137	141	135
5–14	248	251	251	264	284	294	312
15–24	205	197	199	182	173	170	160
25–34	178	182	188	206	212	212	220
35–44	168	174	176	171	175	177	182
45–54	190	186	192	194	191	192	192
55–64	152	164	164	170	172	178	178
65–74	120	115	109	110	116	111	114
75+	61	69	78	79	80	93	98
Total	,1460	1,482	1,503	1,518	1,541	1,567	1,591

Appendix table 1.3: Population estimates by age group, females: 2011–2017

Age groups	2011	2012	2013	2014	2015	2016	2017
0–1	13	13	14	11	14	12	10
0–4	67	71	72	73	70	69	67
5–14	136	136	139	143	152	157	163
15–24	83	84	86	85	83	86	83
25–34	98	99	102	113	115	114	119
35–44	77	83	87	80	86	88	95
45–54	92	91	92	95	92	96	91
55–64	84	87	87	90	89	87	90
65–74	64	59	57	56	60	58	59
75+	37	42	46	48	49	58	62
Total	738	752	767	781	797	812	829

Appendix table 1.2: Population estimates by age group, males: 2011–2017

Age groups	2011	2012	2013	2014	2015	2016	2017
0–1	11	15	12	11	13	16	11
0–4	71	73	74	71	67	72	68
5–14	112	115	113	122	132	137	149
15–24	122	113	113	97	90	84	77
25–34	80	83	86	93	97	98	101
35–44	91	92	89	91	89	89	87
45–54	98	96	100	99	99	96	101
55–64	68	76	77	80	83	92	88
65–74	56	56	52	54	55	53	55
75+	24	27	32	30	30	35	36
Total	722	730	736	737	744	755	762

BIRTHS

Appendix table 1.4: Total number of births: 1989–2011

Year	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Male	25	25	23	27	16	26	18	18	15	14	17	14	11	10	10	9	9	13	16	12	13	12	13	16	8
Female	25	19	26	23	21	17	20	15	15	14	16	16	11	15	13	16	17	10	14	22	15	7	17	9	14
Total	**50**	**44**	**49**	**50**	**37**	**43**	**38**	**33**	**30**	**28**	**33**	**30**	**22**	**25**	**23**	**25**	**26**	**23**	**30**	**34**	**28**	**19**	**30**	**25**	**22**

Appendix table 1.5: Total number of births by age of mothers in age groups: 1987–2016

Years	1987–1991	1992–1996	1997–2001	2002–2006	2007–2011	2012–2016
Less than 15	0	0	1	2	0	0
15–19	30	11	14	14	6	11
20–4	61	43	29	37	30	16
25–29	66	60	42	34	31	42
30–34	49	31	27	32	33	36
35–39	17	19	14	17	19	23
40–44	7	8	5	2	4	3
45+	0	0	1	0	1	0
Total	**230**	**172**	**133**	**138**	**124**	**131**

Appendix table 1.6: Total number of births by place of birth: 2004–2016*

Place of Birth	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Niue	5	2	15	16	6	2	11	14	27	19	15	21	19
Overseas	18	28	19	12	13	28	14	8	6	6	5	5	8
Total	**23**	**30**	**34**	**28**	**19**	**30**	**25**	**22**	**33**	**25**	**20**	**27**	**26**

* Information on place of birth was captured in 2004, after Cyclone Heta had destroyed the only hospital on the island and pregnant women were referred overseas for medical treatment.

DEATHS

Appendix table 1.7: Total number of deaths: 1989–2014

Year	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Male	5	6	11	10	6	8	7	7	17	9	9	8	11	5	9	8	11	8	9	11	9	12	6	7	5
Female	9	7	9	7	6	5	7	1	3	4	9	12	4	7	5	5	6	12	6	8	2	4	6	8	4
Total	**14**	**13**	**20**	**17**	**12**	**13**	**14**	**8**	**20**	**13**	**18**	**20**	**15**	**12**	**14**	**13**	**17**	**20**	**15**	**19**	**11**	**16**	**12**	**15**	**9**

Appendix table 1.8: Total number of deaths by sex, five-year periods and five-year age groups: 1987–2016

Age	1987–1991			1992–1996			1997–2001			2002–2006			2007–2011			2012–2016		
	Males	Females	Total	Males	Females	Total	Males	Females	Total	Males	Females	Total	Males	Females	Total	Males	Females	Total
<1	1	2	3	1	0	1	2	2	4	1	2	3	0	0	0	0	0	0
0–4	0	0	0	0	0	0	1	0	1	0	0	0	0	1	1	0	0	0
5–9	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	1	1
10–14	1	0	1	2	0	2	1	0	1	0	0	0	0	0	0	0	0	0
15–19	1	0	1	2	0	2	0	0	0	0	0	0	2	0	2	0	0	0
20–24	1	0	1	1	0	1	1	0	1	1	0	1	0	0	0	0	1	1
25–29	0	0	0	0	0	0	2	1	3	2	1	3	1	1	2	0	0	0
30–34	1	0	1	0	0	0	0	3	3	2	0	2	0	0	0	1	0	1
35–39	1	0	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0
40–44	2	1	3	1	0	1	1	0	1	2	0	2	0	0	0	2	0	2
45–49	0	0	0	3	0	3	3	1	4	0	0	0	0	0	0	3	0	3
50–54	1	1	2	4	2	6	0	1	1	2	1	3	2	1	3	2	0	2
55–59	1	0	1	1	1	2	4	0	4	7	0	7	3	1	4	1	1	2
60–64	3	1	4	4	3	7	7	2	9	2	5	7	1	2	3	4	2	6
65–69	4	6	10	3	1	4	5	0	5	5	3	8	5	2	7	1	3	4
70–74	4	2	6	5	2	7	6	3	9	3	5	8	8	2	10	3	1	4
75+	16	25	41	20	10	30	9	24	33	20	20	40	15	14	29	11	12	23
Total	**37**	**36**	**73**	**47**	**19**	**66**	**40**	**35**	**75**	**46**	**35**	**81**	**38**	**24**	**62**	**28**	**21**	**49**

AGE–SPECIFIC MORTALITY RATES

Appendix table 1.9: Age-specific mortality rate (deaths per 1,000 people) for males, 2012–2016

Age group	Age-specific death rates		
	per 1,000	L 95% CI	U 95% CI
<5	0.00	0.00	70.86
5–14	0.00	0.00	40.65
15–24	0.00	0.00	50.49
25–34	2.19	0.28	80.81
35–44	4.44	0.28	81.98
45–54	10.19	0.26	75.21
55–64	12.27	0.31	90.52
65–74	9.43	0.30	87.00
≥75	71.20	7.84	302.54

Appendix table 1.10: Age-specific mortality rate (deaths per 1,000 people) for females, 2012–2016

Age group	Age-specific death rates		
	per 1,000	L 95% CI	U 95% CI
<5	0.00	0.00	70.26
5–14	1.38	0.17	50.81
15–24	2.36	0.30	87.10
25–34	0.00	0.00	46.30
35–44	0.00	0.00	59.38
45–54	0.00	0.00	54.02
55–64	6.81	0.29	83.74
65–74	7.50	0.24	69.14
≥75	49.28	4.97	191.96

LIFE TABLES

Appendix table 1.11: Life tables: Total 2012–2016

Age interval	Lower age interval value (x)	Years in interval	Linearity Adjustment	Reported pop/births	Adjusted deaths	Mortality rate	Probability of dying	Probability of surviving	Pop surviving (expected)	Deaths (expected)	Years lived in interval	Cumulative yrs lived in interval	LE: Life Expectancy	CIs for Life Expectancy Normal Approx Binom	
(years)		nx	ax	Nx	d(adj)	mx	qx	px	lx	dx	Lx	Tx	ex	L 95% CI	U 95% CI
<5	0	5	0.2	142.4	0.0	0.00000	0.00000	1.00000	100000	0	500000	7364024	73.6	67.9	79.4
5–14	5	10	0.5	268.8	0.2	0.00074	0.00741	0.99259	100000	741	996293.6	6864024	68.6	62.9	74.4
15–24	15	10	0.5	184.2	0.2	0.00109	0.01080	0.98920	99259	1072	987227.6	5867730	59.1	53.7	64.5
25–34	25	10	0.5	199.8	0.2	0.00100	0.00996	0.99004	98187	978	976978.2	4880502	49.7	44.9	54.5
35–44	35	10	0.5	174.6	0.4	0.00229	0.02265	0.97735	97209	2202	961079.5	3903524	40.2	35.7	44.6
45–54	45	10	0.5	191.0	1.0	0.00524	0.05102	0.94898	95007	4847	925834.1	2942445	31.0	27.2	34.7
55–64	55	10	0.5	169.7	1.6	0.00943	0.09004	0.90996	90160	8118	861008	2016611	22.4	19.6	25.1
65–74	65	10	0.5	191.5	1.6	0.00836	0.08020	0.91980	82042	6580	787519.3	1155603	14.1	12.9	15.3
≥75	75	35	0.5	79.5	4.6	0.05786	1.00000	0.00000	75462.03	75462.03	368083.3	368083.3	4.9		

Appendix table 1.12: Life tables: males 2012–2016

Age interval	Lower age interval value (x)	Years in interval	Linearity Adjustment	Reported pop/births	Adjusted deaths	Mortality rate	Probability of dying	Probability of surviving	Pop surviving (expected)	Deaths (expected)	Years lived in interval	Cumulative yrs lived in interval	LE: Life Expectancy	CIs for Life Expectancy Normal Approx Binom	
(years)		nx	ax	Nx	d(adj)	mx	qx	px	lx	dx	Lx	Tx	ex	L 95% CI	U 95% CI
<5	0	5	0.2	71.5	0.0	0.00000	0.00000	1.00000	100000	0	500000	7175116	71.8	63.4	80.1
5–14	5	10	0.5	123.6	0.0	0.00000	0.00000	1.00000	100000	0	1000000	6675116	66.8	58.4	75.1
15–24	15	10	0.5	99.5	0.0	0.00000	0.00000	1.00000	100000	0	1000000	5675116	56.8	48.4	65.1
25–34	25	10	0.5	91.3	0.2	0.00219	0.02167	0.97833	100000	2167	989165.8	4675116	46.8	38.4	55.1
35–44	35	10	0.5	90.0	0.4	0.00444	0.04348	0.95652	97833	4254	957063.5	3685950	37.7	30.2	45.1
45–54	45	10	0.5	98.1	1.0	0.01019	0.09699	0.90301	93580	9077	890412.5	2728887	29.2	22.9	35.4
55–64	55	10	0.5	81.5	1.0	0.01227	0.11561	0.88439	84503	9769	796183.9	1838474	21.8	17.4	26.1
65–74	65	10	0.5	84.8	0.8	0.00943	0.09009	0.90991	74734	6733	713674.4	1042291	13.9	12.1	15.8
≥75	75	28	0.5	30.9	2.2	0.07120	1.00000	0.00000	68001	68001	328616.1	328616.1	4.8		

Appendix table 1.13: Life tables: females 2012–2016

Age interval	Lower age interval value (x)	Years in interval	Linearity Adjustment	Reported pop/births	Adjusted deaths	Mortality rate	Probability of dying	Probability of surviving	Pop surviving (expected)	Deaths (expected)	Years lived in interval	Cumulative yrs lived in interval	LE: Life Expectancy	CIs for Life Expectancy Normal Approx Binom	
(years)		nx	ax	Nx	d(adj)	mx	qx	px	lx	dx	Lx	Tx	ex	L 95% CI	U 95% CI
<5	0	5	0.2	70.9	0.0	0.00000	0.00000	1.00000	100000	0	500000	7567668	75.7	67.9	83.4
5–14	5	10	0.5	145.2	0.2	0.00138	0.01368	0.98632	100000	1368	993160.1	7067668	70.7	62.9	78.4
15–24	15	10	0.5	84.7	0.2	0.00236	0.02334	0.97666	98632	2302	974811.1	6074508	61.6	54.9	68.3
25–34	25	10	0.5	108.5	0.0	0.00000	0.00000	1.00000	96330	0	963302.1	5099697	52.9	49.5	56.3
35–44	35	10	0.5	84.6	0.0	0.00000	0.00000	1.00000	96330	0	963302.1	4136395	42.9	39.5	46.3
45–54	45	10	0.5	93.0	0.0	0.00000	0.00000	1.00000	96330	0	963302.1	3173092	32.9	29.5	36.3
55–64	55	10	0.5	88.1	0.6	0.00681	0.06586	0.93414	96330	6344	931579.8	2209790	22.9	19.5	26.3
65–74	65	10	0.5	106.7	0.8	0.00750	0.07227	0.92773	89986	6503	867342.3	1278210	14.2	12.7	15.7
≥75	75	41	0.5	48.7	2.4	0.04928	1.00000	0.00000	83483	83483	410868.2	410868.2	4.9		

CAUSE OF DEATHS (by ICD General Mortality list – 103 causes) by sex

Appendix table 1.14: Total cause of death by ICD Chapters or General Mortality list 1 and by five-year periods and sex, 1992–2016

	Cause of Death	1992–1996			1997–2001			2002–2006			2007–2011			2012–2016		
Code	Cause	M	F	Total	M	F	Total	M	F	Total	M	F	Total	M	F	Total
1-001	Infectious and parasitic diseases	0	0	0	2	1	3	2	1	3	2	1	3	1	2	3
1-026	Cancer	3	2	5	7	3	10	9	7	16	9	2	11	3	4	7
1-048	Blood diseases	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0
1-051	Diabetes	0	0	0	2	5	7	5	4	9	3	3	6	7	3	10
1-055	Psychological diseases	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
1-058	Nervous system diseases	0	0	0	0	0	0	0	0	0	0	0	0	2	1	3
1-064	Heart diseases	1	0	1	8	9	17	9	11	20	10	7	17	3	5	8
1-072	Respiratory diseases	1	0	1	6	3	9	9	2	11	6	6	12	6	2	8
1-078	Digestive diseases	0	0	0	0	2	2	2	0	2	0	0	0	3	0	3
1-082	Skin diseases	0	0	0	0	0	0	1	1	2	0	0	0	0	0	0
1-084	Genitourinary diseases	0	0	0	1	0	1	0	0	0	1	0	1	0	1	1
1-092	Perinatal conditions	0	0	0	2	1	3	0	1	1	0	0	0	0	0	0
1-093	Congenital abnormalities	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
1-094	Abnormal findings	2	1	3	0	3	3	2	4	6	1	2	3	1	2	3
1-095	External causes	2	0	2	8	2	10	6	1	7	5	1	6	1	0	1
NA		39	17	56	6	8	14	2	3	5	2	1	3	0	0	0
Grand total		**48**	**20**	**68**	**42**	**37**	**79**	**47**	**37**	**84**	**39**	**24**	**63**	**28**	**21**	**49**

Appendix table 1.15: Total cause of death for males by ICD and specific age groups, 1992–2016

Code	Cause of Death	Age group 0–4	Age group 5–14	Age group 15–59	Age group 60+	Total
1-005	Respiratory tuberculosis	0	0	0	1	1
1-012	Septicaemia	0	0	2	0	2
1-017	Other arthropod–borne viral fevers and viral haemorrhagic fevers	0	0	1	0	1
1-019	Viral hepatitis	0	0	2	1	3
1-027	Malignant neoplasm of lip, oral cavity and pharynx	0	0	1	1	2
1-029	Malignant neoplasm of stomach	0	0	1	3	4
1-030	Malignant neoplasm of colon, rectum and anus	0	0	0	4	4
1-031	Malignant neoplasm of liver and intrahepatic bile ducts	0	0	0	2	2
1-032	Malignant neoplasm of pancreas	0	0	0	1	1

1-034	Malignant neoplasm of trachea, bronchus and lung	0	0	2	4	6
1-040	Malignant neoplasm of prostate	0	0	0	8	8
1-042	Malignant neoplasm of meninges, brain and other parts of central nervous system	0	0	0	1	1
1-045	Leukaemia	0	0	0	1	1
1-046	Remainder of malignant neoplasms	0	0	0	2	2
1-052	Diabetes mellitus	0	0	1	15	16
1-053	Malnutrition	0	0	0	1	1
1-057	Remainder of mental and behavioural disorders	0	0	1	0	1
1-060	Alzheimer's disease	0	0	0	1	1
1-061	Remainder of diseases of the nervous system	0	0	1	0	1
1-066	Hypertensive diseases	0	0	1	2	3
1-067	Ischaemic heart diseases	0	0	2	11	13
1-068	Other heart diseases	0	0	3	6	9
1-069	Cerebrovascular diseases	0	0	0	3	3
1-070	Atherosclerosis	0	0	0	2	2
1-071	Remainder of diseases of the circulatory system	0	0	1	0	1
1-074	Pneumonia	0	0	0	11	11
1-075	Other acute lower respiratory infections	0	0	1	1	2
1-076	Chronic lower respiratory diseases	0	0	1	13	14
1-077	Remainder of diseases of the respiratory system	0	0	0	1	1
1-078	Diseases of the digestive system	0	0	1	0	1
1-080	Diseases of the liver	0	0	3	0	3
1-081	Remainder of diseases of the digestive system	0	0	1	0	1
1-082	Diseases of the skin and subcutaneous tissue	0	0	0	1	1
1-086	Remainder of diseases of the genitourinary system	0	0	0	2	2
1-092	Certain conditions originating in the perinatal period	2	0	0	0	2
1-094	Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	0	0	2	4	6
1-096	Transport accidents	0	0	5	0	5
1-098	Accidental drowning and submersion	0	0	4	1	5
1-101	Intentional self-harm	0	0	6	1	7
1-103	All other external causes	2	1	2	0	5
NA		3	5	20	59	87
Total		**7**	**6**	**65**	**164**	**242**

Appendix table 1.16: Total cause of death for females by ICD and specific age groups, 1992–2016

Code	Cause of Death	Age group 0–4	Age group 5–14	Age group 15–59	Age group 60+	Total
1-005	Respiratory tuberculosis	0	0	0	1	1
1-012	Septicaemia	0	0	0	2	2
1-017	Other arthropod–borne viral fevers and viral haemorrhagic fevers	0	0	1	0	1
1-018	Measles	1	0	0	0	1
1-029	Malignant neoplasm of stomach	0	0	0	2	2
1-030	Malignant neoplasm of colon, rectum and anus	0	0	0	1	1
1-034	Malignant neoplasm of trachea, bronchus and lung	0	0	1	3	4
1-035	Malignant melanoma of skin	0	0	1	0	1
1-036	Malignant neoplasm of breast	0	0	0	2	2
1-037	Malignant neoplasm of cervix uteri	0	0	0	2	2
1-038	Malignant neoplasm of other and unspecified parts of uterus	0	0	1	1	2
1-044	Multiple myeloma and malignant plasma cell neoplasms	0	0	0	1	1
1-045	Leukaemia	0	0	0	1	1
1-046	Remainder of malignant neoplasms	0	0	0	1	1
1-047	Remainder of neoplasms	0	0	0	1	1
1-050	Remainder of diseases of the blood and blood–forming organs and certain disorders involving the immune mechanism	0	0	0	2	2
1-052	Diabetes mellitus	0	0	0	14	14
1-053	Malnutrition	0	0	0	1	1
1-058	Diseases of the nervous system	0	0	0	1	1
1-065	Acute rheumatic fever and chronic rheumatic heart diseases	0	0	0	1	1
1-066	Hypertensive diseases	0	0	0	3	3
1-067	Ischaemic heart diseases	0	0	1	5	6
1-068	Other heart diseases	0	0	0	10	10
1-069	Cerebrovascular diseases	0	0	0	11	11
1-071	Remainder of diseases of the circulatory system	0	0	0	1	1
1-074	Pneumonia	0	0	1	4	5
1-075	Other acute lower respiratory infections	1	0	1	0	2
1-076	Chronic lower respiratory diseases	0	0	0	5	5
1-077	Remainder of diseases of the respiratory system	0	0	0	1	1
1-080	Diseases of the liver	0	0	0	1	1
1-081	Remainder of diseases of the digestive system	0	0	0	1	1
1-082	Diseases of the skin and subcutaneous tissue	0	0	0	1	1

1-086	Remainder of diseases of the genitourinary system	0	0	0	1	1
1-092	Certain conditions originating in the perinatal period	2	0	0	0	2
1-093	Congenital malformations, deformations and chromosomal abnormalities	1	0	0	0	1
1-094	Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	0	0	0	12	12
1-103	All other external causes	0	1	3	1	5
NA		3	0	8	56	67
Total		**8**	**1**	**18**	**150**	**177**

Appendix 2: Standard tabulations of cause of death from the International Statistics Classification of Diseases and Related Health Problems, 10th Revision (ICD–10, 2010 edition)

CAUSE OF DEATHS (by ICD General Mortality list – 103 causes)

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**

Appendix 3: Key concepts and definitions

Adult mortality: The probability of dying between the ages of 15 and 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

Age-specific mortality rate: The number of deaths per 1,000 people of a given age group in a given 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 population

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 one 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 period per 100,000 live births during the same 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 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 males per 100 females; 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 five mortality rate: The number of deaths in children under age five per 1,000 live births in a given period

Appendix 4: WHO World Standard Population Distribution

From: AGE STANDARDIZATION OF RATES: A NEW WHO STANDARD, GPE Discussion Paper Series: No.31, EIP/GPE/EBD, World Health Organization 2001

Table 4.1: 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**