

Mortality Trends in Pacific Island States

June 2014



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**Secretariat of the Pacific Community
School of Population Health, University of Queensland
School of Public Health and Community Medicine, University of New South Wales**

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Authors

Christine Linhart (3)

Karen Carter (1,2)

Richard Taylor (1,3)

Chalapati Rao (1)

Alan Lopez (1)

1 SPH UQ

2. SPC

3. SPHCM, UNSW

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EXECUTIVE SUMMARY

Mortality is an essential measure of the health of populations. Examining mortality trends over time allows governments and development partners to better understand key priorities for intervention, whether health investments are having the desired impact, and how the health of the population is changing over time. This report examines mortality trends through measures of infant mortality rate (IMR) - deaths in children aged <1 year per 1000 live births; under five mortality rate (U5MR) - deaths in children aged less than 5 years per 1000 live births; and life expectancy (LE) - average number of years a person could expect to live given the current conditions for males and females. These are important development indicators, both for the health sector and in a broader development context.

Data in this report are derived from local sources such as censuses, surveys, and vital registration where available, and refer to both the data collection and analytical method used wherever possible. Estimates were excluded from this analysis if: based on an assumed annual improvement; they are implausible; derived from flawed data (such as from incomplete registration not corrected for undercount); or no primary source or method could be identified. Also excluded were data sources which provided contradictory estimates for the same time period.

There is considerable diversity in levels and trends in mortality amongst Pacific Island States, and some caution must be taken when making general statements of trends across the region, or even within subregions.

The data show commendable declines in IMR and U5MR in many Pacific Island States over the past decades, and maintenance of relatively low levels in others. For many of these States, further declines in infant and child mortality will require significant investment as many of the less difficult interventions around safe births, nutrition and sanitation have already been made. A greater understanding of the relative components of infant mortality (both neonatal and post-neonatal mortality) will also be necessary to target and monitor future investments. However, there are still instances where IMR and U5MR are unacceptably elevated compared with expected norms, with countries such as Papua New Guinea and Kiribati experiencing an IMR >40 deaths per 1000 live births despite a consistent downward trend; while just over a third of all the countries have an IMR greater than 20 deaths per 1000 live births, and therefore have scope for further improvement.

Many countries show continued improvement in LE for both males and females, but others have experienced plateaux with no sustained improvement over the last two decades. Although there is no clear evidence to suggest that life expectancy is actually falling in any Pacific Island State once previous estimates were excluded based on method and quality, in several countries stagnation in life expectancy has occurred at relatively low life expectancies, and indicates significant health concerns. Given declines in infant and childhood mortality, these LE patterns are most likely a consequence of the impact of premature adult mortality from non-communicable disease (NCDs).

There was substantial variation in the quality of data available. While in some Pacific Island states mortality data by age and sex from routine death registration is of acceptable coverage and completeness, and direct and indirect demographic estimates from censuses and surveys are credible, in others routine death registration is significantly incomplete and it has been necessary

to rely solely on demographic analyses of censuses or surveys which may underestimate true levels of mortality. Improving registration data in these countries should be a priority.

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1. Introduction

Mortality in populations is an important measure of health status, in addition to measures of illness (or morbidity). Reduction in premature mortality is one of the most important objectives of public health and health services.

This report presents mortality data from all Pacific Island countries and territories of Melanesia, Micronesia and Polynesia which are members of the Secretariat for the Pacific Community (SPC). These dispersed Island nations and territories show great variation in land mass, colonial history, population size, social and economic development, endemic malaria, health services, governance structures, ethnicity and culture. This diversity is reflected in differences in important health status indicators such as child mortality and life expectancy (at birth).

For many Pacific Island countries and territories there are a number of contradictory estimates of mortality level from multiple sources with little information often available on the methods used to calculate the figures provided. This necessitates a circumspect approach and critical appraisal of published estimates so that data from credible primary sources are emphasised and data are clearly referenced.

Compared to cross-sectional estimates from one period, trends over time are of much greater value in the interpretation of mortality and morbidity data in populations since they indicate improvement, stagnation or worsening of the health situation, as well as providing for comparisons with other populations.

2. Background

Much of the work to produce this report was funded through an Australian Development Assistance Award (ADRA) research grant funded by AusAID entitled: Strengthening Mortality and Cause of Death Reporting in Pacific Island Health Information Systems (ADRA Application HSS024, ADRA Agreement 44738). The Principal Investigator (PI) was Richard Taylor. This study was implemented through the School of Population Health (SPH), University of Queensland (UQ), and later in collaboration with the School of Public Health and Community Medicine (SPHCM), University of New South Wales (UNSW) and SPC. The Western Pacific Regional Office of the World Health Organisation (WPRO) also supported the study and rendered assistance when needed. Although the project included working closely with Fiji, Kiribati, Nauru, Palau, Solomon Islands, Tonga, and Vanuatu, to identify weaknesses and gaps in their current mortality data collection and reporting systems, it also involved producing best possible estimates of mortality for other states in the Pacific Islands region which are summarised in this report.

3. Methods

3.1 Data Sources

Mortality indicators used in this report are extracted from: (a) country sources, including Ministry of Health (MoH), Departments of Statistics, Census Reports, Year Books, etc.; (b) international agencies including WHO, SPC, the United Nations Inter-Agency Group for Child Mortality Estimation (UNIGME), United Nations International Children's Emergency Fund (UNICEF), etc.; and (c) publications in the scientific literature.

Reports were accessed in hard copy, including inter-library loan (ILL) and through direct contact with the reporting authority, and in electronic form through country and organisational web sites. Reports accessed were in English or French.

When multiple sources reported the same estimate and time period, the primary source of the data was identified and the duplicate removed. In instances where the primary source could not be determined all estimates were included in the graph. Estimates for the same year are slightly offset for graphical display. The summary table for each country indicates the time period represented by each data point.

In some countries mortality data are recorded through vital registration which involves recording of vital events (births, deaths, marriages) in a population through a civil system (civil vital registration), and/or through a health system (registration of births), and/or by other means (such as through local government, or by churches).

In other countries mortality data are collected intermittently through censuses or population sample surveys using direct methods including questions on deaths in the household in a defined retrospective period, or a complete maternal history, or indirect demographic techniques including questions on survival of parents, spouse or siblings.

3.2 Level of Mortality

Measures of infant mortality rate (IMR) (deaths <1 year/1000 live births), under-five mortality rate (U5MR) (deaths <5 years/1000 live births) and life expectancy (LE) (at birth) were chosen as mortality measures because of their availability. Data were (1) extracted from published reports, journal articles and life tables; or (2) directly calculated by the authors based on published and unpublished vital registration data of infant and under-five deaths, and live births for the same period.

For each data point, the original source of data and the analytic method of calculation were recorded, where possible. Data sources were assessed for reliability and plausibility of estimates based on the analytic method of estimation, original source of data, and data consistency. Unreliable sources were considered for exclusion if they met any of the following criteria: (a) data were derived, or were considered likely to have been derived, from projections assuming a given improvement by year, as evidenced by perfectly linear or curvi-linear improvements in LE or IMR by period; (b) multiple incompatible estimates were given by the source for a single year or adjacent years; (c) source data included implausible estimates (based on equivalent measures for developed countries) or U5MR less than IMR estimates; (d) calculations were based on uncorrected vital registration data known to be

significantly under-reported or with no assessment of reporting completeness. In the absence of primary data some credible international agency estimates have been included.

Estimates published by the United Nations Inter-agency Group for Child Mortality Estimation (UNIGME) comprised of UNICEF, WHO, the World Bank, and the United Nations, for infant mortality (1990; 2012) and under-five mortality (1990; 2000; 2012) for Pacific Island states (except territories) are derived from trends with projections based on selected data (see full report for more detailed methodology [UNIGME 2013]). While the UNIGME estimates meet the exclusion criteria for this report, they have been included in the graphs as an acknowledged international reference source for comparison purposes only and have not been included in generating the trend lines shown. Similarly, estimates from the Global Burden of Disease (GBD) Studies have been included on the graphs for comparison purposes only due to their use as an international reference source, but have not been included in generating the trend lines shown. The estimates generated for the GBD are secondary sources derived from models using a range of data inputs including available country mortality data, economic data, and data from similar countries (see publications for full details [Wang 2010; Wang 2013]).

Estimates from some primary sources which are considered implausible because they are inconsistent with credible sources, are included in graphs for comparison purposes only and have not been included in generating the trend lines shown in this report. A footnote beneath the graphs indicates where this has occurred.

3.3 Mortality Trends

Mortality data are plotted by period and appropriate trend lines fitted to IMR, U5MR and LE data points. Rather than using a linear function ($y = a + bx$) to describe trends, the most suitable function for IMR and U5M was found to be exponential ($y = ae^{bx}$). For LE, the most suitable curve was found to be quadratic ($y = a + bx + cx^2$), however, exponential curves are fitted to LE data in populations characterised by a continuous increasing trend. Where data are unstable a trend line was fitted to a two-point average. Curves were not fitted where there are insufficient data points or where there is no obvious trend over time.

y = IMR, U5M or LE ; x = period (year); a = intercept; b , c = coefficients (slope);
 e = base of the natural logarithm

4. Summary Results

4.1 Infant and Child Mortality

Overall, most countries showed a consistent decline in IMR, although a clear trend could not be discerned in Nauru and Niue, where small population sizes may result in wide variation in rates from only a few events (stochastic variation). There was significantly more data on IMR available than under U5MR, which only began to be measured or reported with any consistency with the introduction of the Millennium Development Goals (MDGs).

While many countries demonstrate quite low levels of IMR, others still have scope for further improvements (Table 1).

Table 1: Recent Infant Mortality Rates (IMR) Summary Table

IMR per 1000 births	Countries
<10	Cook islands French Polynesia Guam New Caledonia Niue Northern Mariana Islands, Commonwealth of (CNMI) Wallis and Futuna <i>Australia*</i> <i>France*</i> <i>New Zealand*</i> <i>United States of America*</i>
10-19	American Samoa Fiji Palau Samoa Tonga Tuvalu
20-29	Marshall Islands, Republic of the (RMI) Micronesia, Federated States of (FSM) Solomon Islands Vanuatu
30-39	Nauru Tokelau
40-49	Kiribati
50-59	Papua New Guinea (PNG)

** Included for comparison*

References: Australia - Australian Bureau of Statistics; France - Institut National de la Statistique et des Etudes Economiques; New Zealand - Statistics New Zealand; United States of America - United States Census Bureau

Estimates published by UNIGME, included in the country graphs for comparison purposes only, were generally comparable with the empirical data from countries, although must be used with caution since they show ongoing improvements in some countries that is not supported by the empirical data.

4.2 Life Expectancy

Just over half of the Pacific Island States show a consistent increase in life expectancy for males and females (Tables 2 and 3), with the remainder showing no sustained improvement over the previous two decades.

Table 2: Recent Male Life Expectancy at birth (years) Summary Table

Life expectancy	Countries	
	Increasing Trend	Plateau
≥80		
75-79	Guam <i>Australia*</i> <i>France*</i> <i>New Zealand*</i> <i>United States of America*</i>	
70-74	American Samoa ⁺ Cook Islands French Polynesia Marshall Islands, Republic of the (RMI) New Caledonia Niue Samoa Wallis and Futuna	Northern Mariana Islands, Commonwealth of the (CNMI)
65-69	Solomon Islands Vanuatu	Micronesia, Federated States of (FSM) Fiji Palau Tokelau Tonga
60-64	Tuvalu	
55-59		Kiribati
<55		Nauru Papua New Guinea (PNG)

** Included for comparison*

+ Increasing trend is dependent on an unverified source

References: Australia - Australian Bureau of Statistics; France - Institut National de la Statistique et des Etudes Economiques; New Zealand - Statistics New Zealand; United States of America - United States Census Bureau

Very few states show a comparable LE to countries such as Australia or New Zealand, with only Guam in the same category for both males and females; although this may be heavily influenced by the large military population present there. With the exception of CNMI, many of these plateaux in LE have occurred at relatively low levels. Given continued declines in infant (and child) mortality, these demonstrate the substantial impact of premature adult mortality on Pacific populations. In the absence of major conflict or a substantial epidemic of HIV/AIDS, this is most likely attributable to the impact of non-communicable diseases, although external causes such as accidents and injuries may also contribute to these results. Detailed analysis of trends in cause of death by age group and sex are required to further understand these trends, where data is available to do so.

Table 3: Recent Female Life Expectancy at birth (years) Summary Table

Life expectancy (at birth) years	Countries	
	Increasing Trend	Plateau
≥80	Guam New Caledonia <i>Australia*</i> <i>France*</i> <i>New Zealand*</i> <i>United States of America*</i>	
75-79	American Samoa ⁺ French Polynesia Niue Wallis and Futuna	Northern Mariana Islands, Commonwealth of the
70-74	Cook Islands Marshall Islands, Republic of the Micronesia, Federated States of Samoa, Solomon Islands Vanuatu	Tokelau Tonga Palau Kiribati
65-69	Tuvalu	Fiji
60-64		
55-59		Nauru
<55		Papua New Guinea

** Included for comparison*

+ Increasing trend is dependent on an unverified source

References: Australia - Australian Bureau of Statistics; France - Institut National de la Statistique et des Etudes Economiques;
New Zealand - Statistics New Zealand; United States of America - United States Census Bureau

4.3 Data Sources and Quality

There was substantial variation in the data available for each country. Some Pacific Island states had reliable mortality data by age and sex from routine death registration, while for others it was necessary to rely on census or survey data of uncertain validity, as routine registration data collections were either incomplete (and produced implausible estimates), or were otherwise not available. Improving the reliability and availability of registration data in these countries should be a priority. Previous studies have found that significantly more data is collected in many Pacific Island countries on mortality and causes of death than is published or publically available. Common issues in collection include poor legislative framework, poor coordination between departments, and a lack of technical skills and resources [Carter 2010; Carter2012]. A regional Pacific Vital Statistics Action Plan (2011-2014) has been established by development partners under the Ten Year Pacific Statistics Strategy (2011-2020) to assist countries to improve their civil registration and vital statistics [BAG, 2014] and governments have committed to improvements of civil registration and vital statistics as a priority through both the Pacific Ministers of Health and the Heads of Planning and Statistics.

Direct and indirect analysis of census and survey data in some cases provided suspiciously low estimates of mortality, potentially disguising major health issues. Where possible, comparisons between multiple approaches (including with results of direct registration) should be undertaken to improve overall understanding of the data.

5. Mortality Trends by Country

For each Pacific Island state, the following pages outline background information, trends in life expectancy and child mortality, and data sources and methods. Brief comments are also provided on trends and data sources. Detailed notes on specific estimates are included in the appendices.

1. American Samoa

Land area (Km ²)	199
2013-mid-year population estimate	56,500
Population growth rate (%)	-0.3

[Source: SPC Pocket Summary 2013]

Trends in Child Mortality

The trend in infant mortality shows no decrease since 1980, and remains stable at a relatively low level of 10-12 deaths per 1000 live births.

Trends in Life Expectancy

The increased trend in LE is mainly influenced by the last data point from the WHO; LE would otherwise show little or no improvement for males or females. Further data is needed to investigate the situation.

Data Sources and Quality

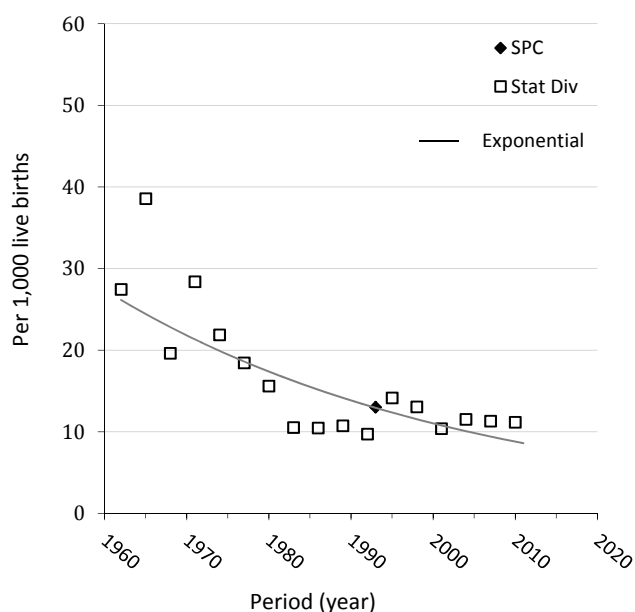
1. Vital registration in American Samoa is considered to be essentially complete.
2. Data may be affected by off island deaths not captured by the routine recording system, where patients have either been referred or have self-referred overseas for medical treatment and subsequently died.

Comments

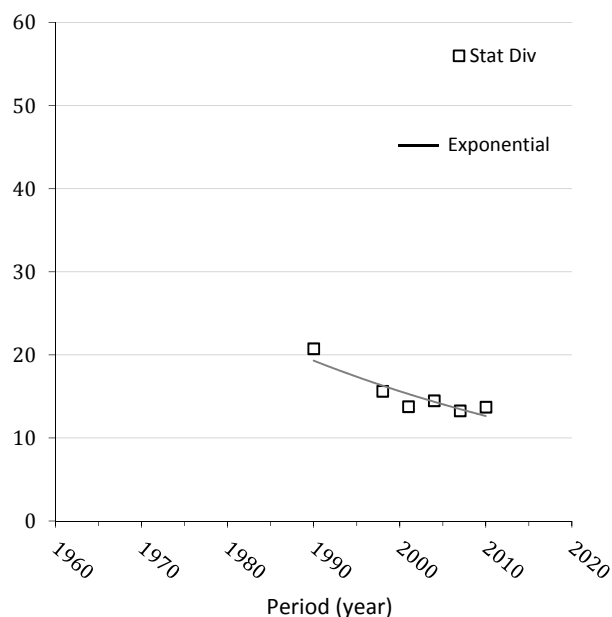
Declines in infant and under-five mortality are evident, although these have slowed in recent years having reached low levels. Although there is a trend for increasing LE, the last point is influential and above the trend line. It is possible that this data point may be masking a more profound health concern. Routine registration of deaths in American Samoa is considered essentially complete, and should be able to support life tables with defined methodology being made available at more regular intervals. The considerable male-female difference in life expectancy is most likely due to differences in premature adult mortality, partly as a consequence of non-communicable disease although other factors such as selective migration may also influence these data.

American Samoa

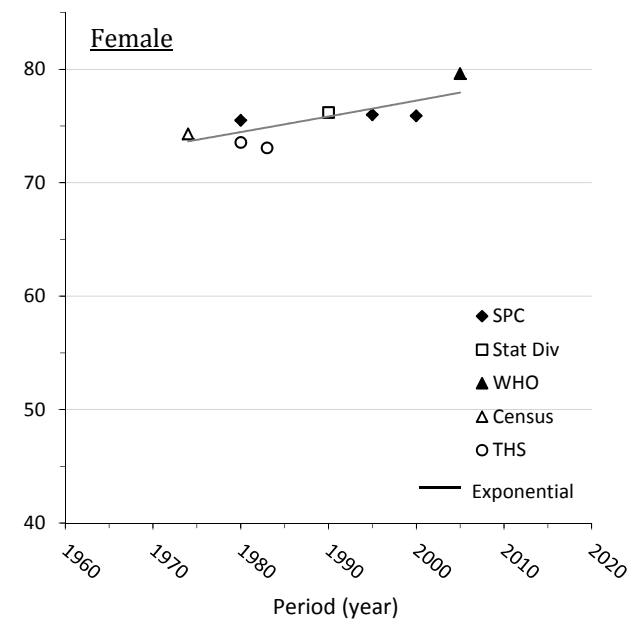
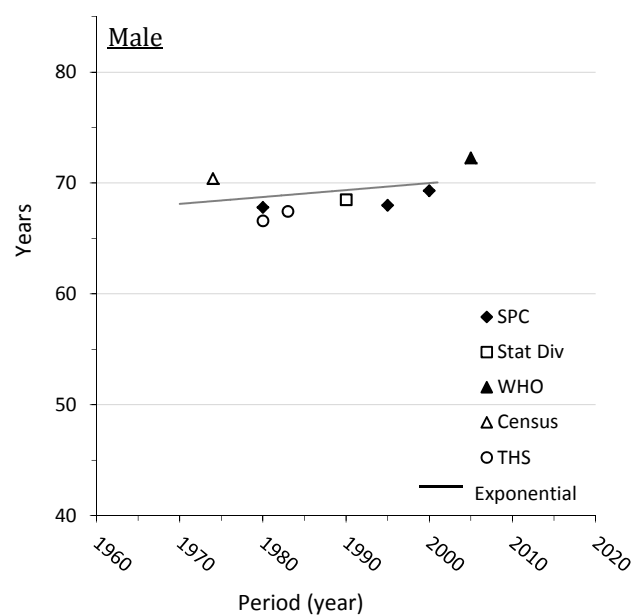
Infant Mortality



Under-Five Mortality



Life Expectancy; American Samoa



Key

SPC: Secretariat of the Pacific Community
WHO: World Health Organisation

Stat Div: Statistics Division American Samoa
THS: Territorial Household Survey

Source	Year	Data	Analysis	Ref
Infant Mortality				
SPC	1991-95(1993)	Unknown	Unknown	1
Stat Div	1961-2011*	Vital registration	Direct calculation	2-5
Under Five Mortality				
Stat Div	1990	Vital registration	Life table (direct calculation +/- model life table)	5
	1997-2011*	Vital registration	Direct calculation	5,6
Life Expectancy				
SPC	1978-82(1980)	Vital registration	Unknown	7
	1995	Unknown	Unknown	1
	2000	Vital registration	Direct calculation using 2000 Census population	8
Stat Div	1990	Vital registration	Life tables (direct calculation +/- model life table)	5
WHO	2005	Unknown	Unknown (cited as US Census Bureau – not located)	9
Census	1974	Census	CEBCS data used to impute complete model life tables (Coale/Demeny West)	10
THS	1978-82(1980); 1981-85(1983)	Vital registration	Age-standardised death rates converted into life table values (Reed-Merrell method)	11

* Data points represent average of three-year period around the estimate

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2. Cook Islands

Land area (Km ²)	237
2013-mid-year population estimate	15,200
Population growth rate (%)	-0.5

[Source: SPC Pocket Summary 2013]

Trends in Child Mortality

The trend in infant mortality has declined to below 10 deaths per 1000 live births by 2010, with a commensurate decline in under-five mortality.

Trends in Life Expectancy

LE has increased to the high 60s (years) for males and mid-70s (years) for females.

Data Sources and Quality

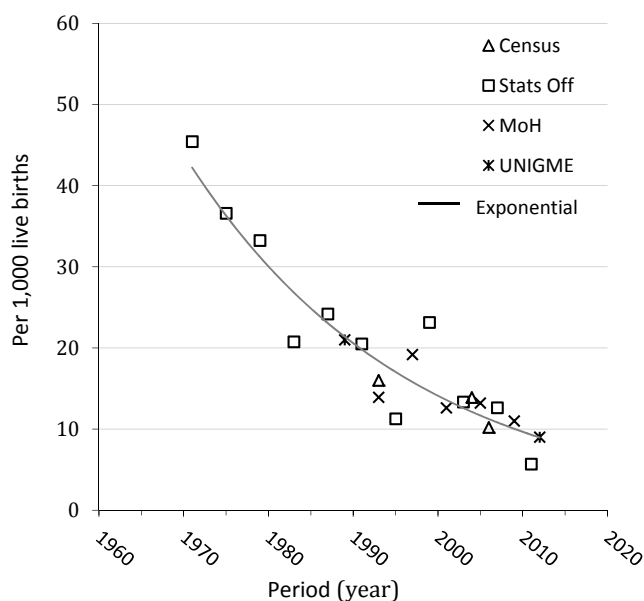
1. Mortality rates and estimates of life expectancy are likely to be affected by small numbers, producing stochastic variation over time.
2. There is significant variation between sources of life expectancy, with lower levels reported by the Ministry of Health more likely to be correct.
3. Civil registration in the Cook Islands is regarded as essentially 99% complete [NMDI website]. Records are frequently reconciled with the Ministry of Health records [Cook Islands Statistical Bulletin, 2013].
4. Many mortality events for Cook Islanders may occur off-island in New Zealand, and would subsequently not be captured in routine death registration.

Comments

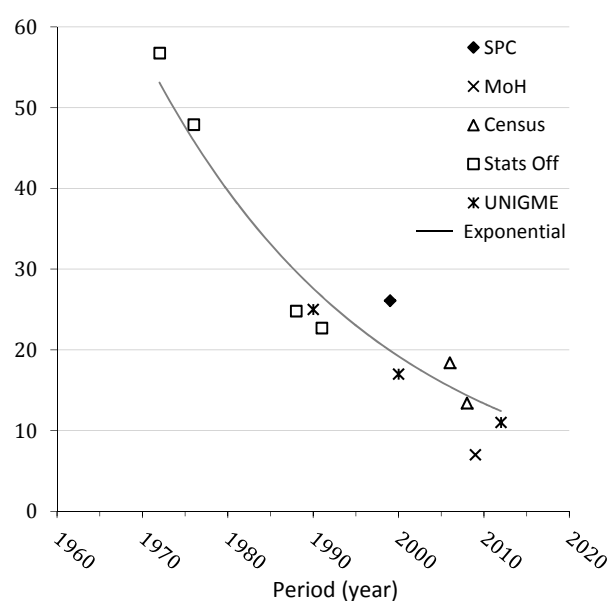
There are commendable decreases in infant and under-five mortality, with the latest estimates are below the trend line. Although life expectancy shows increasing trends, there are systematic differences between various sources (and methodologies) with the Ministry of Health data showing lower levels and lesser increases. Such differences require resolution. Infant and under-five mortality and life expectancy from the Cook Islands should be based on 3-5 year data, and presented with statistical confidence intervals (95%).

Cook Islands

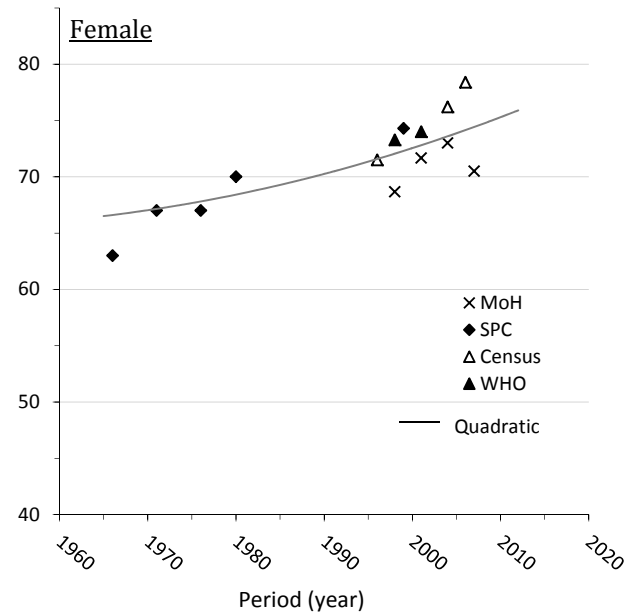
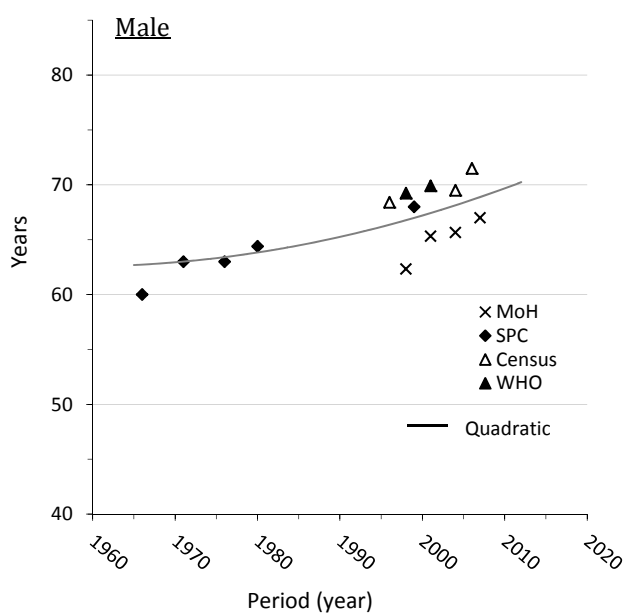
Infant Mortality



Under-Five Mortality



Life Expectancy; Cook Islands



UNIGME estimates are not included in the trendline as they are not a primary source of data - they are for comparison purposes only.

Key

SPC: Secretariat of the Pacific Community
 WHO: World Health Organisation
 Stats Off: Statistics Office Cook Islands

MoH: Ministry of Health
 UNIGME: United Nations Inter-agency Group
 for Child Mortality Estimation

Source	Year	Data	Analysis	Ref
Infant Mortality				
Census	1991-96(1993)	Vital registration	Direct calculation	1
	2001-06(2004)	Vital registration	Life table based on vital registration data using software package PAS, procedure LTPOPDTH, of the US Census Bureau	2
	2001-12(2006)	Vital registration and Census	Life tables based on vital registration and CEBCS data using software package PAS, procedure LTPOPDTH, of the US Census Bureau	3
Stats Off	1969-2012^	Vital registration	Direct calculation	4,5
MoH	1987-2010^	Vital registration	Direct calculation	6
UNIGME	1990;2012	UNIGME	Projection (see UNIGME methodology page 3)	7
Under Five Mortality				
SPC	1996-2002(1999)	Vital registration	Life table –smoothed (direct calculation +/- model life table)	8
MoH	2008-10(2009)	Vital registration	Direct calculation	6
Census	2001-06(2004)	Vital registration	Life table based on vital registration data using software package PAS, procedure LTPOPDTH, of the US Census Bureau	2
	2001-12(2006)	Vital registration and Census	Life tables based on vital registration and CEBCS data using software package PAS, procedure LTPOPDTH, of the US Census Bureau	3
Stats Off	1970-1977^; 1987-1992*	Vital registration	Direct calculation	9-11
UNIGME	1990; 2000; 2012	UNIGME	Projection (see UNIGME methodology page 3)	7
Life Expectancy				
MoH	1997-2005*	Vital registration	Life tables (direct calculation +/- model life table)	12
	2006-07(2007)	Vital registration	Life tables (direct calculation +/- model life table)	13
SPC	1966; 1971; 1974-81~	Vital registration	Life tables (direct calculation +/- model life table)	14
	1996-2002(1999)	Vital registration	Life tables – smoothed (using model life tables)	7
Census	1995-97 1996)	Vital registration	Based on model life tables (Far East Asian) using MORTPAK3.0	1
	2001-06(2004)	Vital registration	Life table based on vital registration data using software package PAS, procedure LTPOPDTH, of the US Census Bureau	2
	2001-12(2006)	Vital registration and Census	Life tables based on vital registration and CEBCS data using software package PAS, procedure LTPOPDTH, of the US Census Bureau	3
WHO	1999; 2000	Unknown	Unknown	15

Data points represent average of: * three-year period; ^ four-year period; ~ five-year period around the estimate

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3. Fiji

Land area (Km ²)	18,333
2013-mid-year population estimate	859,200
Population growth rate (%)	0.8

[Source: Secretariat of the Pacific Community Pocket Summary 2013]

Trends in Child Mortality

There has been a decline in infant mortality to about 15 deaths per 1000 live births by 2010, with a commensurate trend in under-five mortality.

Trends in Life Expectancy

LE has plateaued out in the mid-60s (years) in males and late 60s (years) in females since 1985.

Data Sources and Quality

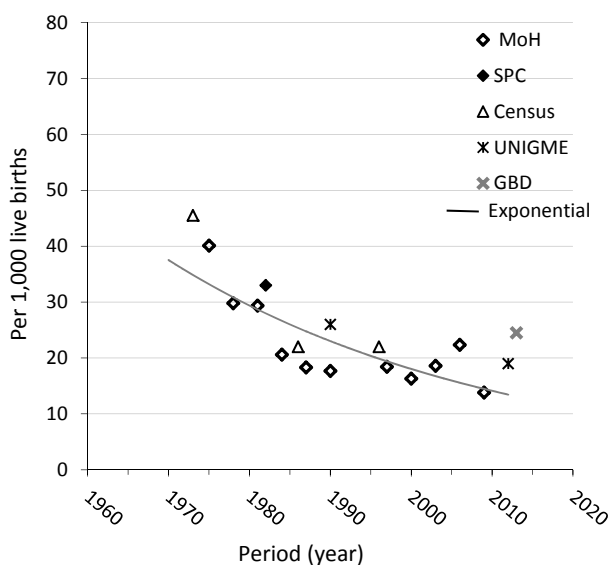
Vital registration data collected through the Ministry of Health have previously been evaluated and found to be reasonably complete [Carter et al. 2011].

Comments

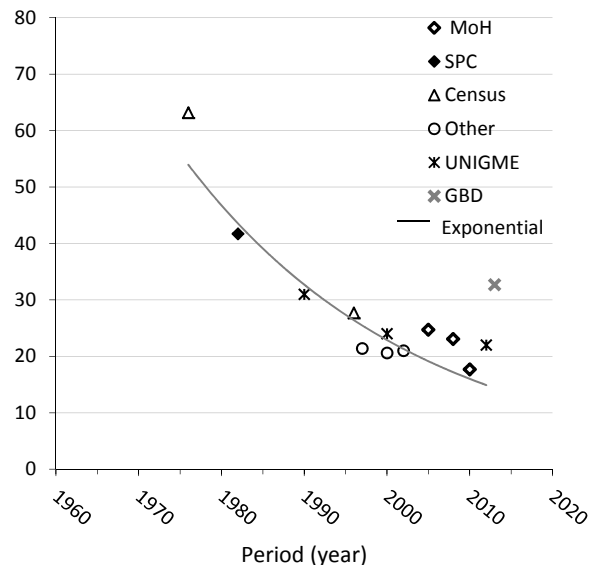
Substantial reductions in infant and under-five mortality are shown. There has been a plateau in male and female LE for approximately 25 years at 64 years for males and 69 years for females due to premature adult mortality, most likely a consequence of non-communicable disease. Divergent trends have been demonstrated by ethnicity [Taylor et al. 2013], although are not shown here.

Fiji

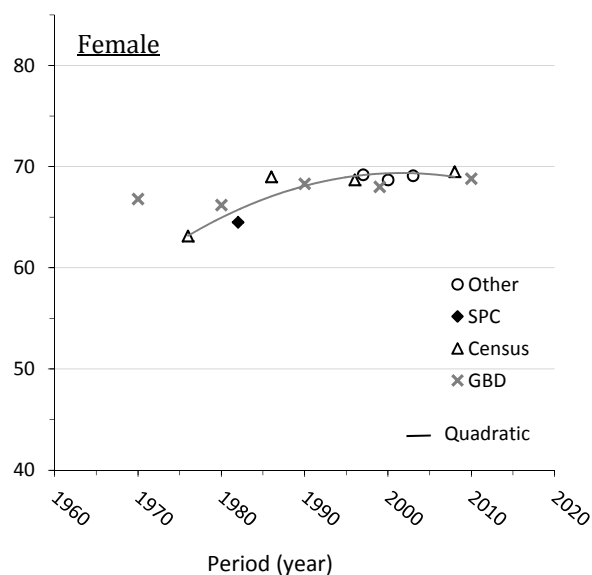
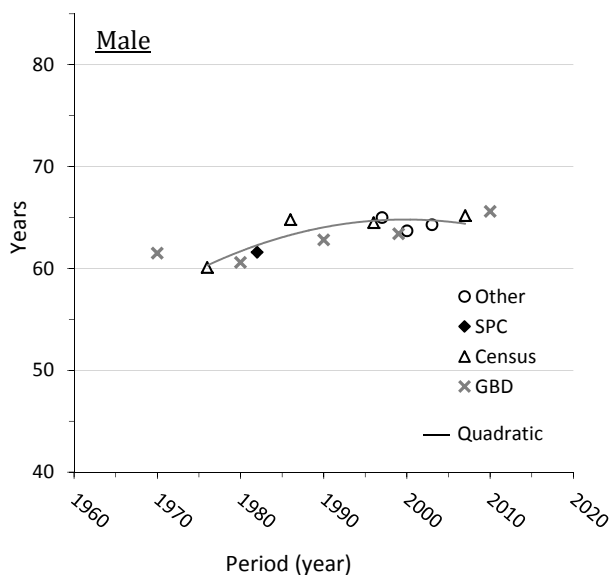
Infant Mortality



Under-Five Mortality



Life Expectancy; Fiji



UNIGME and GBD estimates are not included in the trendlines as they are not a primary source of data - they are for comparison purposes only.

Key

SPC: Secretariat of the Pacific Community
 UNIGME: United Nations Inter-agency Group for Child Mortality Estimation

MoH: Ministry of Health
 Other: Other source(s) noted in reference list
 GBD: Global Burden of Disease Study

Source	Year	Data	Analysis	Ref
Infant Mortality				
MoH	1974-91*	Vital registration	Direct calculation	1,2,
	1994-2010*	Vital registration	Direct calculation	3-6
SPC	1981-83(1982)	Vital registration	Direct calculation (adjusted for under-reporting using Brass method)	7
Census	1976	Census	CEBCS (+/- model life table)	8
	1986	Census	CEBCS (+/- model life table)	9
	1995-97(1996)	Vital registration and Census	Vital registration and Census data used to impute a model life table (UN Far Eastern 2 parameter model)	10
UNIGME	1990; 2012	UNIGME	Projection (see UNIGME methodology page 3)	11
GBD	2013	GBD	Modelled data (see reference) – added early neonatal mortality, late neonatal mortality, and post neonatal infant mortality.	16
Under Five Mortality				
Other	1996-2004*	Vital registration	Life tables from age specific deaths and populations	12
MoH	2004-09*; 2010	Vital registration	Direct calculation	5,13
SPC	1981-83(1982)	Vital registration	Direct calculation (adjusted for under-reporting using Brass method)	14
Census	1976	Census	Census survivorship data used to impute a model life table	8
	1995-97(1996)	Vital registration and Census	Vital registration and Census data used to impute a model life table (UN Far Eastern 2 parameter model)	10
UNIGME	1990; 2000; 2012	UNIGME	Projection (see UNIGME methodology page 3)	11
GBD	2013	GBD	Modelled data (see reference)	16
Life Expectancy				
Other	1996-2004*	Vital registration	Life tables from age specific deaths and populations	6,12
SPC	1981-83(1982)	Vital registration	Life tables (adjusted for under-reporting using Brass method)	7
Census	1976	Census	Census survivorship data used to impute model life tables	8
	1986	Census	Child and adult survival data used to impute logit model life tables	9
	1995-97(1996)	Vital registration and Census	Vital registration and Census data used to impute model life tables (UN Far Eastern 2 parameter model)	10
	2006-08(2007)	Vital registration	Direct calculation	15
GBD	1970; 1980; 1990; 2000; 2010	GBD	Modelled data (see reference)	17

*Data points represent average of three-year period around the estimate

References

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10. Fiji Islands Bureau of Statistics. 1996 Fiji Census of population and housing. Analytic report part 1 demographic characteristics. Suva: Parliament of Fiji; 1998.
11. The United Nations Inter-agency Group for Child Mortality Estimation (UNIGME). Levels and trends in child mortality: Report 2013. The United Nations Children's Fund; 2013.
12. Carter K, Cornelius M, Taylor R et al. An assessment of mortality estimates for Fiji, 1949-2008: findings and life tables. Health Information Systems Knowledge Hub. Documentation note series. Number 12; November 2010.
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16. Wang H, Liddell CA, Coates MM, Mooney M, Levitz CE, Schumacher AE, et al. *Global, regional, and national levels of neonatal, infant, and under-5 mortality during 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013*. Lancet. Published Online. May 2, 2014. [http://dx.doi.org/10.1016/S0140-6736\(14\)60497-9](http://dx.doi.org/10.1016/S0140-6736(14)60497-9).
17. Wang H, Dwyer-Lindgren L, Lofgren KT, Knoll Rajaratnam J, Marcus JR, Levin-Rector A et al. *Age-specific and sex-specific mortality in 187 countries, 1970-2010: a systematic analysis for the Global Burden of Disease Study 2010*. Lancet. 380:2071-94; 2012.

4. French Polynesia

Land area (Km ²)	3,521
2013-mid-year population estimate	261,400
Population growth rate (%)	1.8

[Source: SPC Pocket Summary 2013]

Trends in Child Mortality

Infant mortality has now stabilised at around 5 deaths per 1000 live births, with commensurate levels of under-five mortality.

Trends in Life Expectancy

LE increased to the mid-70s (years) in males and late 70s (years) in females by 2010, with no apparent plateau.

Data Sources and Quality

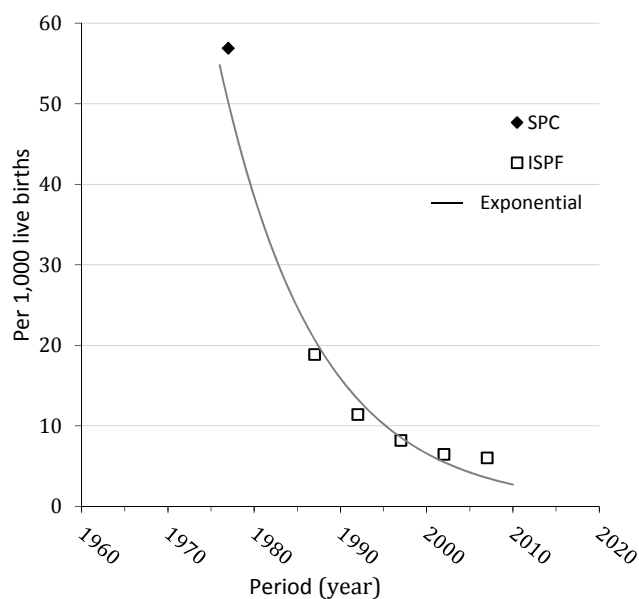
Although not explicitly stated it is likely that all mortality data from French Polynesia emanates from accurate vital registration.

Comments

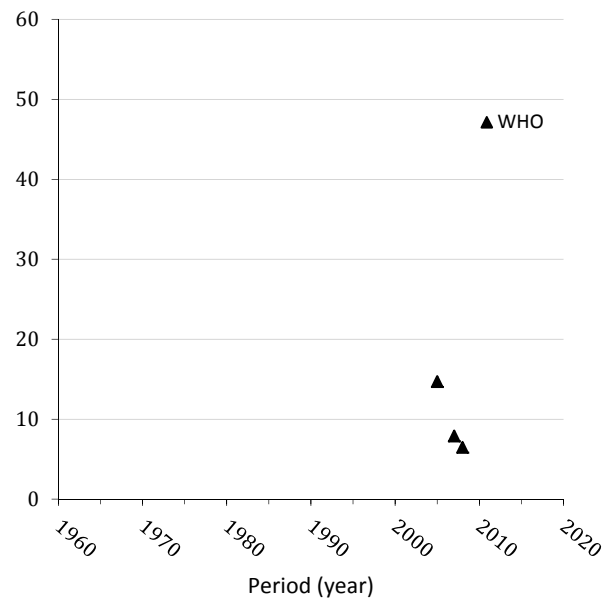
There have been substantial falls in infant and under-five mortality to levels comparable to developed countries. Progressive increases have occurred in life expectancy into the 70s for males and females, although LE remains lower than for developed countries, including France.

French Polynesia

Infant Mortality

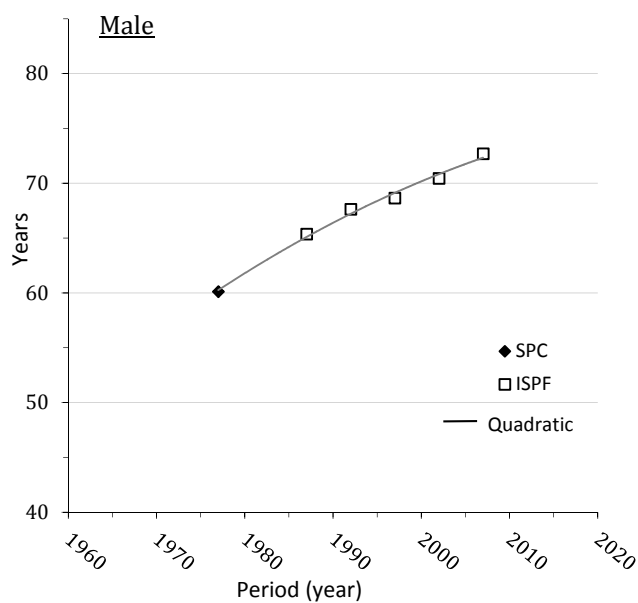


Under-Five Mortality

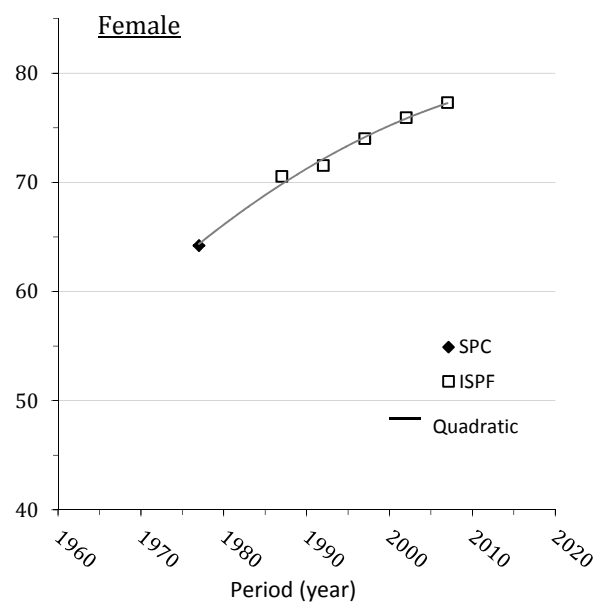


Life Expectancy; French Polynesia

Male



Female



Key

SPC: Secretariat of the Pacific Community
WHO: World Health Organisation

ISPF: Institut de la Statistique de la Polynésie Française

Source	Year	Data	Analysis	Ref
Infant Mortality				
SPC	1976-78(1977)	Vital registration	Direct calculation	1
ISPF	1985-2009~	Vital registration	Direct Calculation	2
Under Five Mortality				
WHO	2005	Unknown	Unknown (cited as Observatoire Polynésien de la Santé – not located)	3
	2007	Unknown	Unknown (cited as Observatoire Polynésien de la Santé – not located)	4
	2008	Unknown	Unknown (cited as Observatoire Polynésien de la Santé – not located)	5
Life Expectancy				
SPC	1976-78(1977)	Vital registration	Unknown	1
ISPF	1985-2009~	Unknown	Unknown	2

~ Data points represent average of five-year period around the estimate

References

1. Tetaria C. *Country report for French Polynesia*. Tenth Regional Conference of Permanent Heads of Health Services. Noumea: South Pacific Commission; 1983. And; Baudchon G. Projections de populations a l'horizon 1985; Polynesie francaise. Les dossiers de PITSTAT, No 7. Papeete, Institut Territorial da la Statistique, 1983. And; Baudchon G. The demographic situation in French Polynesia. ESCAP/SPC Conference on population problems of small island countries of the ESCAP/SPC region. Noumea: South Pacific Commission; 1982. Estimate cited in; Taylor R, Lewis N, Levy S. *Societies in transition: mortality patterns in Pacific Island populations*. International Journal of Epidemiology. 1989;18(3):634-646.
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5. Direction de la Santé (Observatoire Polynésien de la Santé). Estimate cited in; World Health Organisation. Western Pacific Country Health Information Profiles 2011 Revision. Geneva: WHO; 2011.

5. Guam

Land area (Km ²)	541
2013-mid-year population estimate	174,900
Population growth rate (%)	0.3

[Source: SPC Pocket Summary 2013]

Trends in Child Mortality

Infant mortality reached below 10 deaths per 1000 live births by 2000, however, trends in the most recent decade suggest a sustained increase.

Trends in Life Expectancy

Increasing trends in LE to the mid-70s (years) for males and early 80s (years) for females by 2010, with no apparent plateaux.

Data Sources and Quality

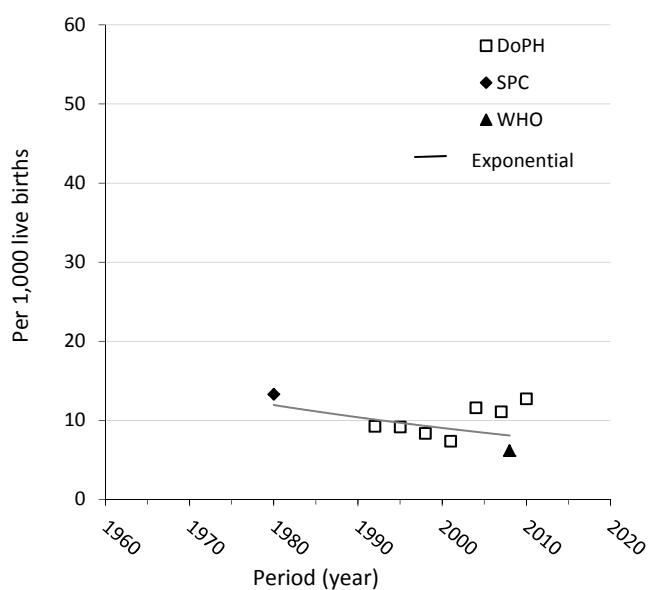
1. LE estimates may be artificially inflated by the considerable and mobile military population of healthy younger adults
2. No empirical data on U5MR in Guam was available, and projected estimates have been excluded.

Comments

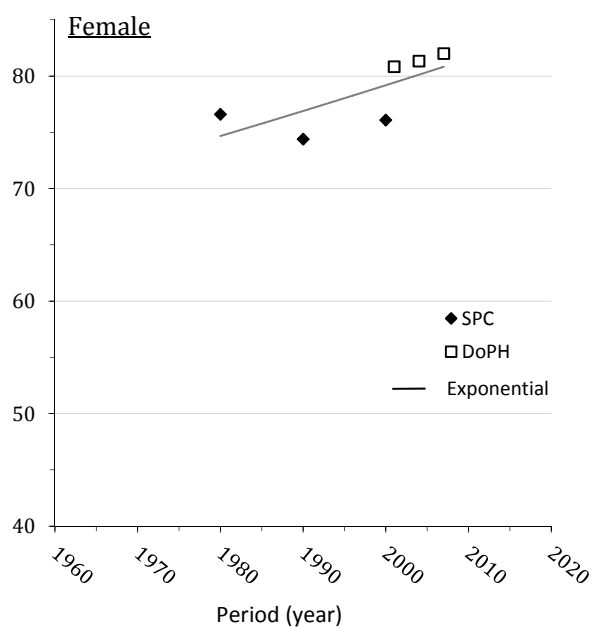
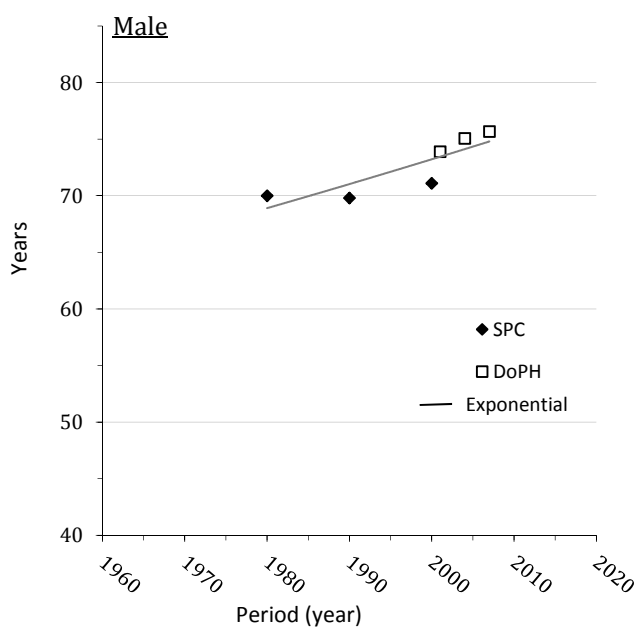
Low infant mortality and increasing LE are comparable with developed country levels, although differences in estimates by source are evident. Further review of infant and child mortality levels should be encouraged given the data gaps and potential shift in IMR trends over the previous decade.

Guam

Infant Mortality



Life Expectancy; Guam



Key

SPC: Secretariat of the Pacific Community
 WHO: World Health Organisation

DoPH: Department of Public Health and Social Services

Source	Year	Data	Analysis	Ref
Infant Mortality				
DoPH	1991-2011*	Vital registration	Direct calculation	1,2
SPC	1979-81(1980)	Vital registration	Direct calculation	3
WHO	2008	Unknown	Unknown (cited as US Census Bureau – not located)	4
Life Expectancy				
SPC	1979-81(1980)	Vital registration	Unknown	3
	1990	Unknown	Unknown	5
	2000	Vital registration	Unknown	6
DoPH	2000-08*	Unknown	Unknown	7

* Data points represent average of three-year period around the estimate

References

1. Office of Vital Statistics, Department of Public Health and Social Services, Government of Guam. Estimate cited in; Bureau of Statistics and Plans. 2004 Guam Statistical Yearbook. Hagatna, Guam; 2005.
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7. International database, international programmes centre, U.S Census Bureau. Estimate cited in; Bureau of Statistics and Plans. Guam Statistical Yearbook 2008. Hagatna, Guam; 2009.

6. Kiribati

Land area (Km ²)	811
2013-mid-year population estimate	108,800
Population growth rate (%)	2.2

[Source: SPC Pocket Summary 2013]

Trends in Child Mortality

Trends in infant and under-five mortality are declining, but still unacceptably high with infant mortality over 40 deaths per 1000 live births in 2010.

Trends in Life Expectancy

LE reached a plateau from the 1990s at 60 (years) in males and 65 (years) in females, with no subsequent increase.

Data Sources and Quality

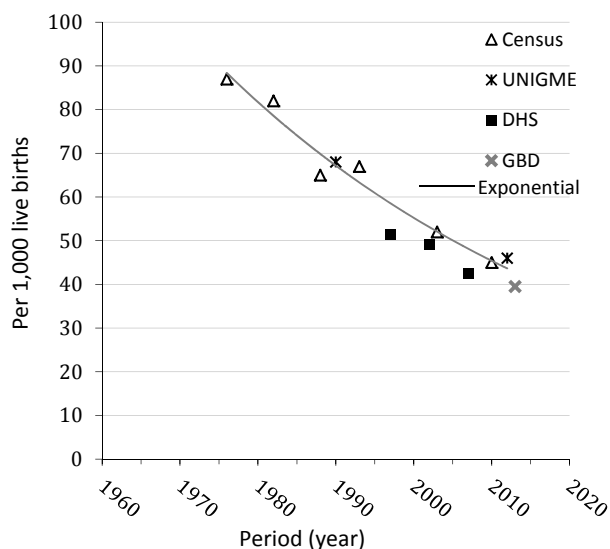
Registration of vital events, including deaths, in Kiribati is considered to be incomplete and indirect demographic estimation techniques are used for estimation of mortality and LE.

Comments

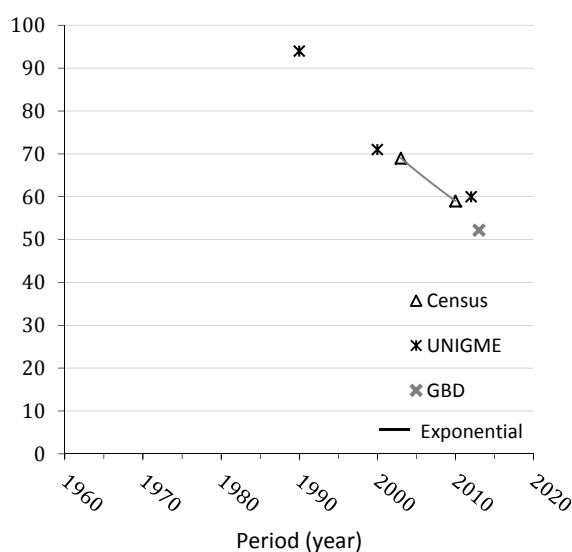
There is evidence of reductions in infant and under-five mortality, but rates remain high in relation to most other Pacific Island states. In the context of declining under-five mortality, the lack of further improvements in LE over the same period imply increasing premature adult mortality.

Kiribati

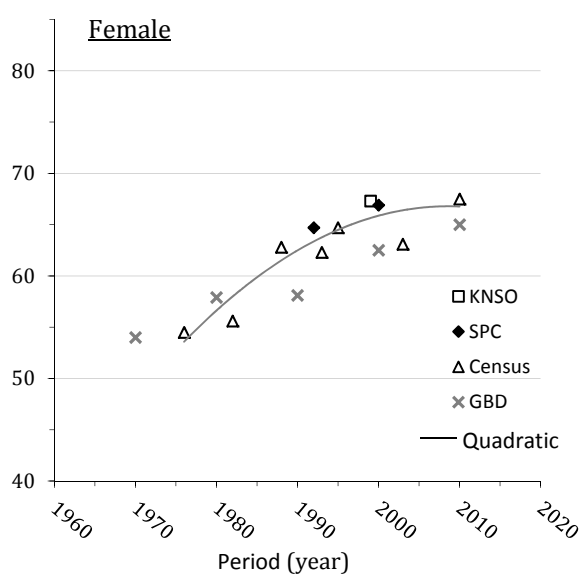
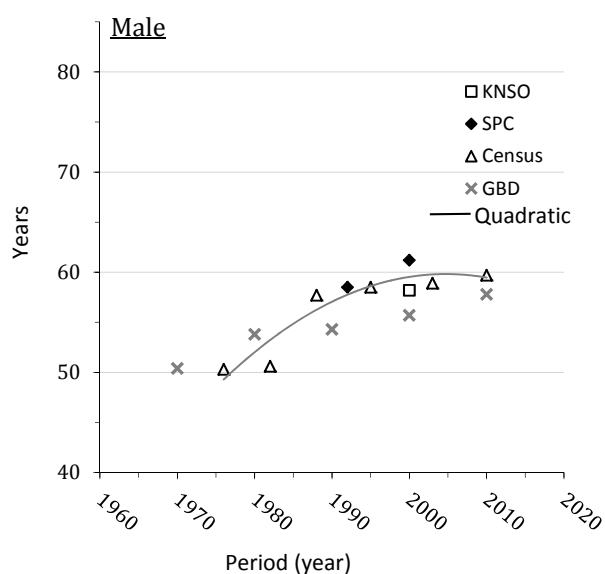
Infant Mortality



Under-Five Mortality



Life Expectancy; Kiribati



UNIGME and GBD estimates are not included in the trendlines as they are not a primary source of data - they are for comparison purposes only.

Key

SPC: Secretariat of the Pacific Community
UNIGME: United Nations Inter-agency Group
for Child Mortality Estimation

KNSO: Kiribati National Statistics Office
WHO: World Health Organisation
GBD: Global Burden of Disease Study

Source	Year	Data	Analysis	Ref
Infant Mortality				
Census	1973-78 (1976); 1978-85 (1882); 1985-90 (1988)	Census	CEBCS and adult survivorship data from paternal orphanhood method used to impute a model life table	1
	1995	Census	CEBCS using MORTPAK3.0	2
	2003; 2010	Census	CEBCS used to impute a model life table (UN Far East Asian) using MORTPAK4.1	3,4
DHS	1995-2009~	Survey	Retrospective maternal history	5
UNIGME	1990; 2012	UNIGME	Projection (see UNIGME methodology page 3)	6
GBD	2013	GBD	Modelled data (see reference) – added early neonatal mortality, late neonatal mortality, and post neonatal infant mortality.	10
Under Five Mortality				
Census	2003	Census	CEBCS used to impute a model life table (UN Far East Asian) using MORTPAK4.1	3
	2010	Census	CEBCS used to impute a model life table (UN Far East Asian) using MORTPAK4.1	4
DHS	1995-2009~	Survey	Retrospective maternal history	5
UNIGME	1990; 2000; 2012	UNIGME	Projection (see UNIGME methodology page 3)	6
GBD	2013	GBD	Modelled data (see reference)	10
Life Expectancy				
KNSO	2000	Unknown	Unknown	7
SPC	1992	Unknown	Unknown	8
	2000	Unknown	Unknown	9
Census	1973-78 (1976); 1978-85 (1982); 1985-90 (1988)	Census	CEBCS and adult survivorship data from paternal orphanhood method used to impute a model life table	1
	1995	Census	CEBCS and adult survivorship data from paternal orphanhood method used to impute a model life table (Coale/Demeny West)	2
	2003; 2010	Census	CEBCS used to impute model life tables (UN Far East Asian) using MORTPAK4.1	3,4
GBD	1970; 1980; 1990; 2000; 2010	GBD	Modelled data (see reference)	11

~ Data points represent average of five-year period around the estimate

References

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2. Demmke A, Haberkorn G, Rakaseta VL, Lepers C, Beccalossi G. *Kiribati Population Profile based on the 1995 Census*. Noumea; Secretariat of the Pacific Community: 1998.
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11. Wang H, Dwyer-Lindgren L, Lofgren KT, Knoll Rajaratnam J, Marcus JR, Levin-Rector A et al. *Age-specific and sex-specific mortality in 187 countries, 1970-2010: a systematic analysis for the Global Burden of Disease Study 2010*. *Lancet*. 380:2071-94; 2012.

7. Marshall Islands, Republic of the (RMI)

Land area (Km ²)	181
2013-mid-year population estimate	54,200
Population growth rate (%)	0.4

[Source: SPC Pocket Summary 2013]

Trends in Child Mortality

There has been a significant reduction in infant mortality to below 30 deaths per 1000 live births by 2010. Under-5 mortality has declined even more rapidly.

Trends in Life Expectancy

Trends show a sustained increase in LE to around 70 (years) in males and females.

Data Sources and Quality

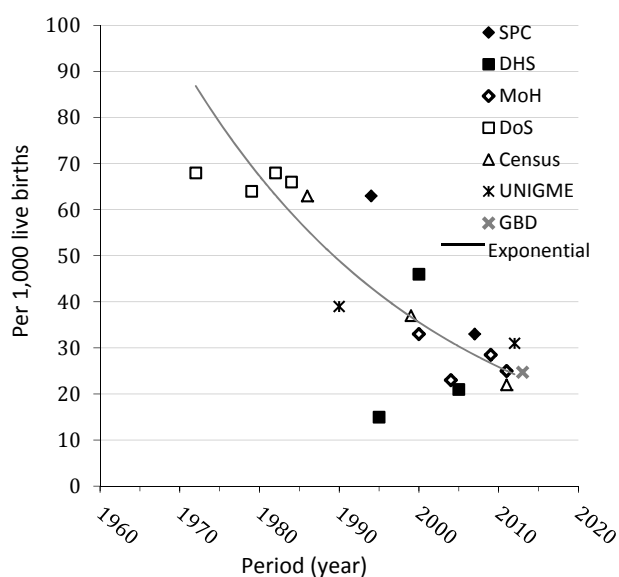
There is limited routine death registration data available, although some infant and under-five mortality estimations are based on vital registration of deaths and births. Further review of data is required to assess completeness.

Comments

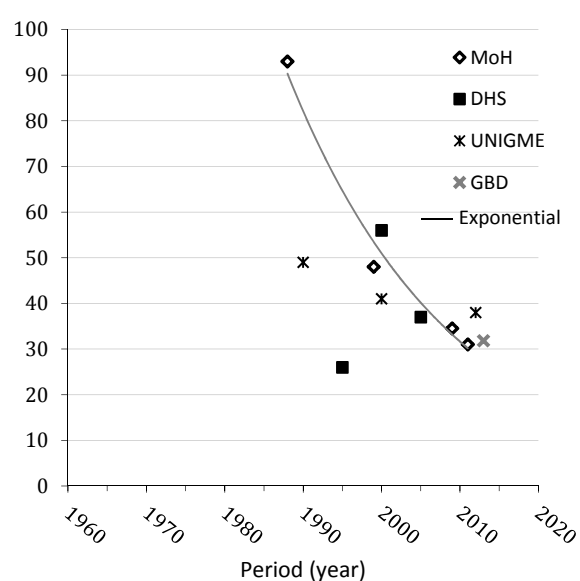
Infant and under-five mortality have declined, but further reductions are required to bring the infant mortality rate below 20 and the under-five mortality rate below 30 deaths per 1000 live births. LE appears to be increasing, but life tables for the most recent estimates have been imputed from mortality for children aged <2 from data produced through indirect demographic methods (CEBCS), and may therefore underestimate adult premature mortality. Gains in LE may be starting to level off, especially in females, and should be further investigated.

Marshall Islands, Republic of the

Infant Mortality



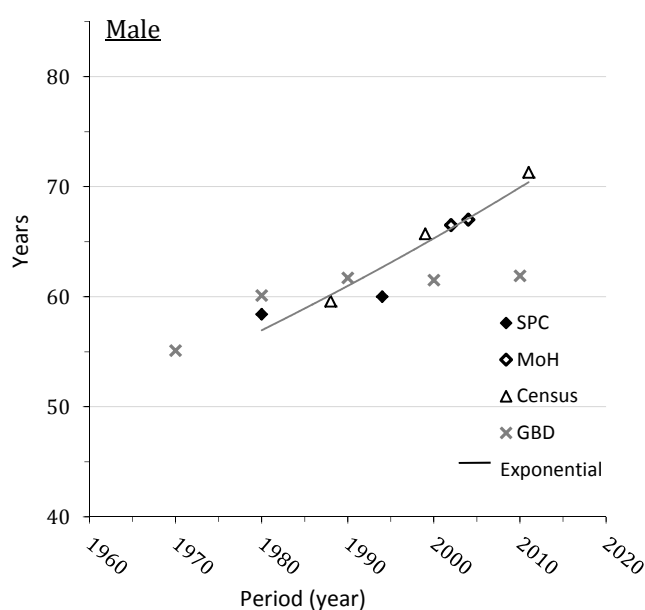
Under-Five Mortality



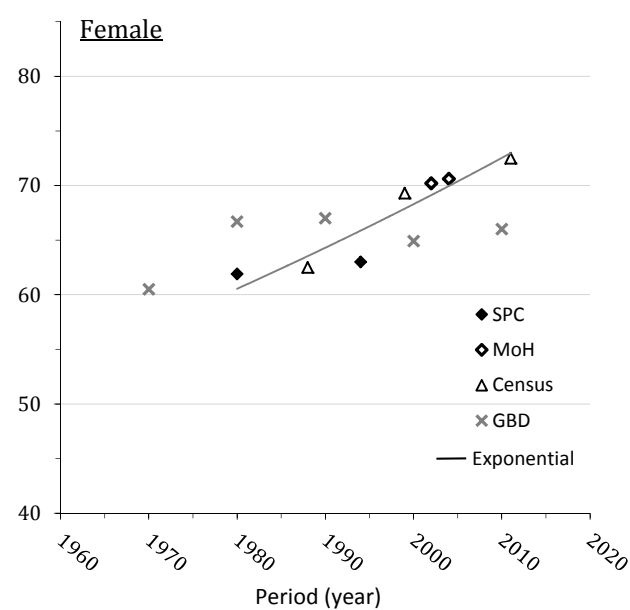
The DHS estimates of IMR and U5MR for 1993-97 are not included in calculation of the trendline because they are inconsistent and are presented on the graph for illustrative purposes only.

Life Expectancy; Marshall Islands, Republic of the

Male



Female



UNIGME and GBD estimates are not included in the trendlines as they are not a primary source of data - they are for comparison purposes only.

Key

SPC: Secretariat of the Pacific Community
UNIGME: United Nations Inter-agency Group
for Child Mortality Estimation

MoH: Ministry of Health
DHS: Demographic and Health Survey
DoS: Department of Statistics
GBD: Global Burden of Disease Study

Source	Year	Data	Analysis	Ref
Infant Mortality				
SPC	1994	Unknown	Child mortality data used to impute a model life table	1
	2007	Unknown	Unknown	2
DHS	1993-2007~	Survey	Retrospective maternal history	3
MoH	2000; 2004; 2008-09 (2009); 2010-11 (2011)	Vital registration	Direct calculation	4,5
DoS	1972; 1979; 1982; 1984	Vital registration	Direct calculation	6
Census	1986; 1999	Census	CEBCS data used to impute a model life table (Coale/Demeny West)	7,8
	2011	Census	<2 mortality CEBCS data used to impute model life tables (Coale/Demeny West)	9
UNIGME	1990; 2012	UNIGME	UNIGME methodology (see page 3)	10
GBD	2013	GBD	Modelled data (see reference) – added early neonatal mortality, late neonatal mortality, and post neonatal infant mortality.	14
Under Five Mortality				
MoH	1988; 1999; 2008-09 (2009); 2010-11 (2011)	Vital registration	Direct calculation	5, 11
DHS	1993-2007~	Survey	Retrospective maternal history	3
UNIGME	1990; 2000; 2012	UNIGME	UNIGME methodology (see page 3)	10
GBD	2013	GBD	Modelled data (see reference)	14
Life Expectancy				
SPC	1979-81 (1980)	Vital registration	Unknown (data adjusted for underreporting)	12
	1994	Unknown	Child mortality data used to impute model life tables	1
MoH	2002; 2004	Unknown	Unknown	13
Census	1988; 1999	Census	CEBCS and adult survivorship data from paternal orphanhood method used to impute model life tables (Coale/Demeny West)	7,8
	2011	Census	Mortality in children aged <2 years from CEBCS data used to impute model life tables (Coale/Demeny West)	9
GBD	1970; 1980; 1990; 2000; 2010	GBD	Modelled data (see reference)	15

~ Data points represent average of five-year period around the estimate

References

1. South Pacific Commission. South Pacific Commission 1998. Pacific Island Populations - Revised edition. Report prepared by the South Pacific Commission for the International Conference on Population and Development 1994: Cairo, Egypt. SPC, Noumea. Estimate cited in; Taylor R, Lopez A. *Differential mortality among Pacific Island countries and territories*. Asia-Pacific Population Journal. 2007;22(3):45-58.
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4. Ministry of Health. Annual Report 2004 [Internet]. No date [cited 2012 Oct 5]. Available from: <http://www.rmiembassyus.org/Health/RMI%20MOH%20Annual%20Report%20FY%202004.pdf>
5. Ministry of Health, Republic of the Marshall Islands. Annual Report FY 2011 [Internet]. No date [cited 2014 Jan 10]. Available from: http://www.spc.int/nmdi/nmdi_documents/RMIFY2011AnnualHealthDataReportFinal.pdf
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10. The United Nations Inter-agency Group for Child Mortality Estimation (UNIGME). Levels and trends in child mortality: Report 2013. The United Nations Children's Fund; 2013.
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14. Wang H, Liddell CA, Coates MM, Mooney M, Levitz CE, Schumacher AE, et al. *Global, regional, and national levels of neonatal, infant, and under-5 mortality during 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013*. Lancet. Published Online. May 2, 2014. [http://dx.doi.org/10.1016/S0140-6736\(14\)60497-9](http://dx.doi.org/10.1016/S0140-6736(14)60497-9).
15. Wang H, Dwyer-Lindgren L, Lofgren KT, Knoll Rajaratnam J, Marcus JR, Levin-Rector A et al. *Age-specific and sex-specific mortality in 187 countries, 1970-2010: a systematic analysis for the Global Burden of Disease Study 2010*. Lancet. 380:2071-94; 2012.

8. Micronesia, Federated States of (FSM)

Land area (Km ²)	701
2013-mid-year population estimate	103,000
Population growth rate (%)	0.3

[Source: SPC Pocket Summary 2013]

Trends in Child Mortality

Infant mortality has declined, although is still around 30 deaths per 1000 live births for the latest estimate, with a commensurate trend in plausible under-five mortality.

Trends in Life Expectancy

There is limited data available on LE, and while this has increased over the period reviewed, these gains appear to have started to level off from 2000 in the late 60s (years) in males and the early 70s (years) in females.

Data Sources and Quality

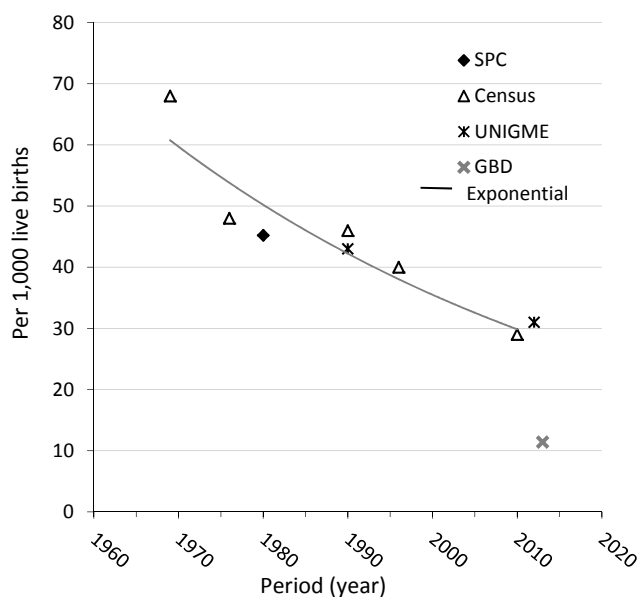
1. Direct and indirect demographic estimation techniques are predominantly used for estimation of mortality and LE.
2. The most recent Census estimates use a single input parameter (child mortality for under 2 year olds) and is therefore likely to underestimate adult mortality based on experience elsewhere in the Pacific.
3. Vital registration data may be incomplete, and is therefore not currently used for the calculation of LE.

Comments

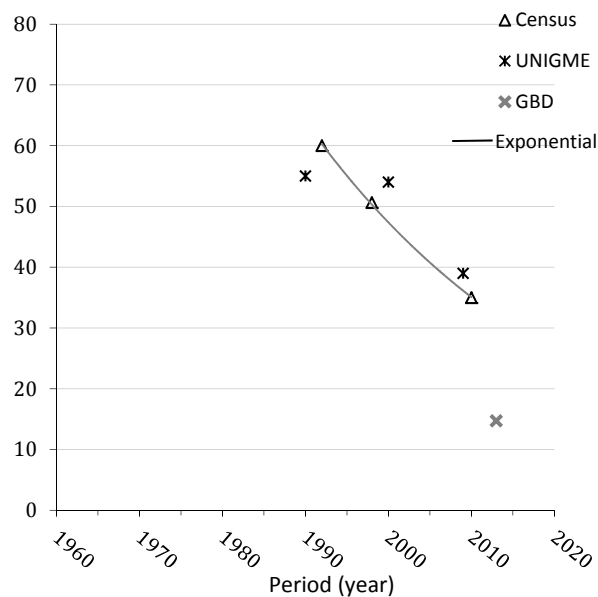
Sustained decreases in infant and under-five mortality are evident, but further reductions are required to bring the infant mortality rate below 20 and the under-five mortality rate below 30 deaths per 1000 live births. LE in both sexes has flattened since 2000 at levels from which further improvement should be expected. Since LE is derived from life tables imputed from a single input parameter using indirect demographic methods (CEBCS) they may underestimate premature adult mortality. Flattening of LE in the context of declining under-five mortality implies increasing premature adult mortality, which may be associated with non-communicable disease.

Micronesia, Federated States of

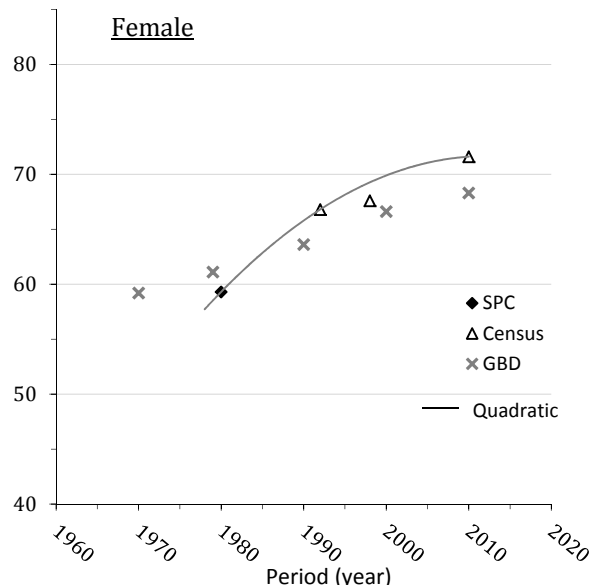
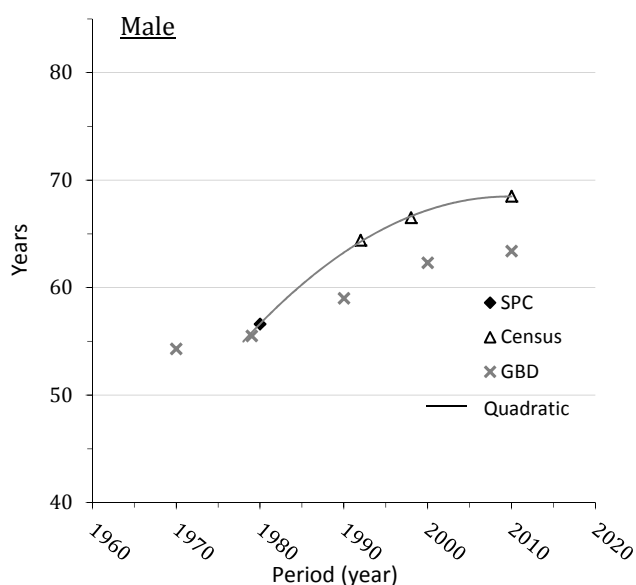
Infant Mortality



Under-Five Mortality



Life Expectancy; Micronesia, Federated States of



UNIGME and GBD estimates are not included in the trendlines as they are not a primary source of data - they are for comparison purposes only.

Key

SPC: Secretariat of the Pacific Community
GBD: Global Burden of Disease Study

UNIGME: United Nations Inter-agency Group
for Child Mortality Estimation

Source	Year	Data	Analysis	Ref
Infant Mortality				
SPC	1979-81 (1980)	Vital registration (adjusted)	Unknown	1
Census	1969; 1976; 1990; 1996; 2010	Census	CEBCS data used to impute a model life table (Coale/Demeny West)	2,3
UNIGME	1990; 2012	UNIGME	Projection (see UNIGME methodology page 3)	4
GBD	2013	GBD	Modelled data (see reference) – added early neonatal mortality, late neonatal mortality, and post neonatal infant mortality.	6
Under Five Mortality				
Census	1991-92 (1992); 1997-98 (1998); 2010	Census	CEBCS data used to impute a model life table (Coale/Demeny West)	2,3,5
UNIGME	1990; 2000; 2012	UNIGME	Projection (see UNIGME methodology page 3)	4
GBD	2013	GBD	Modelled data (see reference)	6
Life Expectancy				
SPC	1979-81 (1980)	Death recording Health Department (adjusted)	Unknown	1
Census	1969; 1976; 1991-92 (1992); 1997-98 (1998); 2010	Census	CEBCS data used to impute model life tables (Coale/Demeny West)	2,3,5
GBD	1970; 1980; 1990; 2000; 2010	GBD	Modelled data (see reference)	7

References

1. Pretrick E. *Country statement for the Federated States of Micronesia*. Working paper 17. Tenth Regional Conference of Permanent Heads of Health Services. Noumea; South Pacific Commission: 1983. And; Health Planning and Development Agency, Trust Territory of the Pacific Islands. Five Year Comprehensive Health Plan. Siapan, TTP1, 1980. And; Department of State, USA. Annual Report to the United Nations on the administration of the Pacific Islands 34, 1981; 35,1982; 36, 1983. Estimate cited in; Taylor R, Lewis N, Levy S. *Societies in transition: mortality patterns in Pacific Island populations*. International Journal of Epidemiology. 1989;18(3):634-646.
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7. Wang H, Dwyer-Lindgren L, Lofgren KT, Knoll Rajaratnam J, Marcus JR, Levin-Rector A et al. *Age-specific and sex-specific mortality in 187 countries, 1970-2010: a systematic analysis for the Global Burden of Disease Study 2010*. Lancet. 380:2071-94; 2012.

9. Nauru

Land area (Km ²)	21
2013-mid-year population estimate	10,500
Population growth rate (%)	1.8

[Source: SPC Pocket Summary 2013]

Trends in Child Mortality

Infant and under-five mortality are relatively high with no clear trend. Some under-five mortality values are lower than infant mortality, and are thus implausible.

Trends in Life Expectancy

LE is low at around the mid-50s (years) for males and around 60 (years) for females in 2010, without any clear evidence of improvement over recent decades.

Data Sources and Quality

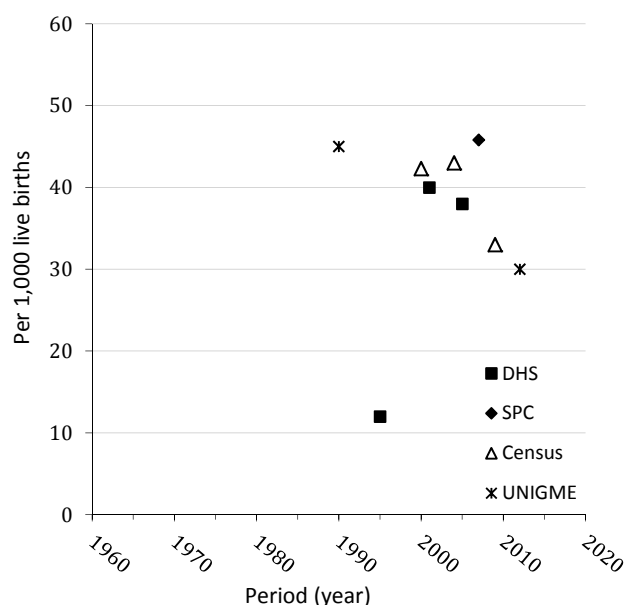
1. Mortality rates and estimates of LE are likely to be affected by small numbers, producing stochastic variation over time.
2. Mortality data and populations are for Nauruans only.

Comments

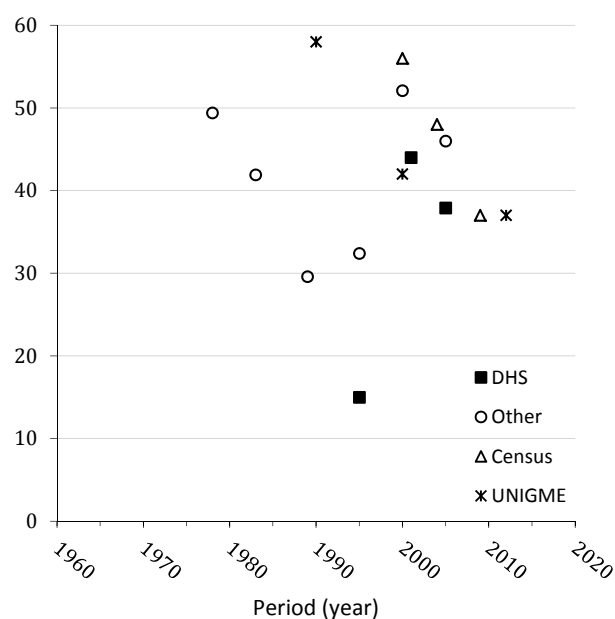
There are no clear trends in infant or under-five mortality which remain at high levels requiring further improvement. Very low life expectancies are demonstrated in males (mid 50s) and females (around 60 yrs). The latest female life expectancy estimate is higher than the trend line, and suggests that while LE is stable rather than declining. Further investigation of cause of death by age and sex is required to better understand the reasons for such high premature mortality.

Nauru

Infant Mortality



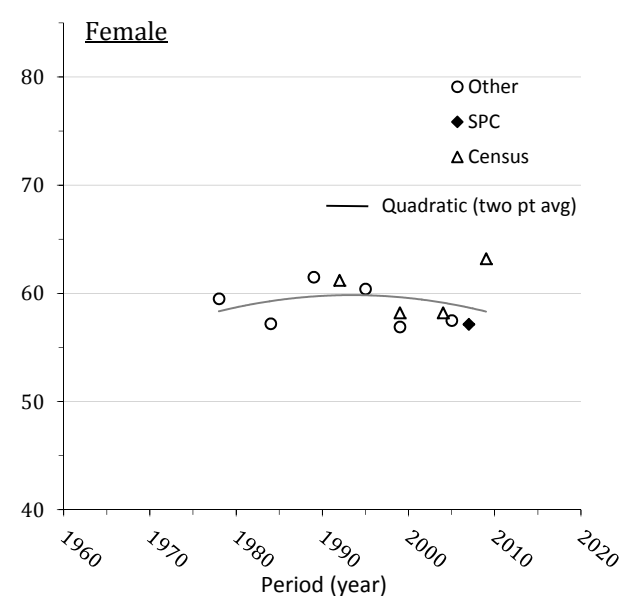
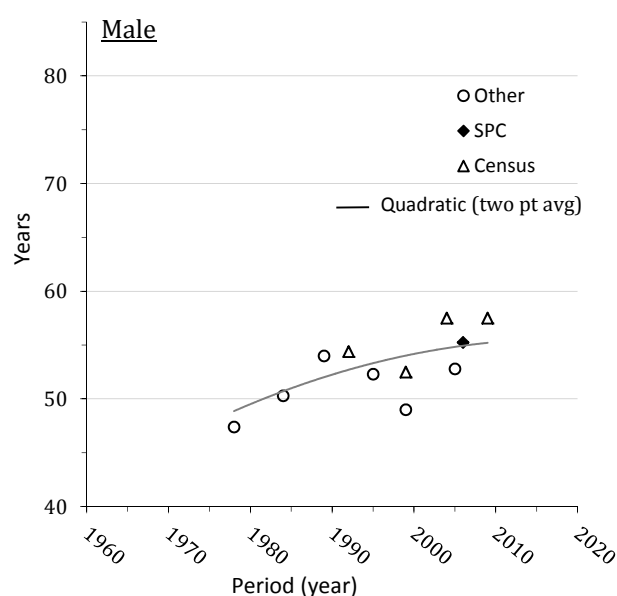
Under-Five Mortality



UNIGME estimates are not included in the trendline as they are not a primary source of data - they are for comparison purposes only.

The DHS estimates of IMR and U5MR for 1993-97 are not included in calculation of the trendline because they are inconsistent and are presented on the graph for illustrative purposes only.

Life Expectancy; Nauru



Key

SPC: Secretariat of the Pacific Community
DHS: Demographic and Health Survey
Other: other source noted in reference list

UNIGME: United Nations Inter-agency Group
for Child Mortality Estimation

Source	Year	Data	Analysis	Ref
Infant Mortality				
DHS	1998-2003 (2000); 2003-07 (2005)	Survey	Retrospective maternal history	1
SPC	2006-07 (2007)	Unknown	Unknown	2
Census	1997-2002 (2000)	Vital registration	Direct calculation	3
	2002-06 (2004); 2007-11 (2009)	Vital registration	Direct calculation adjusted for underreporting	4
UNIGME	1990; 2012	UNIGME	Projection (see UNIGME methodology page 3)	5
Under Five Mortality				
DHS	1998-2003 (2000); 2003-07 (2005)	Survey	Retrospective maternal history	1
Other	1976-81 (1978); 1982-85 (1983); 1986-92 (1989); 1992-97 (1995); 1997-2002 (2000);	Vital registration	Direct calculation	6
	2002-07 (2005)	Vital registration	Deaths under-five years divided by population	6
Census	1997-2002 (2000)	Vital registration	Life tables (using deaths and population)	3
	2002-06 (2004); 2007-11 (2009)	Vital registration	Direct calculation adjusted for underreporting	4
UNIGME	1990; 2000; 2012	UNIGME	Projection (see UNIGME methodology page 3)	5
Life Expectancy				
Other	1976-81 (1978); 1982-85 (1984); 1986-92 (1989); 1992-97 (1995); 1997-2002 (1999); 2002-07 (2005)	Vital registration	Life tables from age specific deaths and populations	6
SPC	2006	Unknown	Unknown	2
Census	1991-93 (1992)	Vital registration	Model life tables (UN Far Eastern)	7
	1997-2002 (2000)	Vital registration	Life tables - using deaths and population (direct calculation +/- model life tables)	3
	2002-06 (2004); 2007-11 (2009)	Vital registration	Life tables - adjusted for underreporting (direct calculation +/- model life tables)	4

References

1. Nauru Bureau of Statistics, the Secretariat of the Pacific Community, and Macro International Inc. Republic of Nauru Demographic and Health Survey 2007. Noumea: SPC; 2009 Apr.
2. Secretariat of the Pacific Community. Table 7: Recent developments in fertility and mortality [Internet]. 2010 [cited 2012 Feb 5]. Available from: http://www.spc.int/sdp/index.php?option=com_docman&task=cat_view&gid=28&dir
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4. UNFPA, Secretariat of the Pacific Community, Australian Government. Republic of Nauru National Report on Population and Housing Census 2011 [Internet]. No date [cited 2014 Jan 15]. Available from: http://www.spc.int/nmdi/nmdi_documents/2011_NAURU_CENSUS_REPORT.pdf
5. The United Nations Inter-agency Group for Child Mortality Estimation (UNIGME). Levels and trends in child mortality: Report 2013. The United Nations Children's Fund; 2013.
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10. New Caledonia

Land area (Km ²)	18,576
2013-mid-year population estimate	259,000
Population growth rate (%)	1.9

[Source: SPC Pocket Summary 2013]

Trends in Child Mortality

Trends in infant mortality have declined significantly to around 5 deaths per 1000 live births from 2000.

Trends in Life Expectancy

There have been sustained increases in LE to the mid-70s (years) in males and to 80 (years) in females by 2010.

Data Sources and Quality

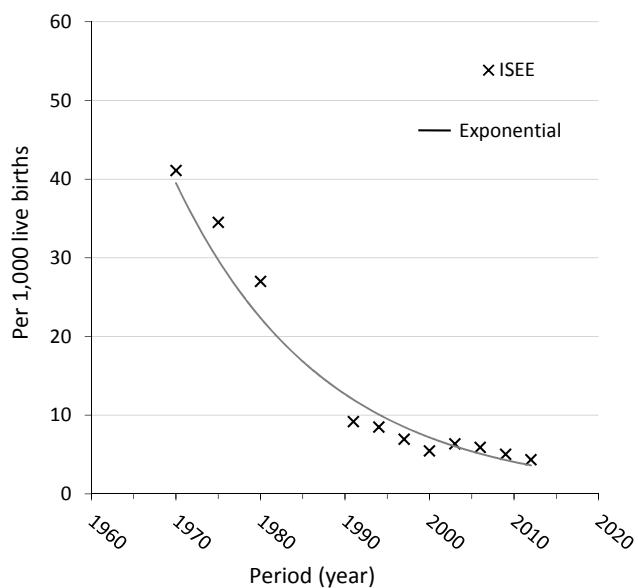
The civil vital registration system in New Caledonia is considered to be complete.

Comments

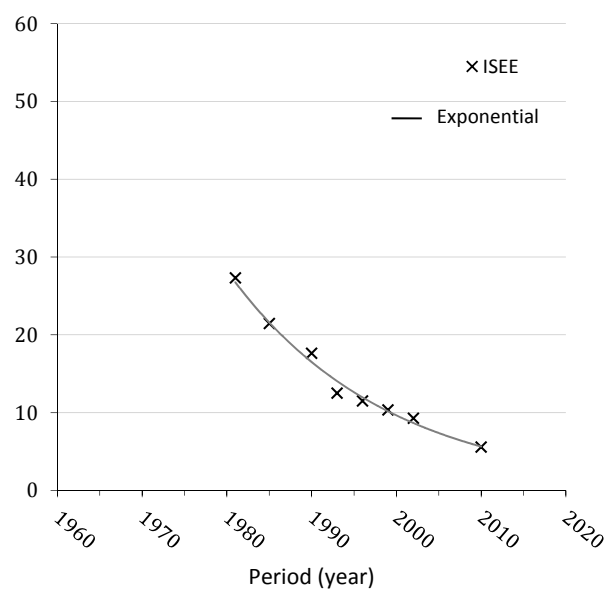
Commendable reductions in infant and under-five mortality to developed country levels are evident. LE has increased to over 80 years in females and to the mid-70s in males.

New Caledonia

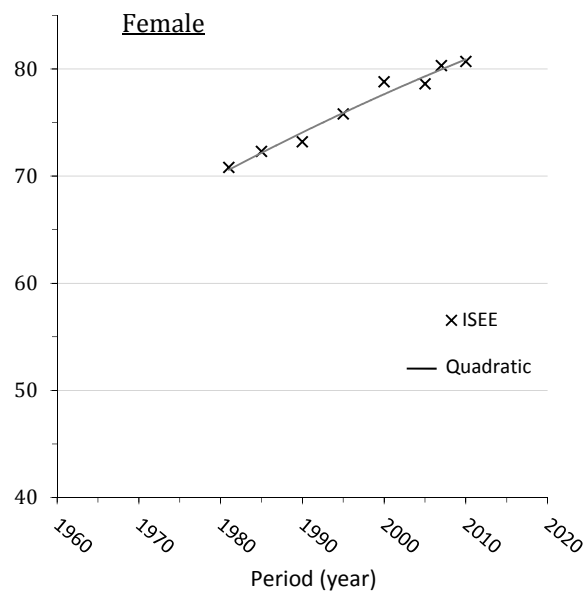
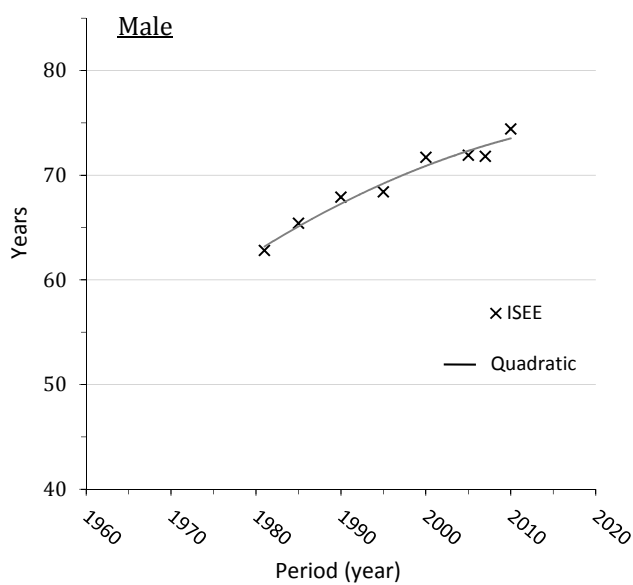
Infant Mortality



Under-Five Mortality



Life Expectancy; New Caledonia



Key

ISEE: Institut de la Statistique et des Etudes
Economiques

Source	Year	Data	Analysis	Ref
Infant Mortality				
ISEE	1970; 1975; 1980; 1990-2012*	Vital registration	Direct calculation	1,2
Under Five Mortality				
ISEE	1981; 1985; 1990; 1992-2003*; 2010	Vital registration	Direct calculation	3
Life Expectancy				
ISEE	1981; 1985; 1990; 1995; 2000; 2005; 2007; 2010	Vital registration	Life tables	4,5

* Data points represent average of three-year period around the estimate

References

1. Institut de la Statistique et des Etudes Economiques. Statistiques de l'état civil [Internet]. 2007 [cited 2011 Feb 4]. Available from: <http://www.isee.nc/tec/popsociete/telechargements/fab-5-6.pdf>
2. Institut de la Statistique et des Etudes Economiques (ISEE). Obtained directly from ISEE by the Secretariat of the Pacific Community.
3. Institut de la Statistique et des Etudes Economiques. *D13 – Mortality rates by sex and age group*. Statistiques de l'état civil [Internet]. No date [cited 2014 Jan 29]. Available from: <http://www.isee.nc/etacivil/etcivildefi.html>
4. Institut de la Statistique et des Etudes Economiques. *D14 – Life expectancy by sex and age*. Statistiques de l'état civil [Internet]. No date [cited 2014 Jan 29]. Available from : <http://www.isee.nc/etacivil/etcivildefi.html>
5. Institut de la Statistique et des Etudes Economiques. Key Figures - Demography [Internet]. 2012 [updated 2012 Jul 6; cited 2012 Oct 17]. Available from <http://www.isee.nc/chiffresc/chiffresc.html#population>

11. Niue

Land area (Km ²)	259
2013-mid-year population estimate	1,500
Population growth rate (%)	-0.2

[Source: SPC Pocket Summary 2013]

Trends in Child Mortality

Infant and under-five mortality rates are relatively low for the most recent estimates, although clear trends are difficult to discern due to stochastic variation from small numbers.

Trends in Life Expectancy

Steady increases in life expectancy are shown to around 70 (years) for males and mid-70s (years) for females by 2010.

Data Sources and Quality

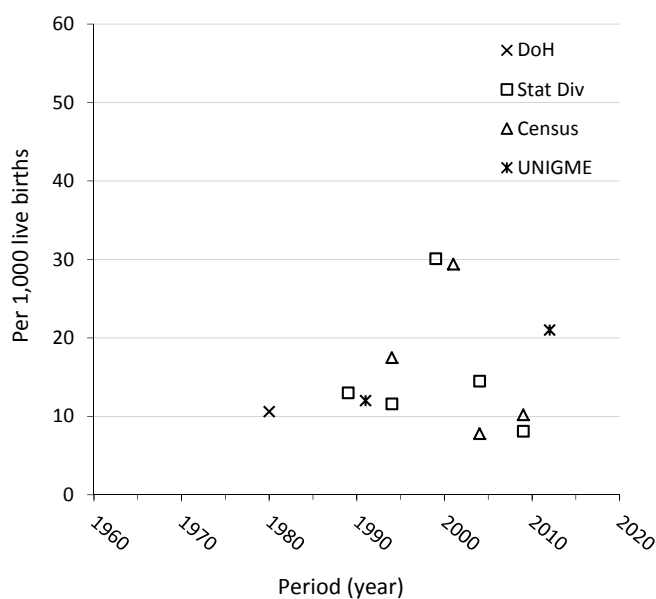
1. Mortality rates and estimates of LE are likely to be affected by small numbers, producing stochastic variation over time.
2. Infant mortality rates from the Niue Statistics Division are based on vital registration system, which is considered fairly complete. However, some mothers travel to New Zealand to give birth, and as this changes over time according to the medical staff on island, this is likely to account for some of the higher estimates of infant and child mortality (because of the impact of births missing from denominators).
3. Some of the differences in reported infant mortality rates between Census reports and the Statistics Division are due to different denominators; the Statistics Division estimates use births to resident mothers, whereas Census reports use all registered births.

Comments

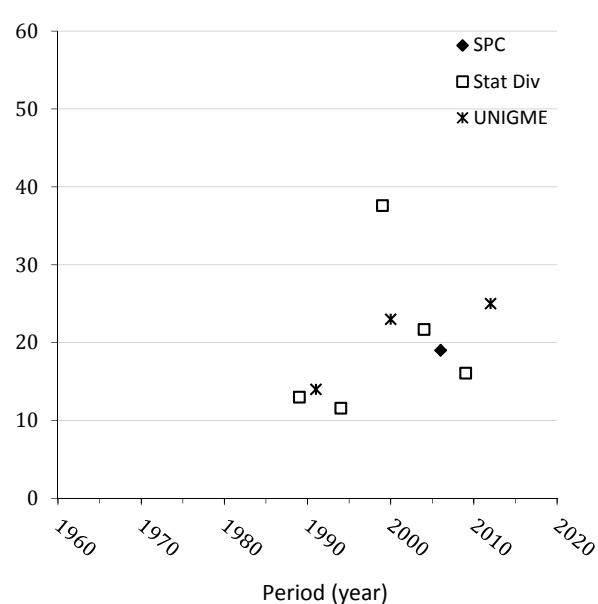
Recent trends in infant and under-five mortality appear satisfactory, however, trends are difficult to discern because of stochastic variation due to small numbers. LE has increased for males and females, although remains at levels at which further improvement should be expected. Numbers of deaths are low in Niue because of the very small population, and mortality and life expectancy should be aggregated for at least 5-year intervals and presented with statistical confidence intervals (95%).

Niue

Infant Mortality



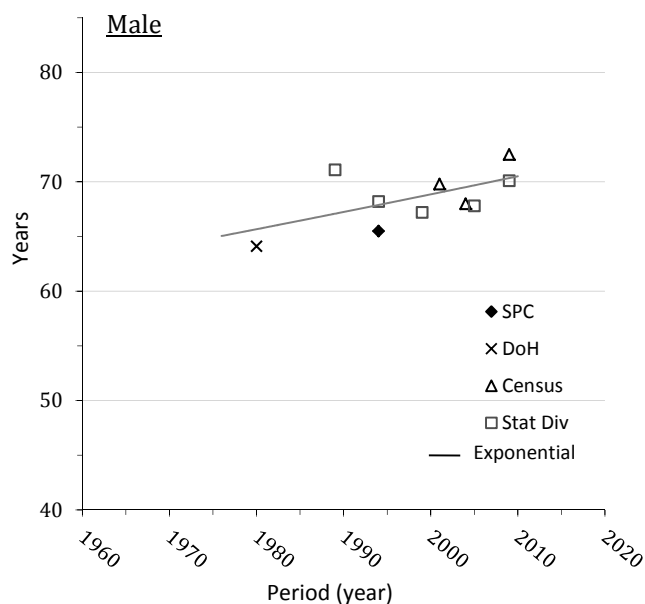
Under-Five Mortality



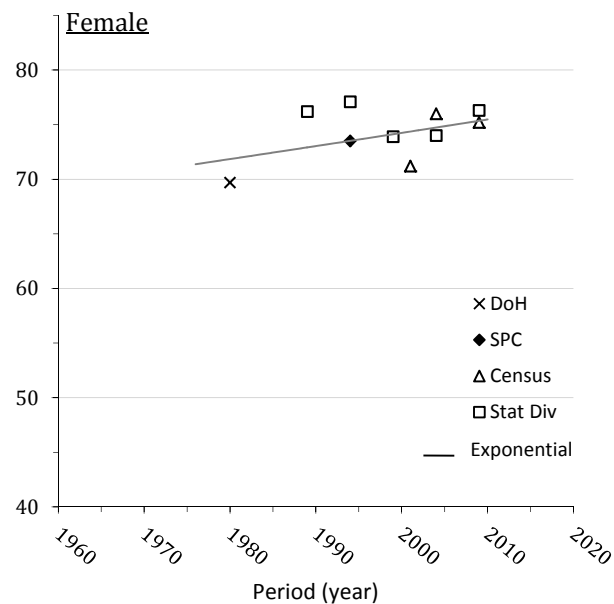
UNIGME estimates are not included in the trendline as they are not a primary source of data - they are for comparison purposes only.

Life Expectancy; Niue

Male



Female



Key

SPC: Secretariat of the Pacific Community
DoH: Department of Health
Stat Div: Niue Statistics Division

UNIGME: United Nations Inter-agency Group
for Child Mortality Estimation

Source	Year	Data	Analysis	Ref
Infant Mortality				
DoH	1978-82(1980)	Vital registration	Direct calculation	1
Census	1991-97(1994)	Vital registration	Direct calculation	2
	2001	Vital registration	Direct calculation	3
	2001-06(2004)	Vital registration	Direct calculation	4
	2006-11(2009)	Vital registration	Direct calculation	5
Stat Div	1987-2011~	Vital registration	Direct calculation	6
UNIGME	1990; 2012	UNIGME	Projection (see UNIGME methodology page 3)	7
Under Five Mortality				
SPC	2006	Unknown	Unknown	8
Stat Div	1987-2011~	Vital registration	Direct calculation	6
UNIGME	1990; 2000; 2012	UNIGME	Projection (see UNIGME methodology page 3)	7
Life Expectancy				
DoH	1978-82(1980)	Vital registration	Sex-specific LE estimated from both sexes LE derived from direct calculation	1
SPC	1991-97(1994)	Survey	Sex-specific LE estimated from both sexes LE from the 1997 Census which used CEBCS data to impute Model Life Tables (Coale/Demeny West and UN's far Eastern model)	9
Census	2001	Unknown	Model Life tables	3
	2001-06(2004)	Vital registration	Age specific death rates used to impute Model Life Tables (Coale/Demeny West) using US Census Bureau PAS software and UN Mortpak4 program	4
	2006-11(2009)	Census	CEBCS data used to impute Model Life Tables (Coale/Demeny West) using US Census Bureau PAS software and UN Mortpak 4.1 program.	5
Stat Div	1987-2011~	Vital registration	Direct calculation using deaths and populations	6

~ Data points represent average of five-year period around the estimate

References

1. Department of Health Niue. Annual reports 1971-1982. Niue. Estimate cited in; Taylor R, Nemaia H, Connell J. *Mortality in Niue, 1978-82*. *NZ Med J*. 1987 Aug 12; 100(829):447-81.
2. Secretariat of the Pacific Community. Niue population profile based on 1997 Census – a guide for planners and policy-makers. Noumea; 1999.
3. Economic, Planning, Development and Statistics Unit Premiers Department. Niue 2001 Census of Population and Housing.
4. Secretariat of the Pacific Community. Niue population profile based on 2006 Census of population and housing. A guide for planners and policy makers. Noumea; 2008.
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7. The United Nations Inter-agency Group for Child Mortality Estimation (UNIGME). Levels and trends in child mortality: Report 2013. The United Nations Children's Fund; 2013.
8. Secretariat of the Pacific Community. South-South cooperation among Pacific island countries -a regional overview. High level meeting on cooperation for child rights in the Asia-Pacific Region. Beijing, China, 4-6 November 2010 [Internet]. 2010 [cited 2012 Oct 2]. Available from: http://www.unicef.org/eapro/South-South_Cooperation_among_Pacific_island_countries_-_a_regional_overview_-_November_2011.pdf.
9. Secretariat of the Pacific Community. Table 7: Recent developments in fertility and mortality [Internet]. 2010 [cited 2012 Feb 5]. Available from: http://www.spc.int/sdp/index.php?option=com_docman&task=cat_view&gid=28&dir

12. Northern Mariana Islands, Commonwealth of the (CNMI)

Land area (Km ²)	457
2013-mid-year population estimate	55,600
Population growth rate (%)	-2.5

[Source: SPC Pocket Summary 2013]

Trends in Child Mortality

Infant mortality has declined and stabilised at below 10 deaths per 1000 live births.

Trends in Life Expectancy

Pronounced flattening of LE from the mid-1990s in the mid-70s (years) for males and late-70s (years) for females is evident.

Data Sources and Quality

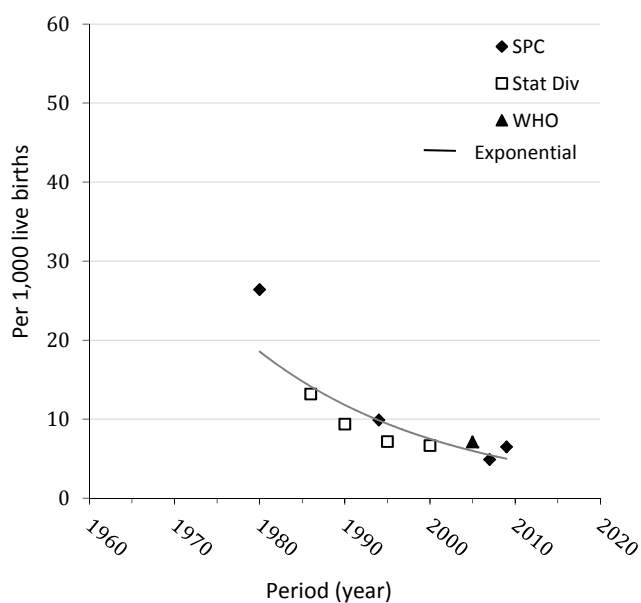
1. Mortality and LE are based on vital registration; however, methods of calculation are not given in any detail. As registration is expected to be complete, it is likely these were derived from direct calculation.
2. There is only limited published data on under-five mortality in CNMI available, although with complete registration, routine publication of this indicator should be encouraged.

Comments

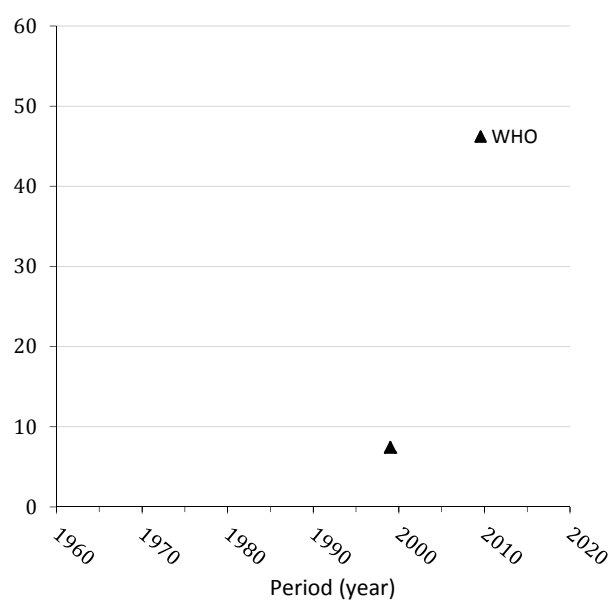
Infant mortality has declined, and infant and under-five mortality are now at levels comparable to developed countries. LE trends display distinct plateaux since the mid-1990s in the mid-70s for men and late 70s for women. In the context of the low under-five mortality these trends would be due to increasing premature adult mortality, most likely contributed to by non-communicable disease.

Northern Mariana Islands, Commonwealth of the

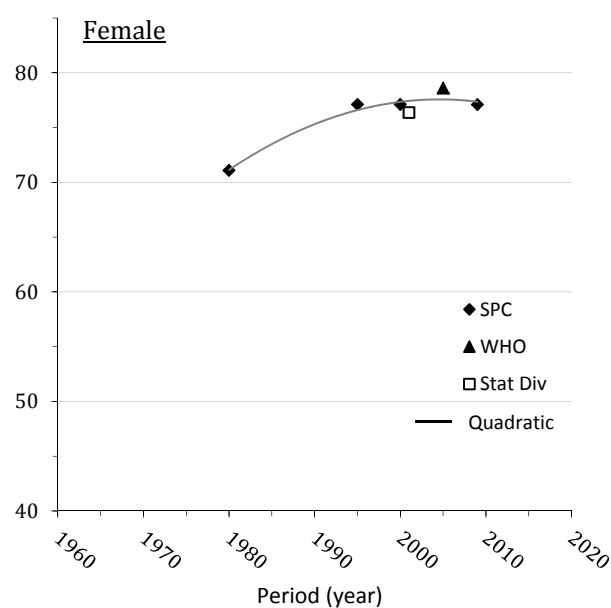
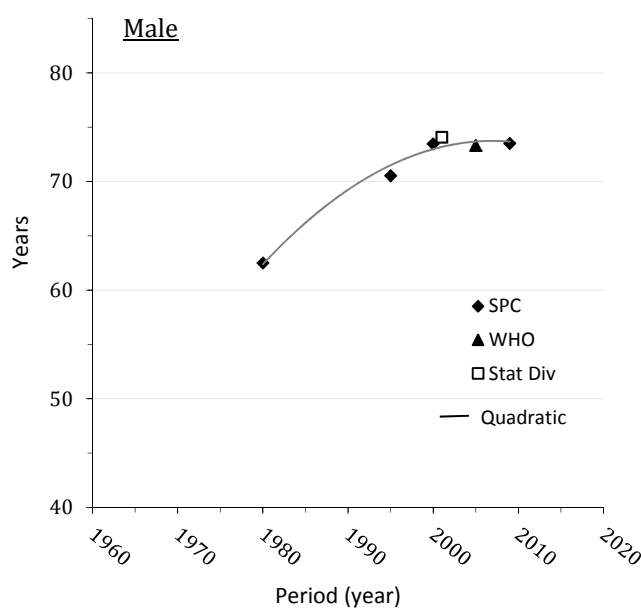
Infant Mortality



Under-Five Mortality



Life Expectancy; Northern Mariana Islands, Commonwealth of the



Key

SPC: Secretariat of the Pacific Community

WHO: World Health Organisation

Stat Div: Statistics Division Commonwealth of the Northern Mariana Islands

Source	Year	Data	Analysis	Ref
Infant Mortality				
SPC	1979-81(1980)	Vital registration	Direct calculation	1
	1992-96(1994)	Vital registration	Direct calculation	2
	2006-08(2007)	Unknown	Unknown	3
	2009	Unknown	Unknown	4
Stat Div	1984-87(1986); 1988-2002~	Vital registration	Direct calculation	5
WHO	2005	Unknown	Unknown (cited as US Census Bureau – not located)	6
Under Five Mortality				
WHO	1999	Vital registration	Unknown	7
Life Expectancy				
SPC	1979-81(1980)	Vital registration	Unknown	1
	1994-96(1995); 1999-2001(2000)	Vital registration	Unknown	3
	2009	Unknown	Unknown	4
Stat Div	2000-01(2001)	Unknown	Unknown	8
WHO	2005	Unknown	Unknown (cited as US Census Bureau – not located)	6

~ Data points represent average of five year period around the estimate

References

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2. Statistics Division of the Commonwealth of the Northern Mariana Islands and Population/Demography Programme Secretariat of the Pacific Community. CNMI Population Profile based on the 1995 Census of population and housing. A guide for policy-makers. Noumea: SPC; 1998.
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13. Palau

Land area (Km ²)	444
2013-mid-year population estimate	17,800
Population growth rate (%)	-1.9

[Source: SPC Pocket Summary 2013]

Trends in Child Mortality

Infant mortality has declined to below 20 deaths per 1000 live births since 2005. Limited data and stochastic variation make it difficult to identify any clear trends in under-five mortality.

Trends in Life Expectancy

LE increased to the mid-60s (years) in males and early 70s (years) in females, before flattening around 2000 in both sexes. The decline in the exponential trend shown is mainly influenced by the last data point by the WHO; which should be interpreted with caution as the primary source could not be located.

Data Sources and Quality

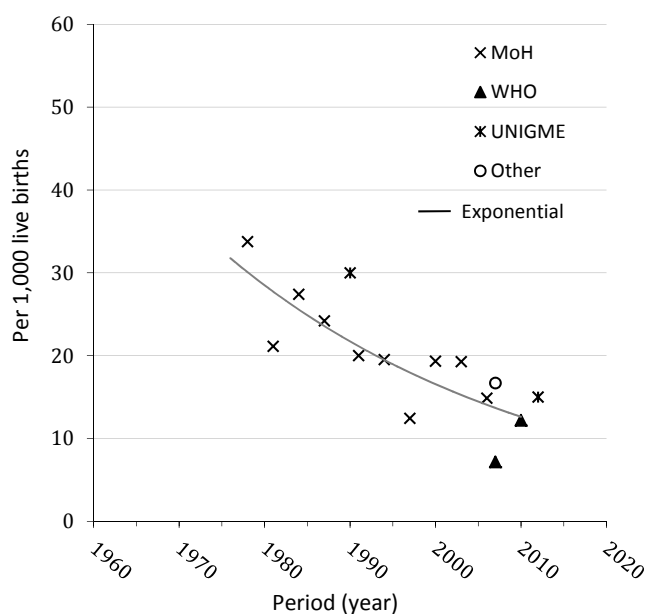
1. There are divergent estimates of infant mortality and under-five mortality for Palau.
2. Vital registration was used for calculations of infant and under-five mortality; no estimates were derived from censuses or surveys.
3. LE, as reported by the census and “other” sources (excluding WHO) has been generated from age specific mortality rates and model life tables and is therefore likely to be reliable; indirect demographic techniques were not used.
4. Mortality rates and estimates of LE are likely to be affected by small numbers, producing stochastic variation over time.

Comments

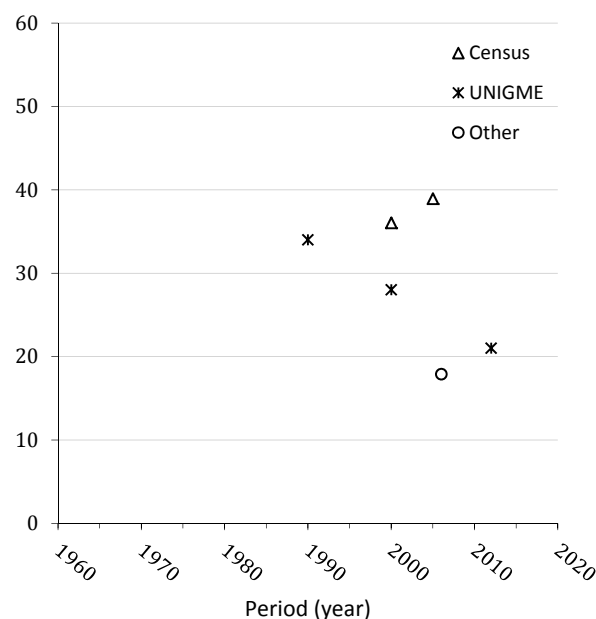
Sustained declines in infant mortality are noted, although estimates of under-five mortality are divergent and should be further investigated. While LE has reached moderate levels in Palau, there has been a distinct flattening of LE since 2000, at levels from which further improvements should be expected. This flattening, in view of the trends in infant mortality, indicates high premature adult mortality, most likely due to non-communicable diseases. Further investigation of deaths by age and cause should be encouraged.

Palau

Infant Mortality

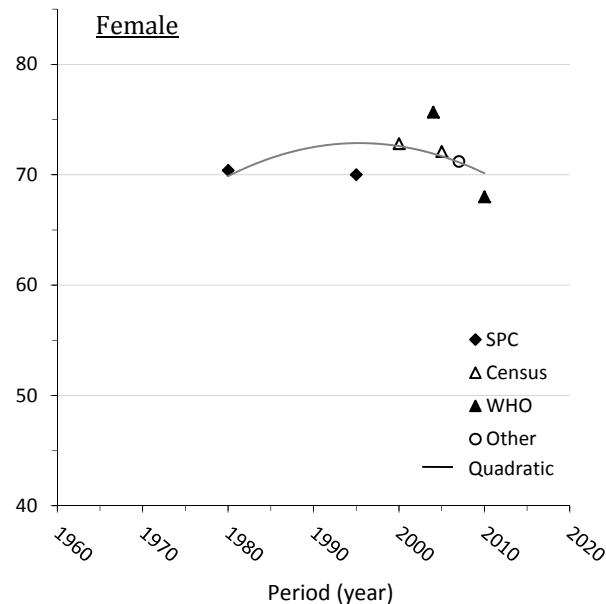
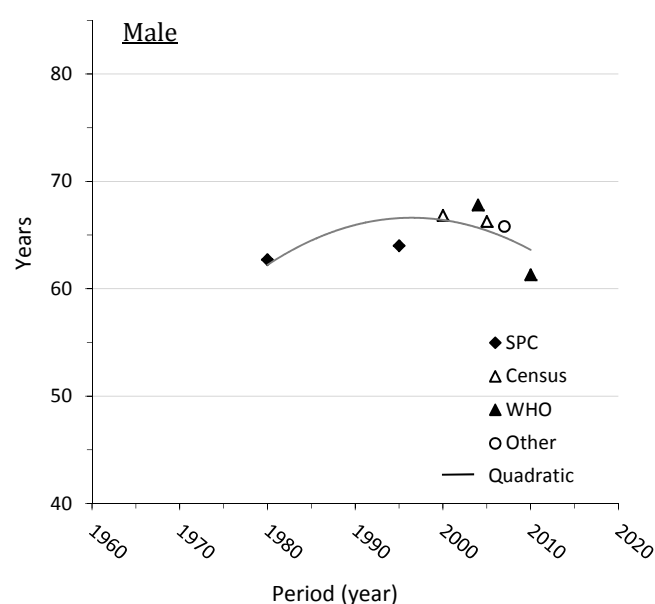


Under-Five Mortality



UNIGME estimates are not included in the trendline as they are not a primary source of data - they are for comparison purposes only.

Life Expectancy; Palau



Key

SPC: Secretariat of the Pacific Community
 WHO: World Health Organisation
 MoH: Ministry of Health

Other: other source noted in reference list
 UNIGME: United Nations Inter-agency Group
 for Child Mortality Estimation

Source	Year	Data	Analysis	Ref
Infant Mortality				
MoH	1977-1988*	Vital registration	Direct calculation	1
	1990-2004*; 2005-06(2006)	Vital registration	Direct calculation	2
WHO	2007	Unknown	Unknown	3
	2010	Unknown	Unknown	4
Other	2004-09(2006)	Vital registration	Direct calculation using population mortality rate (population <1 year) and converted to a probability using life table methods.	5
UNIGME	1990; 2012	UNIGME	Projection (see UNIGME methodology page 3)	6
Under Five Mortality				
Census	2000; 2005	Vital registration	Age specific death rates used to impute a model life table (Coale/Demeny West)	7,8
Other	2004-09(2006)	Vital registration	Direct calculation using population mortality rate (population <5 year) and converted to a probability using life table methods.	5
UNIGME	1990; 2000; 2012	UNIGME	Projection (see UNIGME methodology page 3)	6
Life Expectancy				
SPC	1979-81(1980)	Vital registration	Life table	9
	1995	Unknown	Unknown	10
Census	2000; 2005	Vital registration	Age specific death rates used to impute a model life table (Coale/Demeny West)	7,8
WHO	2004	Unknown	Unknown	11
	2010	Unknown	Unknown	12
Other	2004-09(2006)	Vital registration	Smoothed empirical data used to impute model life tables (Coale/Demeny West)	5

* Data points represent average of three-year period around the estimate

References

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14. Papua New Guinea (PNG)

Land area (Km ²)	462,840
2013-mid-year population estimate	7,398,500
Population growth rate (%)	2.3

[Source: SPC Pocket Summary 2013]

Trends in Child Mortality

Infant and under-five mortality have declined significantly, with estimates of infant mortality now around 60 deaths per 1000 live births and under-five mortality around 70 deaths per 1000 live births. Nevertheless, these levels are the highest in the Pacific Islands region.

Trends in Life Expectancy

LE appears to plateau at the mid-50s (years) for both males and females, although there are no recent data after 2000 to confirm this trend.

Data Sources and Quality

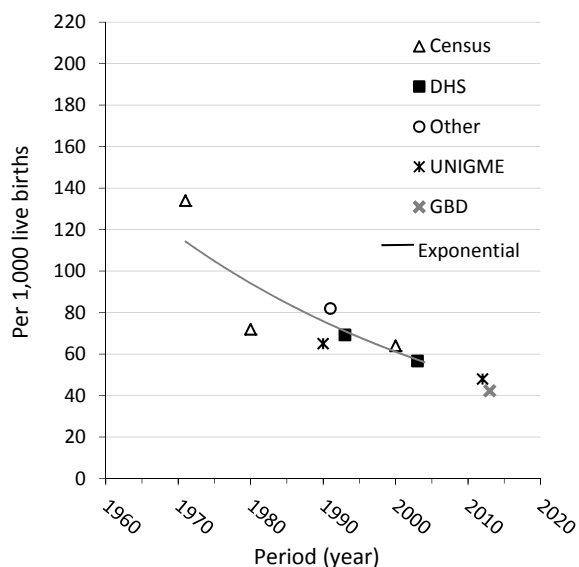
Mortality and LE in PNG are based on indirect demographic methods and there is no accurate national vital registration data.

Comments

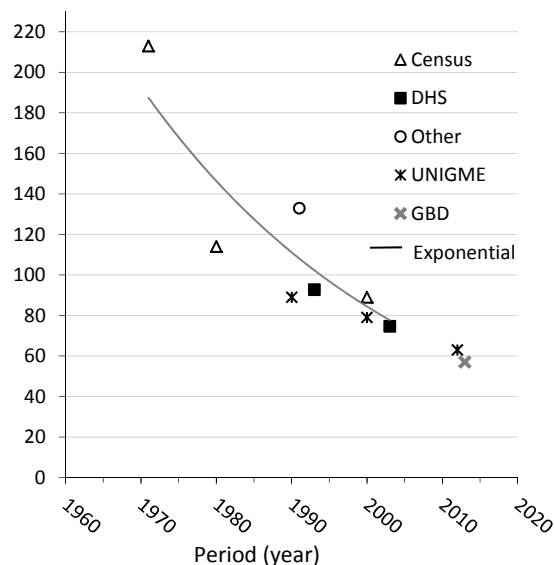
There have been considerable declines in infant and under-five mortality since 1970 in PNG; however, both infant and under-five mortality remain at higher levels than any other Pacific Island country. LE appears to plateau at the mid-50s (years) for both sexes, the lowest in the Pacific region, but there are no recent data to confirm such a trend.

Papua New Guinea

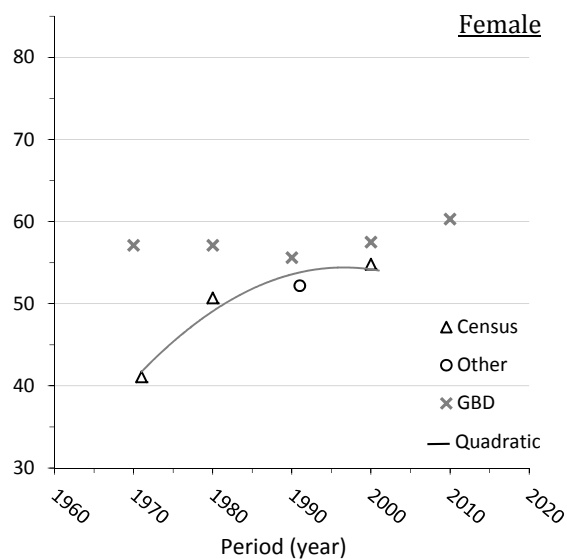
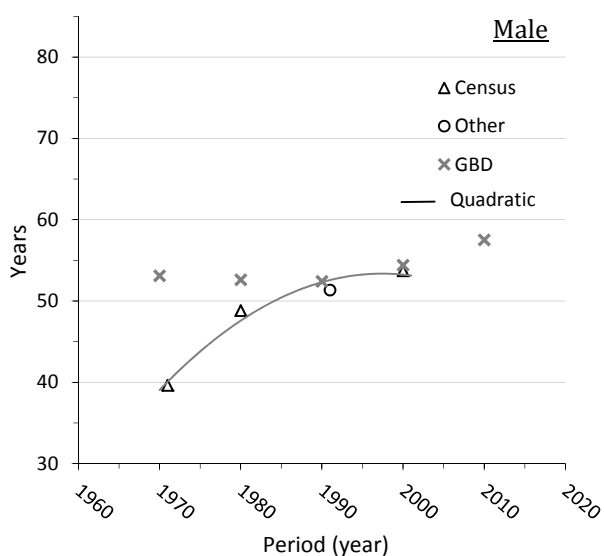
Infant Mortality



Under-Five Mortality



Life Expectancy; Papua New Guinea



UNIGME and GBD estimates are not included in the trendlines as they are not a primary source of data - they are for comparison purposes only.

Key

Other: other source noted in reference list
 DHS 1996: Demographic and Health Survey
 DHS 2006: Demographic and Health Survey

UNIGME: United Nations Inter-agency Group
 for Child Mortality Estimation
 GBD: Global Burden of Disease Study

Source	Year	Data	Analysis	Ref
Infant Mortality				
Census	1971; 1980; 2000	Census	CEBCS used to impute a model life table (Coale/Demeny West)	1-3
Other	1991	Survey	CEBCS used to impute a model life table (Coale/Demeny Far East)	4
DHS 2006	1993-2007~	Survey	Retrospective maternal history	5
DHS 1996	1982-1996~	Survey	Retrospective maternal history	6
UNIGME	1990; 2012	UNIGME	Projection (see UNIGME methodology page 3)	7
GBD	2013	GBD	Modelled data (see reference) – added early neonatal mortality, late neonatal mortality, and post neonatal infant mortality.	8
Under Five Mortality				
Census	1971; 1980; 2000	Census	CEBCS used to impute a model life table (Coale/Demeny West)	1,3
DHS 2006	1993-2007~	Survey	Retrospective maternal history	5
DHS 1996	1982-1996~	Survey	Retrospective maternal history	6
Other	1991	Survey	CEBCS used to impute a model life table (Coale/Demeny Far East)	4
UNIGME	1990; 2000; 2012	UNIGME	Projection (see UNIGME methodology page 3)	7
GBD	2013	GBD	Modelled data (see reference)	8
Life Expectancy				
Census	1980	Census	CEBCS and maternal orphanhood data used to impute a model life table	1
	1971; 2000	Census	CEBCS used to impute a model life table (Coale/Demeny West)	3,2
Other	1991	Survey	CEBCS used to impute a model life table (Coale/Demeny Far East)	4
GBD	1970; 1980; 1990; 2000; 2010	GBD	Modelled data (see reference)	9

~ Data points represent average of five-year period around the estimate

References

1. Bakker, ML. The mortality situation in Papua New Guinea: levels, differentials, patterns and trends. Port Moresby; National Statistical Office: 1986.
2. National Statistics Office Working Paper No. 3, M.L.Bakker, 1983, p.51 Table XXIV. Estimate cited in: Policy Planning and Evaluation Division, Department of Health, Ministry of Health. Handbook on Health Statistics PNG 1987. Papua New Guinea. Port Moresby; Ministry of Health: 1989.
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7. The United Nations Inter-agency Group for Child Mortality Estimation (UNIGME). Levels and trends in child mortality: Report 2013. The United Nations Children's Fund; 2013.
8. Wang H, Liddell CA, Coates MM, Mooney M, Levitz CE, Schumacher AE, et al. *Global, regional, and national levels of neonatal, infant, and under-5 mortality during 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013*. Lancet. Published Online. May 2, 2014. [http://dx.doi.org/10.1016/S0140-6736\(14\)60497-9](http://dx.doi.org/10.1016/S0140-6736(14)60497-9).
9. Wang H, Dwyer-Lindgren L, Lofgren KT, Knoll Rajaratnam J, Marcus JR, Levin-Rector A et al. *Age-specific and sex-specific mortality in 187 countries, 1970-2010: a systematic analysis for the Global Burden of Disease Study 2010*. Lancet. 380:2071-94; 2012.

15. Samoa

Land area (Km ²)	2.934
2013-mid-year population estimate	187,400
Population growth rate (%)	0.8

[Source: SPC Pocket Summary 2013]

Trends in Child Mortality

Infant mortality has decreased to below 20 deaths per 1000 live births. Less data are available on under-five mortality, which displays no trend.

Trends in Life Expectancy

Trends in LE increased to the early 70s (years) in males and mid-70s (years) in females; however, adult premature mortality may be under-estimated and affected by the methodologies employed. There is some indication that these gains are not sustained, and should be monitored over future periods.

Data Sources and Quality

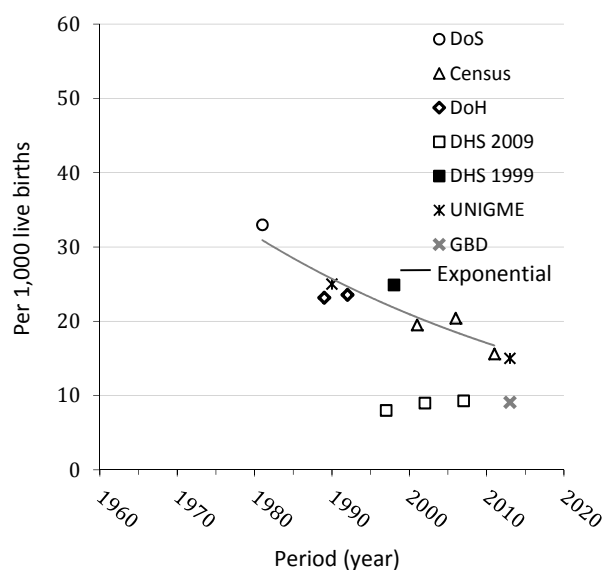
1. Estimates of infant mortality and under-five mortality from the 2009 Samoa Demographic and Health Survey (DHS) have been excluded from calculation of the trendline as they are inconsistent with other sources of mortality estimates for the country. The survey report notes that "...the number of reported births and deaths in the Samoan DHS was not sufficient to give reliable mortality estimates" [Samoa DHS 2009].
2. The estimate of infant mortality from the 1999 Samoa DHS has been included in calculation of the trendline.
3. While vital registration data have been used for some earlier estimates of infant mortality in Samoa, it is likely that registration is not fully complete.

Comments

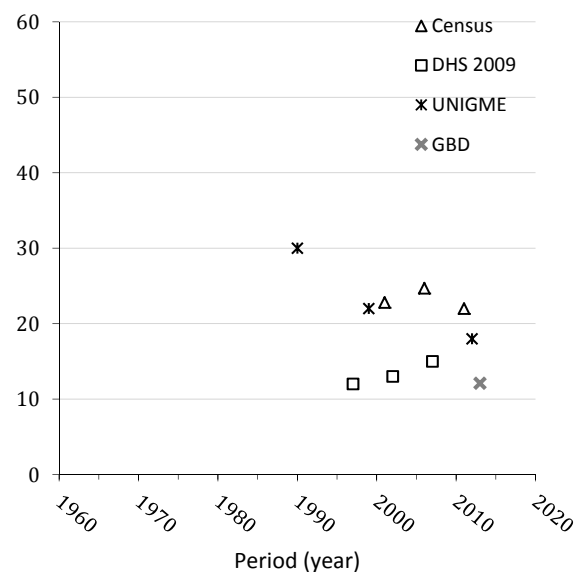
Infant mortality has shown sustained declines to below 20 deaths per 1000 live births, however there is insufficient data to show a commensurate decline in under-five mortality, although this is likely. LE has reached reasonably high levels and shows continued increases, although there is some suggestion this is starting to slow. Some care must be taken in interpretation as all data is sourced from retrospective collection and may be subject to recall and reporting biases which may tend to under-estimate mortality levels. An assessment of vital registration data is encouraged to assess under-reporting and provide an alternative data source for comparison.

Samoa

Infant Mortality

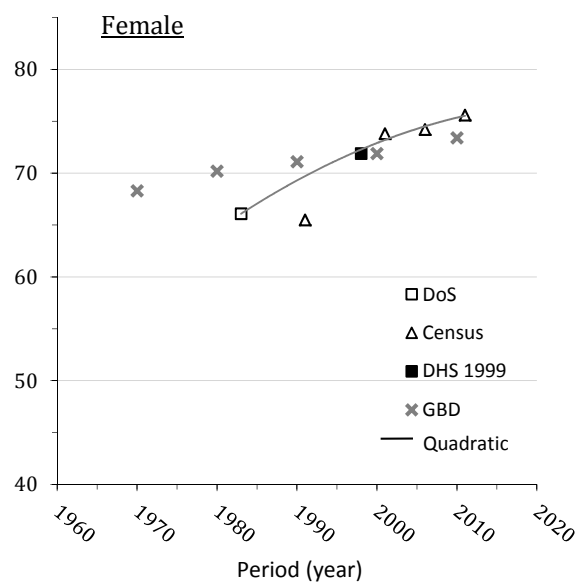
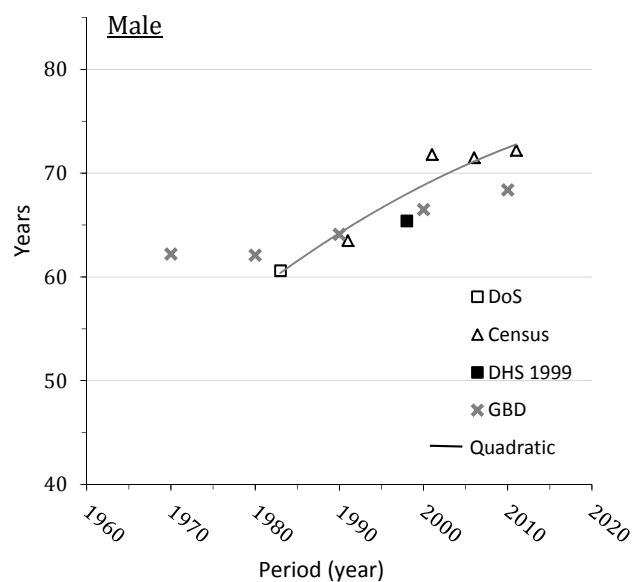


Under-Five Mortality



The DHS 2009 estimates of IMR and U5MR are not included in calculation of the trendline because they are inconsistent and are presented on the graph for illustrative purposes only.

Life Expectancy; Samoa



UNIGME and GBD estimates are not included in the trendlines as they are not a primary source of data - they are for comparison purposes only.

Key

DoS: Department of Statistics

DoH: Department of Health

DHS: Demographic and Health Survey

UNIGME: United Nations Inter-agency Group for Child Mortality Estimation

GBD: Global Burden of Disease Study

Source	Year	Data	Analysis	Ref
Infant Mortality				
Census	2001	Census	CEBCS using MORTPAK software	1
	2006	Census	Direct calculation based on retrospective reporting of births and deaths in the household	2
	2011	Census	Direct calculation based on retrospective reporting of births and deaths in the household	3
DoH	1988-90(1989); 1991-92(1992)	Vital registration	Direct calculation	4
DHS 2009	1995-2009~	Survey	Reported infant deaths divided by estimated live births	5
DHS 1999	1998	Survey	Reported infant deaths divided by estimated live births	6
DoS	1980-82(1981)	Vital statistics survey	Unknown	7
UNIGME	1990; 2012	UNIGME	Projection (see UNIGME methodology page 3)	8
GBD	2013	GBD	Modelled data (see reference) – added early neonatal mortality, late neonatal mortality, and post neonatal infant mortality.	10
Under Five Mortality				
Census	2001; 2006; 2011	Census	CEBCS using MORTPAK software	3
DHS 2009	1995-2009~	Survey	Reported infant deaths divided by estimated live births	5
UNIGME	1990; 2000; 2012	UNIGME	Projection (see UNIGME methodology page 3)	8
GBD	2013	GBD	Modelled data (see reference)	10
Life Expectancy				
DoS	1982-83(1983)	Vital statistics survey	Unknown	7
Census	1991	Unknown	Unknown	9
	2001	Census	CEBCS data used to impute a model life tables (Coale/Demeny West)	1
	2006	Vital registration	Direct calculation based on reported births and deaths used to create life tables	2
	2011	Census	Direct calculation based on retrospective questions on births and deaths used to create life tables (+/- model life table)	3
DHS	1997-98(1998)	Vital statistics sample survey	Life tables calculated from retrospective questions on births and deaths smoothed using model life tables (model not stated)	6
GBD	1970; 1980; 1990; 2000; 2010	GBD	Modelled data (see reference)	11

~ Data points represent average of five-year period around the estimate

References

1. Government of Samoa, Ministry of Finance, Statistical Services Division. Report of the Census of Population and Housing Samoa 2001. Apia, Samoa; 2001.
2. Samoa Bureau of Statistics. Samoa Population and Housing Census Report 2006. Apia, Samoa: Government of Samoa; 2008 Jul.
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9. Department of Statistics. Census of population and housing, 1991. Apia; Department of Statistics: 1992.
10. Wang H, Liddell CA, Coates MM, Mooney M, Levitz CE, Schumacher AE, et al. *Global, regional, and national levels of neonatal, infant, and under-5 mortality during 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013*. Lancet. Published Online. May 2, 2014. [http://dx.doi.org/10.1016/S0140-6736\(14\)60497-9](http://dx.doi.org/10.1016/S0140-6736(14)60497-9).
11. Wang H, Dwyer-Lindgren L, Lofgren KT, Knoll Rajaratnam J, Marcus JR, Levin-Rector A et al. *Age-specific and sex-specific mortality in 187 countries, 1970-2010: a systematic analysis for the Global Burden of Disease Study 2010*. Lancet. 380:2071-94; 2012.

16. Solomon Islands

Land area (Km ²)	28,000
2013-mid-year population estimate	610,800
Population growth rate (%)	2.8

[Source: SPC Pocket Summary 2013]

Trends in Child Mortality

Infant mortality has decreased to below 30 deaths per 1000 live births, and under-five mortality to below 40 deaths per 1000 live births.

Trends in Life Expectancy

LE is reported to have increased to the mid-60s (years) for males and over 70 (years) for females.

Data Sources and Quality

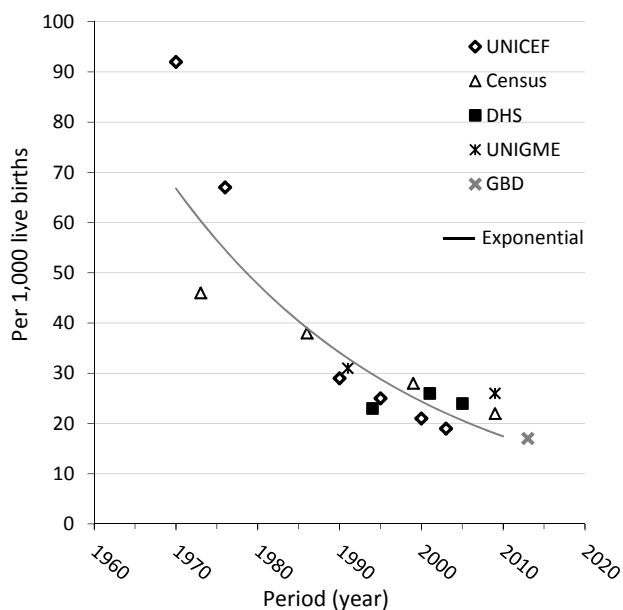
1. All mortality data from the Solomon Islands are based on direct or indirect analytic methods from Censuses or surveys – none are from vital registration data.
2. Reported mortality estimates appear implausibly low in relation to the economic development and availability of health services within the country, and in comparison with other countries in the region.

Comments

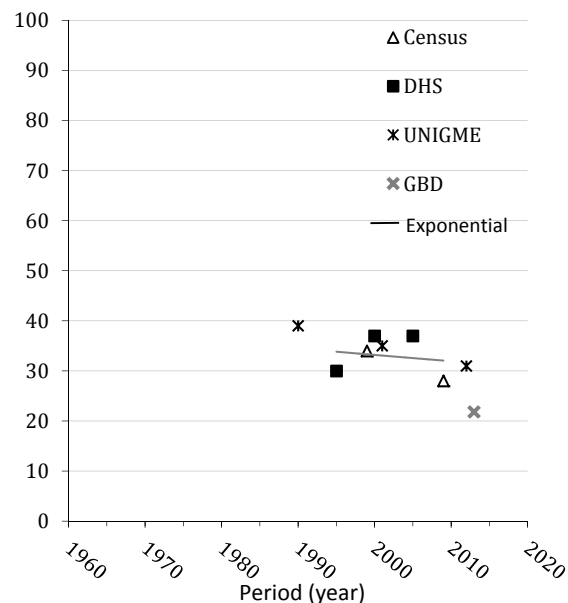
All mortality and LE estimates in the Solomon Islands are based on direct or indirect demographic methods from censuses or surveys. Reported estimates show declines in infant and under-five mortality and increases in LE, however, the relatively high life expectancies reported are directly attributable to the most recent census estimate and indicate an improbable rapid improvement in overall mortality levels. Although based on two input parameters, rather than a single input model life table, census estimates are derived from indirect methods applied to retrospective data and may under-estimate true levels of mortality.

Solomon Islands

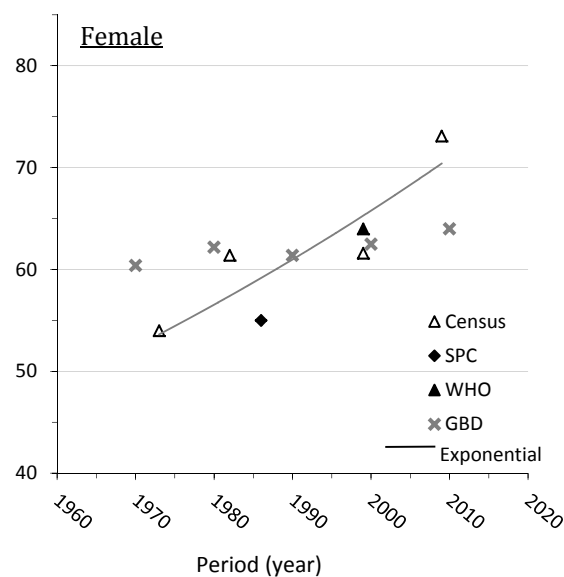
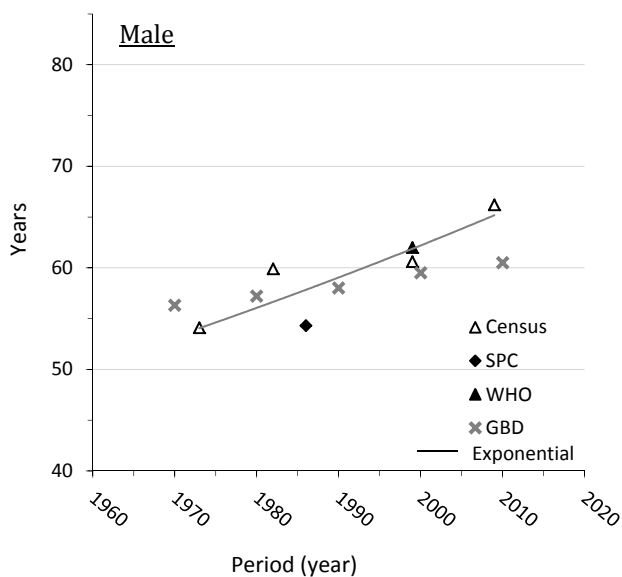
Infant Mortality



Under-Five Mortality



Life Expectancy; Solomon Islands



UNIGME and GBD estimates are not included in the trendlines as they are not a primary source of data - they are for comparison purposes only.

Key

SPC: Secretariat of the Pacific Community
 WHO: World Health Organisation
 UNICEF: United Nations International Children's Emergency Fund

DHS: Demographic and Health Survey
 GBD: Global Burden of Disease Study
 UNIGME: United Nations Inter-agency Group for Child Mortality Estimation

Source	Year	Data	Analysis	Ref
Infant Mortality				
UNICEF	1970; 1976; 1990; 1995; 2000; 2003	Unknown	Unknown	1
Census	1971-75 (1973); 1980-84 (1986)	Census	CEBCS	2,3
	1999; 2009	Census	CEBCS data and adult survivorship data used to impute a model life table (Coale/Demeny North)	4
DHS	1993-2007~	Survey	Retrospective maternal history	5
UNIGME	1990; 2012	UNIGME	Projection (see UNIGME methodology page 3)	6
GBD	2013	GBD	Modelled data (see reference) – added early neonatal mortality, late neonatal mortality, and post neonatal infant mortality.	10
Under Five Mortality				
Census	1999; 2009	Census	CEBCS data and adult survivorship data used to impute a model life table (Coale/Demeny North)	4
DHS	1993-2007~	Survey	Retrospective maternal history	5
UNIGME	1990; 2000; 2012	UNIGME	Projection (see UNIGME methodology page 3)	6
GBD	2013	GBD	Modelled data (see reference)	10
Life Expectancy				
Census	1971-75 (1973); 1980-84 (1982)	Census	CEBCS and adult survivorship data used to impute a model life table (Coale/Demeny West)	2,3
	1999	Census	Unknown	7
	2009	Census	CEBCS and adult survivorship data used to develop a life table using UN software package MORTPAK procedure COMBIN	4
SPC	1986	Unknown	Unknown	8
WHO	1999	Unknown	Unknown	9
GBD	1970; 1980; 1990; 2000; 2010	GBD	Modelled data (see reference)	11

~ Data points represent average of five-year period around the estimate

References

1. UNICEF. *A Situation Analysis of Women and Children in the Solomon Islands* [Internet]. 1993, pp. 10 [cited 2006 Oct 1]. Available from: www.unescap.org/stat/data/goalIndicatorArea.aspx.
2. Census 1976. Estimate cited in; Taylor R, Lewis N, Levy S. *Societies in transition: mortality patterns in Pacific Island populations*. *International Journal of Epidemiology*. 1989;18(3):634-646.
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7. Solomon Islands National Statistics Office. *Social Statistics* [Internet]. 2006 [cited 2012 Oct 6]. Available from: <http://www.spc.int/prism/country/sb/stats/Social/Soc-Index.htm>
8. Secretariat of the Pacific Community. Table 7: *Recent developments in fertility and mortality* [Internet]. 2010 [cited 2012 Feb 5]. Available from: http://www.spc.int/sdp/index.php?option=com_docman&task=cat_view&gid=28&dir
9. Lopez A, Salomon J, Ahmad O, Murray C, Mafat D. *Life Tables for 191 Countries: Data, Methods and Results*. GPE Discussion Paper Series: No.9. EIP/GPE/EBD. Geneva: World Health Organisation; 2000.
10. Wang H, Liddell CA, Coates MM, Mooney M, Levitz CE, Schumacher AE, et al. *Global, regional, and national levels of neonatal, infant, and under-5 mortality during 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013*. *Lancet*. Published Online. May 2, 2014. [http://dx.doi.org/10.1016/S0140-6736\(14\)60497-9](http://dx.doi.org/10.1016/S0140-6736(14)60497-9).
11. Wang H, Dwyer-Lindgren L, Lofgren KT, Knoll Rajaratnam J, Marcus JR, Levin-Rector A et al. *Age-specific and sex-specific mortality in 187 countries, 1970-2010: a systematic analysis for the Global Burden of Disease Study 2010*. *Lancet*. 380:2071-94; 2012.

17. Tokelau

Land area (Km ²)	12
2013-mid-year population estimate	1,200
Population growth rate (%)	0.9

[Source: SPC Pocket Summary 2013]

Trends in Child Mortality

Available data suggest slow decline in infant mortality to around 30 deaths per 1000 live births. There are no data available on under-five mortality.

Trends in Life Expectancy

LE appears to have stabilised at the late 60s (years) for males and around 70 (years) in females, but there are no available data since 2000.

Data Sources and Quality

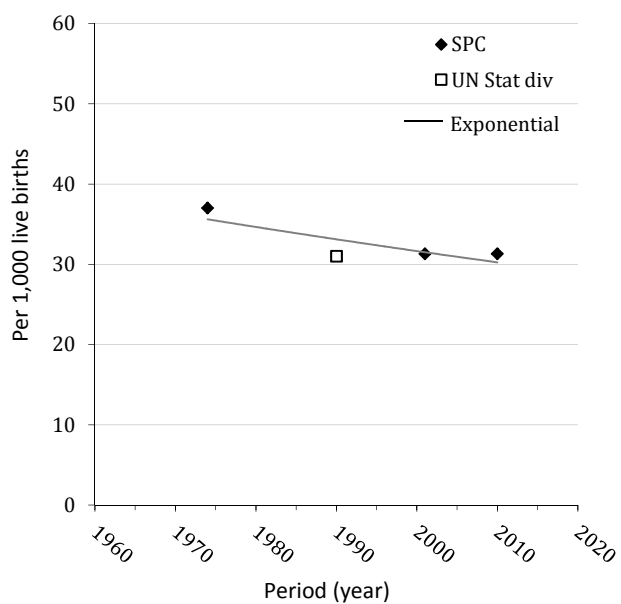
1. Mortality rates and estimates of LE are likely to be affected by small numbers, producing stochastic variation over time. Mortality and LE data from Tokelau should span at least 5 years, and should be presented with statistical confidence intervals (95%).
2. No recent life expectancy estimates available since 2000.
3. High risk pregnancies are referred to either Samoa or New Zealand, and births generally do not occur on island. There are no reliable figures for infant births or deaths off island, although Tokelau is working to implement reporting procedures to capture these.

Comments

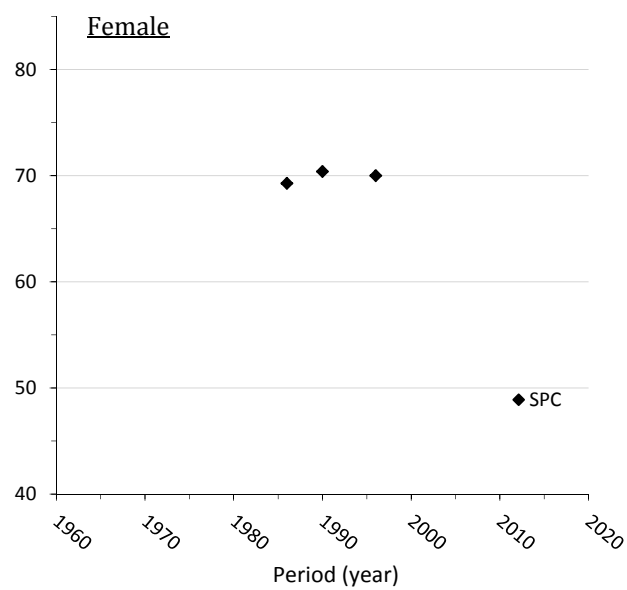
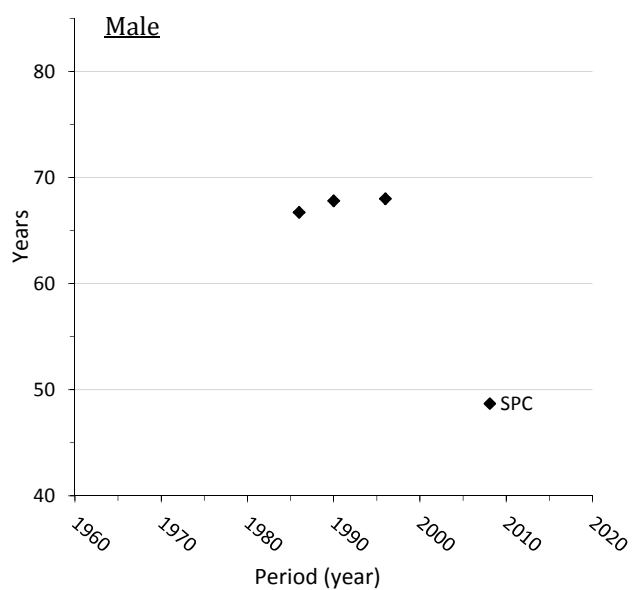
Both infant and child mortality show slow but consistent declines, with LE stable at moderate levels. Although the small population size and overseas referrals make calculation of mortality rates for Tokelau difficult, these data suggest mortality levels at which further improvements could be made.

Tokelau

Infant Mortality



Life Expectancy; Tokelau



Key

SPC: Secretariat of the Pacific Community

UN Stat Div: United Nations Statistics Division

Source	Year	Data	Analysis	Ref
Infant Mortality				
SPC	1970-79(1974)	Vital registration	Direct calculation	1
	2000-03(2001)	Unknown	Unknown	2
	2010	Unknown	Unknown	3
UN Stat Div	1990	Unknown	Unknown	4
Life Expectancy				
SPC	1986; 1990	Unknown	Unknown	2
	1996	Vital registration	Life table (direct calculation +/- model life table)	5

References

1. Office for Tokelau Affairs. 1982 annual report on health services. Apia, OTA, 1982. Estimate cited in; Taylor R, Lewis N, Levy S. *Societies in transition: mortality patterns in Pacific Island populations*. *International Journal of Epidemiology*. 1989;18(3):634-646.
2. Secretariat of the Pacific Community. Table 7: *Recent developments in fertility and mortality* [Internet]. 2010 [cited 2012 Feb 5]. Available from: http://www.spc.int/sdp/index.php?option=com_docman&task=cat_view&gid=28&dir
3. Secretariat of the Pacific Community. Pocket Statistical Summary 2010 [Internet]. 2010 [cited 2012 October 10]. Available from: http://www.spc.int/sdp/index.php?option=com_docman&task=cat_view&gid=28&dir=ASC&ord%20%20er=name&limit=5&limit_start=10
4. Secretariat of the Pacific Community. Estimate cited in; United Nations Statistics Division. Social indicators, Health, table 2b – maternal mortality and infant mortality [Internet]. 2011 Dec [cited 2012 Oct 10]. Available from: <http://unstats.un.org/unsd/demographic/products/socind/health.htm>
5. South Pacific Commission. South Pacific Commission 1998. Pacific Island Populations - Revised edition. Report prepared by the South Pacific Commission for the International Conference on Population and Development 1994: Cairo, Egypt. SPC, Nouméa. Estimate cited in; Taylor R, Lopez A. *Differential mortality among Pacific Island countries and territories*. Asia-Pacific Population Journal. 2007;22(3):45-58.

18. Tonga

Land area (Km ²)	749
2013-mid-year population estimate	103,300
Population growth rate (%)	0.2
Crude birth rate (per 1000 population)	27.1
Total fertility rate (year)	3.9 (2011)

[Source: SPC Pocket Summary 2013]

Trends in Child Mortality

Infant mortality declined to below 20 deaths per 1000 live births, and under-five mortality below 30 deaths per 1000 live births.

Trends in Life Expectancy

LE appears to be mid-60s (years) for males and high 60s (years) for females based on reconciliation of four sources of vital registration, and estimates from capture-recapture. The degree to which trends represent declines in LE is difficult to determine because previous estimates were probably too high; however life expectancies have at the very least flattened and show no consistent improvement.

Data Sources and Quality

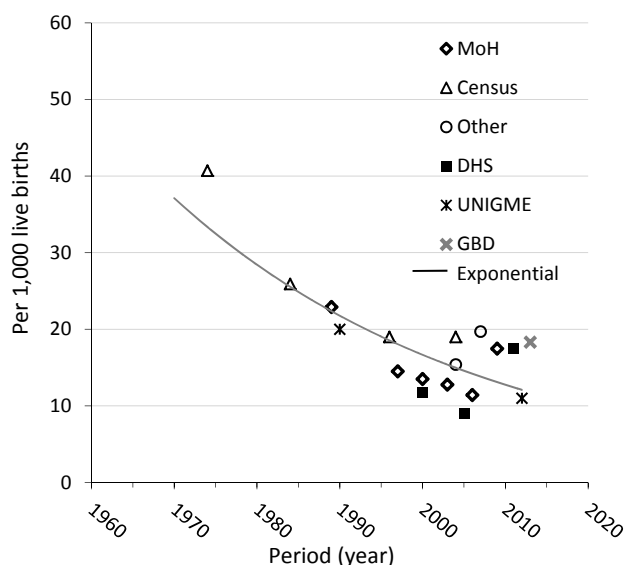
1. Estimates of mortality in Tonga, prior to recent analyses based on reconciliation of vital registration data from four sources, are probably unreliable.
2. Recent analyses involving reconciliation of civil and health vital registration (labelled 'Other' on the graphs) indicate that previous measures of life expectancy are likely to have been overestimated.

Comments

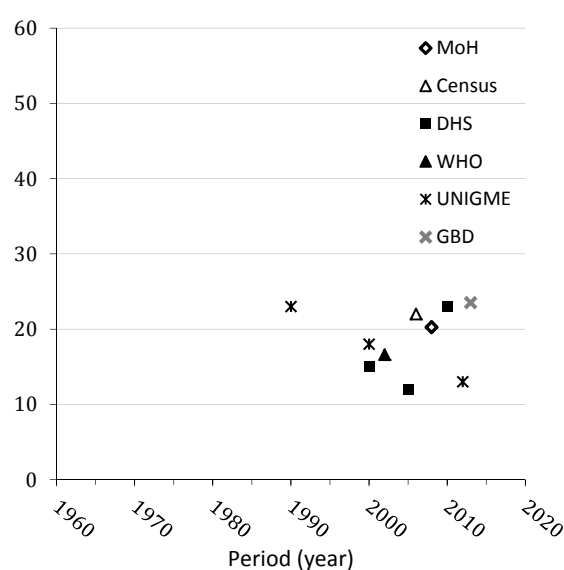
Infant mortality is below 20 deaths per 1000, with recent increases attributable to the reconciliation of data between sources, with previous estimates potentially biased by undercount. While reconciled data (labelled "other") from Hufunga et al. [2012] demonstrate that LE is likely to have been overestimated and is closer to low 60s (years) for males and high 60s (years) for females, it is apparent that there has been no improvement in LE since the early 1990s, and that flattening in LE has occurred at levels where further improvements should be sought. These patterns of LE, when combined with relatively low infant and child mortality, demonstrate the impact of premature adult mortality, most likely as a result of non-communicable diseases.

Tonga

Infant Mortality

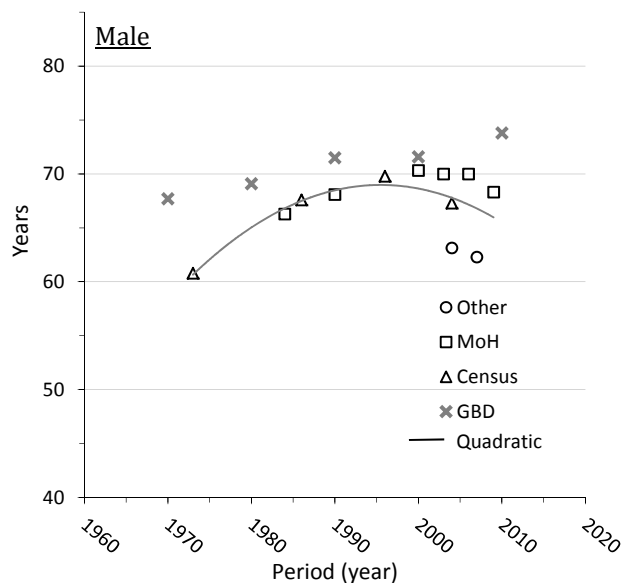


Under-Five Mortality

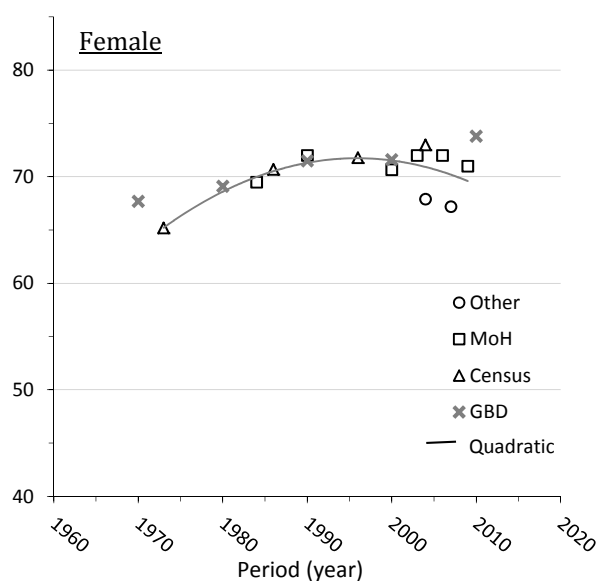


Life Expectancy; Tonga

Male



Female



UNIGME and GBD estimates are not included in the trendlines as they are not a primary source of data - they are for comparison purposes only.

Key

SPC: Secretariat of the Pacific Community
 WHO: World Health Organisation
 Other: other source noted in reference list

MoH: Ministry of Health
 UNIGME: United Nations Inter-agency Group for Child Mortality Estimation
 GBD: Global Burden of Disease Study

Source	Year	Data	Analysis	Ref
Infant Mortality				
MoH	1987-92 (1990)	Vital registration	Data adjusted for under-enumeration using Brass technique and projected onto model life tables	1
	1996-2010*	Vital registration	Direct calculation	2
Census	1973-75 (1974)	Unknown	Unknown	3
	1984	Census	<5 mortality from CEBCS data used to impute a model life table (Coale/Demeny West) to generate IMR	4
	1996	Census	<5 mortality from CEBCS used to generate IMR	5
	2006	Census	<5 mortality from CEBCS data imputed into a model life table (using MORTPAK4.1) to generate IMR	6
Other	2001-04 (2003); 2005-09 (2007)	Vital registration and Census data	Reconciliation of multiple source vital registration and capture-recapture analysis, for deaths.	7
DHS	1998-2012~	Survey	Retrospective maternal history	8
UNIGME	1990-2012	UNIGME	Projection (see UNIGME methodology page 3)	9
GBD	2013	GBD	Modelled data (see reference) – added early neonatal mortality, late neonatal mortality, and post neonatal infant mortality.	12
Under Five Mortality				
Census	2006	Census	CEBCS data imputed into a model life table (using MORTPAK4.1)	6
MoH	2005-09 (2007)	Vital registration	Direct calculation	10
DHS	1998-2012~	Survey	Retrospective maternal history	8
WHO	2001	Unknown	Unknown	11
UNIGME	1990; 2000; 2012	UNIGME	Projection (see UNIGME methodology page 3)	9
GBD	2013	GBD	Modelled data (see reference)	12
Life Expectancy				
MoH	1982-86 (1984); 1987-92 (1990)	Vital registration	Data adjusted for under-enumeration using Brass technique and put on to model life tables (model not stated)	1
	1999-2010*	Unknown	Unknown	2
Other	2001-04 (2003) 2005-09 (2007)	Vital registration	Reconciliation of multiple source vital registration and capture-recapture analysis - average of final ranges.	7
Census	1971-75 (1973)	Unknown	Unknown	3
	1986	Census	<5 mortality from CEBCS and adult survivorship data from paternal orphanhood method used to impute model life tables	4
	1996	Census	<5 mortality from CEBCS and adult survivorship data from paternal orphanhood method used to impute model life tables	5
	2001-06 (2004)	Vital registration and Census	Vital registration mortality data and reported number of deaths from Censuses questions imputed into model life tables (Far East Asian for males; Coale/Demeny West for females) (calculated using MORTPAK4.1)	6
GBD	1970; 1980; 1990; 2000; 2010	GBD	Modelled data (see reference)	13

Data points represent average of: * three-year period around the estimate; ~ five-year period around the estimate

References

1. Kupu S. *Mortality Analysis for Tonga, 1982-1992*. *Pacific Health Dialog*. 1999;6(2):221-235.
2. Government of Tonga. *Report of the Minister for Health for the year 2000/2005/2010* [Internet]. No date [cited 2014 February 10]. Available from: http://health.gov.to/Annualreport_Public
3. *1976 Census*. Estimate cited in; Taylor R, Lewis N, Levy S. *Societies in transition: mortality patterns in Pacific Island populations*. *International Journal of Epidemiology*. 1989;18(3):634-646.
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11. Tonga Statistics Department. Estimate cited in; World Health Organisation. *Western Pacific Country Health Information Profiles 2008 Revision*. Geneva: WHO; 2008.
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13. Wang H, Dwyer-Lindgren L, Lofgren KT, Knoll Rajaratnam J, Marcus JR, Levin-Rector A et al. *Age-specific and sex-specific mortality in 187 countries, 1970-2010: a systematic analysis for the Global Burden of Disease Study 2010*. *Lancet*. 380:2071-94; 2012.

19. Tuvalu

Land area (Km ²)	26
2013-mid-year population estimate	10,900
Population growth rate (%)	1.1

[Source: SPC Pocket Summary 2013]

Trends in Child Mortality

Infant and under-five mortality have consistently decreased, with infant mortality below 30 deaths per 1000 live births. The decline in under-five mortality has been even more pronounced, and now appears to be comprised almost exclusively of infant deaths.

Trends in Life Expectancy

LE has increased to early 60s (years) in males and mid-60s (years) in females, although no LE data are available since 2000.

Data Sources and Quality

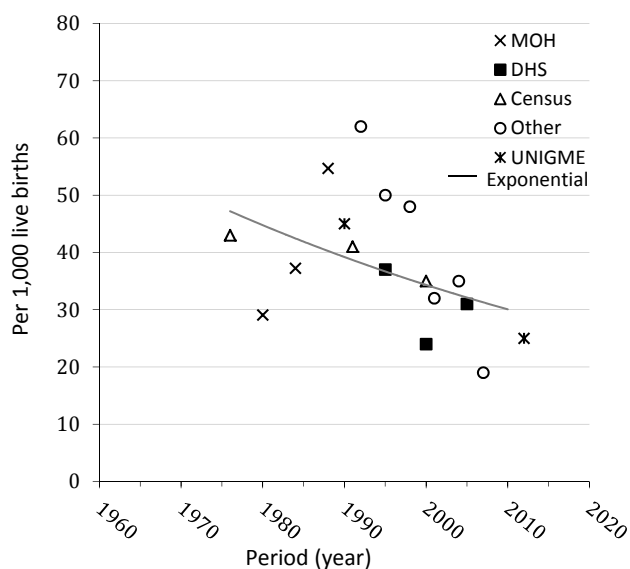
1. No LE data is available for Tuvalu since 2000.
2. Mortality rates and estimates of LE are likely to be affected by small numbers, producing stochastic variation over time.

Comments

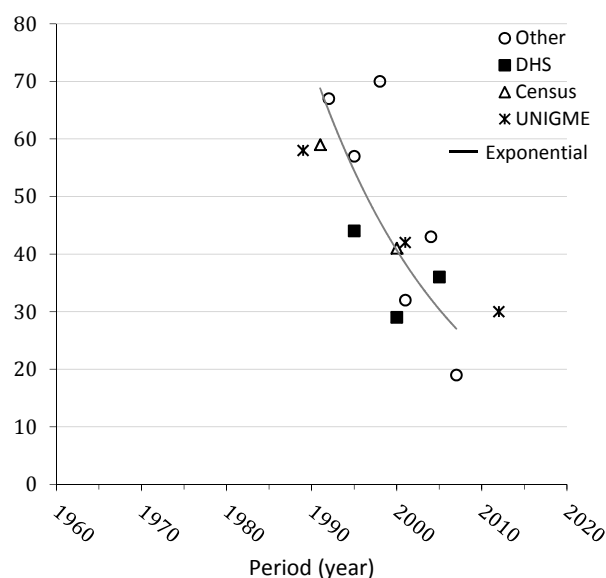
Infant and under-five mortality show declines, and LE increased to early-mid 60s, although there are no LE data available since 2000. Small numbers lead to stochastic variation, especially for infant and under-five mortality. Analyses of mortality and LE for Tuvalu should use 3-5 year periods and should be presented with statistical confidence intervals (95%).

Tuvalu

Infant Mortality



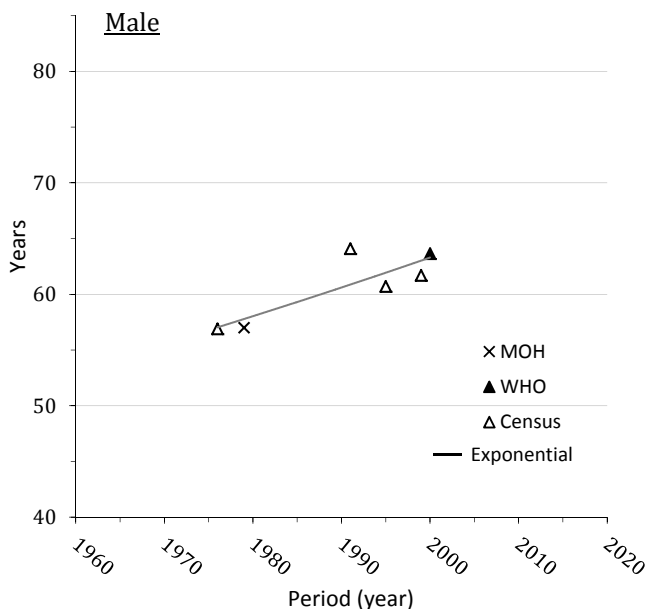
Under-Five Mortality



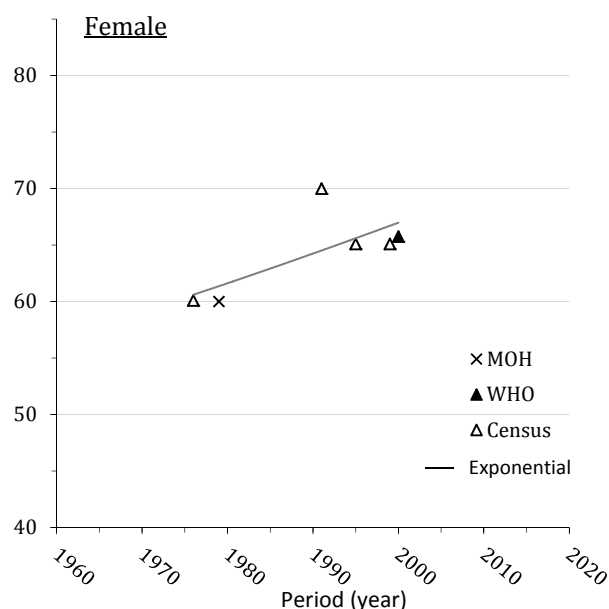
UNIGME estimates are not included in the trendline as they are not a primary source of data - they are for comparison purposes only.

Life Expectancy; Tuvalu

Male



Female



Key

WHO: World Health Organisation
DHS: Demographic and Health Survey
Other: other source noted in reference list

MoH: Ministry of Health
UNIGME: United Nations Inter-agency Group for Child Mortality Estimation

Source	Year	Data	Analysis	Ref
Infant Mortality				
MoH	1979-81 (1980)	Unknown	Unknown	1
	1982-85 (1984); 1986-89 (1988)	Unknown	Unknown	2
Other	1991-2008*	Vital registration	Direct calculation	3
DHS	1993-2007~	Survey	Retrospective maternal history	4
Census	1974-78 (1976)	Unknown	Unknown	5
	1990-91 (1991)	Census	<5 mortality from CEBCS and adult survivorship data from paternal orphanhood method used to impute a model life table to generate IMR	6
	1997-2002 (2000)	Vital registration	Direct calculation	7
UNIGME	1990; 2012	UNIGME	Projection (see UNIGME methodology page 3)	8
Under Five Mortality				
Other	1991-2008*	Vital registration	Direct calculation	3
DHS	1993-2007~	Survey	Retrospective maternal history	4
Census	1990-91 (1991)	Census	CEBCS and adult survivorship data from paternal orphanhood method used to impute a model life table	6
	1997-2002 (2000)	Vital registration	Direct calculation	7
UNIGME	1990; 2000; 2012	UNIGME	Projection (see UNIGME methodology page 3)	8
Life Expectancy				
MoH	1979	Unknown	Unknown	9
WHO	1999	Unknown	Unknown	10
Census	1976	Unknown	Unknown	5
	1990-91 (1991)	Census	CEBCS and adult survivorship data from paternal orphanhood method used to impute a model life table	6
	1992-97 (1995); 1997-2002 (1999)	Vital registration	Vital registration data imputed into model life tables using US Census Bureau and MORTPAK LITE 3.0	7

Data points represent: *average of three-year; ~average of five-year; period around the estimate

References

1. Ministry of Social Services. Health Division Annual Report 1985. Government of Tuvalu.
2. Ministry of Health, Education and Community Affairs. Health Division Annual Report 1989. Funafuti: Government of Tuvalu.
3. Taylor R, Linhart C, Homasi S, Hayes G. *Measuring progress towards achieving Millennium Development Goals in small populations: is under-five mortality in Tuvalu declining?* ANZIPH; 2014. In press.
4. Central Statistics Division (TCSD), SPC and Macro International Inc. Tuvalu Demographic and Health Survey 2007. Noumea: SPC; 2009.
5. Census 1979. Estimate cited in; Taylor R, Lewis N, Levy S. *Societies in transition: mortality patterns in Pacific Island populations*. *International Journal of Epidemiology*. 1989;18(3):634-646.
6. Central Statistics Division. Tuvalu 1991 Population and Housing Census, Volume 2: Analytical Report. Funafuti: Government of Tuvalu, 1992.
7. Secretariat of the Pacific Community. Tuvalu 2002 population and housing Census, volume 2 demographic profile, 1991-2002. Noumea, New Caledonia: SPC; 2005.
8. The United Nations Inter-agency Group for Child Mortality Estimation (UNIGME). Levels and trends in child mortality: Report 2013. The United Nations Children's Fund; 2013.
9. Ministry of Health. Health Division Annual Report. Education and Community Affairs. Funafuti, Tuvalu: Government of Tuvalu; 1986.
10. Lopez A, Salomon J, Ahmad O, Murray C, Mafat D. Life Tables for 191 Countries: Data, Methods and Results. GPE Discussion Paper Series: No.9. EIP/GPE/EBD. Geneva: World Health Organisation; 2000.

20. Vanuatu

Land area (Km ²)	12,281
2013-mid-year population estimate	264,700
Population growth rate (%)	2.5

[Source: SPC Pocket Summary 2013]

Trends in Child Mortality

Trends in infant mortality show a decline to below 30 deaths per 1000 live births, with a commensurate decrease in under-five mortality.

Trends in Life Expectancy

Trends show an increase in LE to the late 60s (years) in males and early 70s (years) in females.

Data Sources and Quality

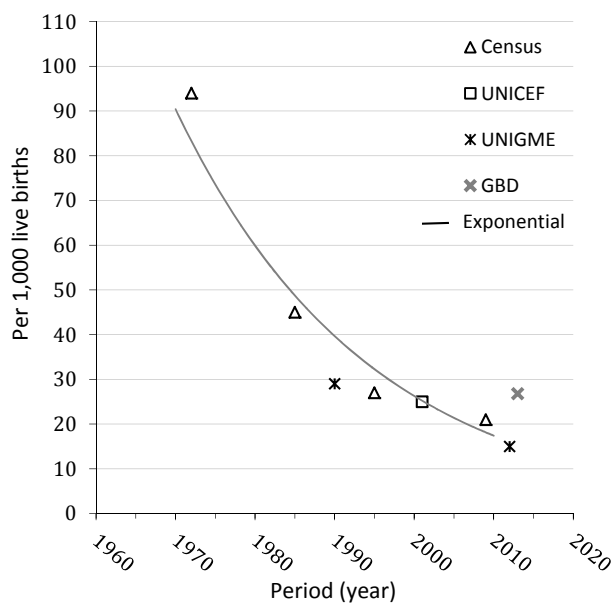
1. All data are from indirect analytic methods from surveys and censuses. Vital registration data is not yet sufficiently complete for calculation of mortality estimates.
2. Reported mortality estimates are suspiciously low in relation to the circumstance of the country.

Comments

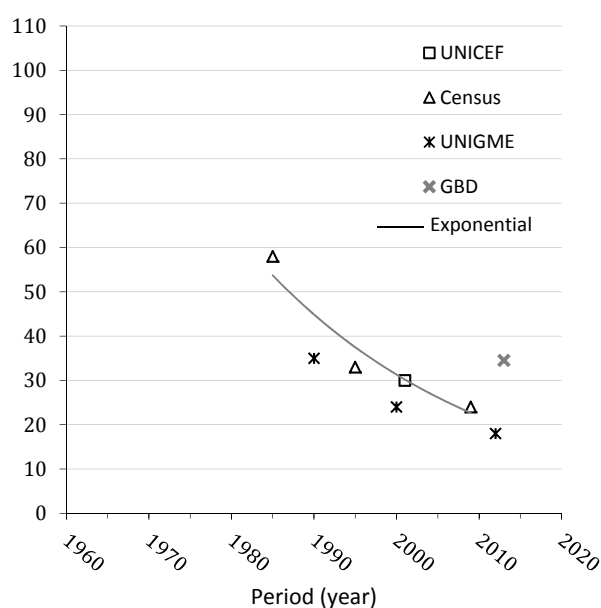
Levels of child mortality are suspiciously low in relation to the circumstance of the country and in comparison with other countries in the region. It would seem unlikely that the recorded minor declines in infant and under-five mortality in the last decade would explain the increase in LE over the same period. Mortality estimates from Vanuatu emanate from direct and indirect demographic methods through censuses and surveys, and life expectancy is derived from model life tables imputed from estimates of under-five mortality (from CEBCS). Models based on single input parameters have been shown to under-estimate adult mortality in other Pacific countries, and highlight the need for development of robust and reliable vital registration systems.

Vanuatu

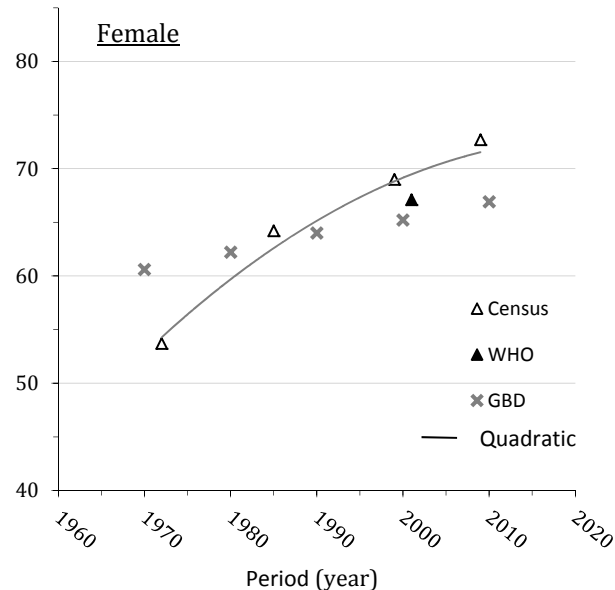
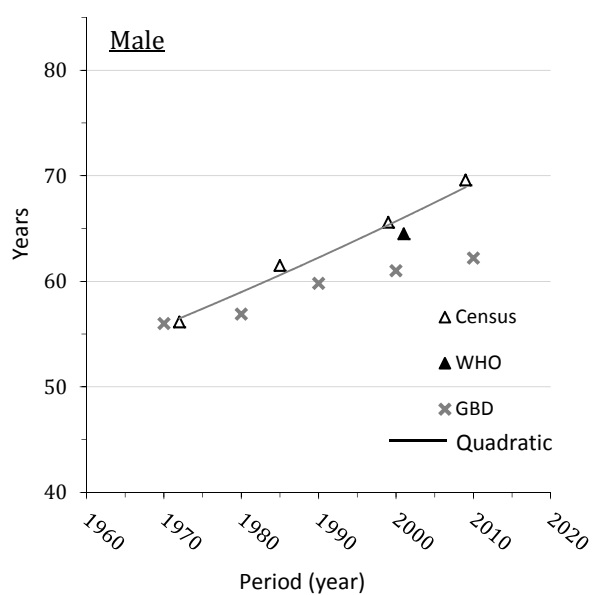
Infant Mortality



Under Five Mortality



Life Expectancy; Vanuatu



UNIGME and GBD estimates are not included in the trendlines as they are not a primary source of data - they are for comparison purposes only.

Key

WHO: World Health Organisation
UNICEF: United Nations International
Emergency Children's Fund

UNIGME: United Nations Inter-agency Group for
Child Mortality Estimation
GBD: Global Burden of Disease Study

Source	Year	Data	Analysis	Ref
Infant Mortality				
Census	1967-79 (1972)	Census	Intercensal fertility data from Own Children Technique used to impute a model life table (Coale/Demeny West)	1
	1979-89 (1985)	Census	CEBCS data used to impute a model life table (Coale/Demeny West)	2
	1995	Census	CEBCS using MORTPAK	3
	2009	Census	CEBCS used to impute a model life table (Coale/Demeny West)	4
UNICEF	2001	Survey	CEBCS data used to impute a model life table (Coale/Demeny West)	5
UNIGME	1990; 2012	UNIGME	Projection (see UNIGME methodology page 3)	6
GBD	2013	GBD	Modelled data (see reference) – added early neonatal mortality, late neonatal mortality, and post neonatal infant mortality.	8
Under Five Mortality				
Census	1979-89 (1985)	Survey	CEBCS data used to impute a model life table (Coale/Demeny West)	2
	1995	Survey	CEBCS using MORTPAK	3
	2009	Unknown	Unknown	4
UNICEF	2001	Survey	CEBCS data used to impute a model life table (Coale/Demeny West)	5
UNIGME	1990; 2000; 2012	UNIGME	Projection (see UNIGME methodology page 3)	6
GBD	2013	GBD	Modelled data (see reference)	8
Life Expectancy				
Census	1967-79 (1972)	Census	Intercensal fertility data from Own Children Technique used to impute a model life table (Coale/Demeny West)	1
	1979-89 (1985)	Census	CEBCS and intercensal estimates of adult death rates used to impute model life tables (Coale/Demeny West)	2
	1999	Census	CEBCS and orphanhood data used to calculate life tables using MORTPAK procedure ORPHAN (+/- model life tables)	3
	2009	Census	CEBCS and orphanhood data used to calculate life tables using MORTPAK procedure ORPHAN (+/- model life tables)	4
WHO	2001	Unknown	Unknown	7
GBD	1970; 1980; 1990; 2000; 2010	GBD	Modelled data (see reference)	9

References

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- The United Nations Inter-agency Group for Child Mortality Estimation (UNIGME). Levels and trends in child mortality: Report 2013. The United Nations Children's Fund; 2013.
- World Health Organisation 2001, Life Tables for 191 Countries: World Mortality 2000, Vanuatu 2001, viewed 24 September 2006 http://www3.who.int/whosis/life/life_tables/life_tables_process.cfm?country=vut&language=en
- Wang H, Liddell CA, Coates MM, Mooney M, Levitz CE, Schumacher AE, et al. *Global, regional, and national levels of neonatal, infant, and under-5 mortality during 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013*. Lancet. Published Online. May 2, 2014. [http://dx.doi.org/10.1016/S0140-6736\(14\)60497-9](http://dx.doi.org/10.1016/S0140-6736(14)60497-9).
- Wang H, Dwyer-Lindgren L, Lofgren KT, Knoll Rajaratnam J, Marcus JR, Levin-Rector A et al. *Age-specific and sex-specific mortality in 187 countries, 1970–2010: a systematic analysis for the Global Burden of Disease Study 2010*. Lancet. 380:2071-94; 2012.

21. Wallis and Futuna

Land area (Km ²)	142
2013-mid-year population estimate	12,100
Population growth rate (%)	-2.1

[Source: SPC Pocket Summary 2013]

Trends in Child Mortality

Infant mortality has decreased to a very low level of around 5 deaths per 1000 live births.

Trends in Life Expectancy

LE has increased to the early 70s (years) in males and mid-70s (years) in females.

Data Sources and Quality

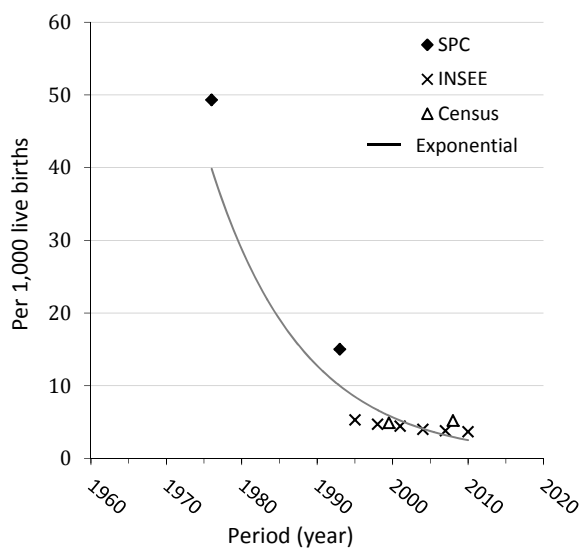
1. Mortality data has been derived from vital registration, which is considered to be essentially complete.
2. Mortality data may be affected by out-migration.
3. No published estimates of under-five mortality are available.
4. Mortality rates and estimates of LE are likely to be affected by small numbers, producing stochastic variation over time.

Comments

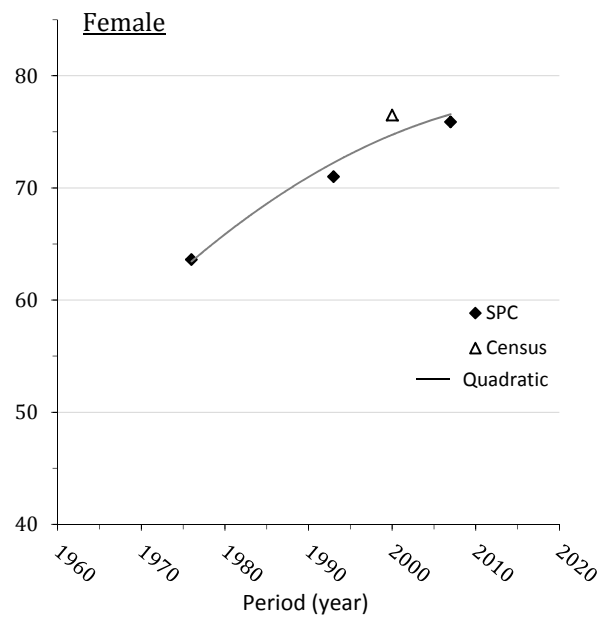
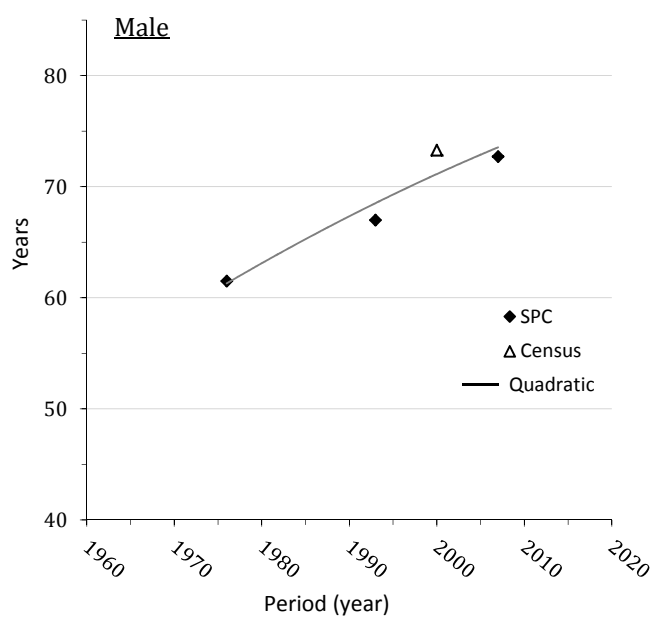
Infant mortality has declined to developed country levels. LE estimates are similar to French Polynesia, but may be affected by out-migration.

Wallis and Futuna

Infant Mortality



Life Expectancy; Wallis and Futuna



Key

SPC: Secretariat of the Pacific Community

INSEE: Institut National de la Statistique et des Etudes Economiques

Source	Year	Data	Analysis	Ref
Infant Mortality				
SPC	1974-78 (1976)	Vital registration	Direct calculation	1
	1990-95 (1993)	Vital registration	Direct calculation	2
INSEE	1994-2011*	Unknown	Unknown	3
Census	1996-2003 (1999)	Vital registration	Direct calculation	4
	2005-08 (2007)	Vital registration	Direct calculation	5
Life Expectancy				
SPC	1974-78 (1976)	Vital registration	Unknown	1
	1990-95 (1993)	Vital registration	Unknown	2
	2005-08 (2007)	Unknown	Unknown	6
Census	1996-2003 (2000)	Vital registration	Unknown	5

* Data points represent average of three year period around the estimate

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Appendices

Appendix 1: Outline of mortality and life expectancy calculation methods

Adjusting for under-reporting: Registration data that is not complete, but is not severely undercounted, may be adjusted to correct for this under-count, and used for the calculation of mortality indices. It is generally accepted that data should be at least 70-80 % complete to be corrected in this manner, otherwise it is unlikely to be representative of the population. There are several methods for adjusting for undercount of deaths, including capture-recapture analysis and the Brass method.

Adult survivorship: are indirect methods of estimation adult mortality based on 'widowhood' or 'orphanhood' of the respondent. Survey respondents are asked whether their spouses ('widowhood') or parents ('orphanhood') are still alive. The resulting deaths are distributed in time according to the age of the respondent and the length of 'exposure to risk' as "in both cases, a particular target person is known to have been alive at the time of some past event (the birth of the respondent in the case of mothers, the conception of the respondent in the case of fathers, and marriage in the case of spouses)" [United Nations 1983, pg 97].

Direct calculation: in relation to calculating infant or under five mortality rates this method involves dividing the number of reported deaths under 1-year (IMR) or under five-years (U5MR) by the number of reported live births in the same period.

Brass Method: (1) The Brass Growth Balance method is an approach for assessing the completeness of adult mortality data, where the completeness equals the inverse slope of the line when the partial deaths (deaths over age x) are plotted against the partial population (population over age x) for each age.

(2) The 'Brass method' for estimating child mortality is an indirect estimate using data on the mean number of children born by five-year age range to women 15 to 49 years old, and the proportion of these children who are dead, by the same age groups. The technique converts the data into probabilities of dying by taking into account both the mortality risks children are exposed to, and their length of exposure to the risk of dying, assuming a particular model age pattern of mortality [United Nations 1983].

Children Ever Born / Children Surviving (CEBCS): is a method of collecting a partial birth history for use in indirect estimation of child mortality indicators. Women of childbearing age are asked during a survey to answer how many children they have ever given birth to, and how many of those children are still alive

Coale and Demeny model life tables: is a set of model life tables developed by Coale and Demeny in the 1960's. These models classify the life tables into four different sets, labelled West, East, North, and South, according to the patterns of mortality (especially the relationship between child and adult mortality) in the predominant regions of Europe represented in the original data.

Life table: is a set of tabulated calculations which converts observed population based mortality rates into risk of dying at each age. The risk of dying can then be applied to a hypothetical cohort to calculate survivors at each age, and the average life span that someone could expect to live at each age (life expectancy), based on the observed mortality rates. It is conventionally calculated separately for males and females.

Model life tables: are sets of life tables derived from empirical data from groups of countries with a similar mortality pattern. Data is aggregated to derive “typical” patterns of mortality by age at differing levels of adult and child mortality. An estimated life table can then be derived for countries which are not able to generate a life table directly from their empirical data by matching known mortality. One parameter life tables often use infant or child mortality, and two parameter life tables often employ child and adult mortality.

MORTPAK: MORTPAK is a UN developed software package for demographic measurement in developing countries, with an emphasis on mortality measurement. It is available free from the UN Population Division. [UN Population Division, 2013]

LTPOPDTH: A programmed spreadsheet in the PAS set that constructs and smooths a life table for both sexes, or one sex at a time, using population and death data. [US Census Bureau, 2014]

ORPHAN: a function in MORTPAK that carries out variations of the maternal orphanhood technique to estimate levels of adult mortality. Female adult mortality is estimated from tabulations on proportion of population with mothers still alive by age group of respondents. [UN Population Division, 2013]

Own child method: this method “permits the estimation of age-specific fertility rates for the 10 or 15 years preceding a census from information on the enumerated number of children classified by single year of age and single year of mother”. Age-specific fertility rates are calculated essentially through “reverse-projection of these enumerated children back to the time of their birth” and an “estimate made of survivorship probabilities for children” based on the Coale and Demeny model life tables. [United Nations 1983, pg 182-184].

PAS: The Population Analysis System (PAS) is a set of Microsoft Excel workbooks developed by the U.S. Census Bureau containing frequently used procedures and methods in basic demographic analysis. [US Census Bureau, 2014]

Projection: An estimate for a future period in time based on past data and a set of assumptions of how this value should change based on mathematical characteristics of previous data, and/or under a prescribed set of conditions, such as economic projections such as GDP.

Reconciliation: a process whereby two or more data sets (such as from Health Department reporting and Civil Registration) are compared and combined to arrive at a single list of unique events, which can then be used for direct calculation of mortality indices (or further adjusted for under-count, if required).

Retrospective maternal history: is where an interviewer, as part of a survey, asks all women of childbearing age how many children she has ever had, when they were born, and whether each of these children are still alive, or if they have died, when this occurred. The births and deaths are summed for each year and used to directly calculate mortality as would be done using registration data.

Reed-Merrell method: is an approach for converting age-standardised death rates to life table values for probability of dying by reading values of q of a set of standard conversion tables for central death rates (m_x) by age group. [Shyrock et. al. 1980]

Smoothing: a process whereby the age-specific mortality rates are adjusted to remove outlier values and minimise fluctuations by fitting a trend line to various age-groups when the age-specific mortality is graphed (on a log scale). This may also be performed by fitting empirical values to a closely matched model life table.

UN Model Life tables: a set of model life tables based on the mortality experience of developing countries with reliable information published by the UN in the 1980s. Empirical life tables for developing countries were grouped into four sets, plus a general set including all of them. These sets refer to the Latin American, Chilean, South Asian, Far Eastern, and General patterns.

UNIGME methodology: Estimates for infant mortality and under-five mortality for countries by a UN committee derived from trends with projections based on selected data (see full report for more detailed methodology) [UNIGME 2013]

Appendix 2: Additional notes on data quality

American Samoa

- The 2006 to 2011 Revisions of the Western Pacific Country Health Information Profiles (CHIPS) by the World Health Organisation Western Pacific Regional Office give the under-five mortality rate in American Samoa as 4.9 in 2002. The American Samoa Statistical Yearbook is cited as the primary source, which quotes this figure as the crude death rate per 1,000. Therefore these estimates have not been included in this report.
- The life expectancy estimate for 2005 in the World Health Organisation Western Pacific CHIPS 2008 Revision (cited as the US Census Bureau) has been included on the graph as it is the only estimates in the most recent decade. It should be interpreted with caution, however, as the Western Pacific CHIPS 2011 Revision does not republish this estimate and does not give any life expectancy estimates for American Samoa.
- The life expectancy estimates published in the Western Pacific CHIPS 2009 and 2010 Revision state that they refer to 2008 – however, the primary source refers to 2000, and is already included on the graph under the Secretariat of the Pacific Community series.
- The life table used for the 1990 estimates of under-five mortality and life expectancy from the American Samoa Bureau of Statistics was published in the 2000 Statistical Yearbook and has been duplicated in subsequent Statistical Yearbooks up to 2010. This table has been used once for under-five mortality and life expectancy for 1990.

Cook islands

- Records of births and deaths are compiled from the records of the Births, Deaths and Marriages Registrar of the Ministry of Justice and Lands. For the islands outside of Rarotonga, the Deputy Registrars of each island furnish these records directly to the Cook Islands Statistics Office [Cook Islands Statistical Bulletin, 2013]
- All records are compiled for each inhabited island of the Cook Islands and are tabulated by the date of occurrence.
- The 1996 Census states that life expectancy is “Probably overestimated by about 1 year due to under-reporting of the number of deaths by up to 10%.”
- Figures of live births and infant deaths for 1987-2010 differ slightly between tabulations from the Ministry of Health Report [Cook Islands MoH 2011] and the Statistics Office Annual Report [Statistics Office Cook Islands 2011], with the MoH reporting higher births and infant deaths in many years, although only by a small number. Both sources have been included on the graph to allow comparison.
- The under-five mortality rate calculated from the Ministry of Health Annual Statistical Tables 2008-2010 [Cook Islands MoH 2011] is 7 deaths per 1000 live births; however, further deaths under 5 years in this period were recorded in subsequent updates. For this reason the estimate is included on the graph, but excluded from the exponential trend line.

Fiji

French Polynesia

Guam

- All Revisions of the World Health Organisation Western Pacific Country Health Information Profiles (CHIPS) contain only projections of estimated under-five mortality in Guam.

Kiribati

Marshall Islands, Republic of the

- Estimates of infant and under-five mortality are derived from retrospective maternal histories or CEBCS, as well as direct calculation from births and deaths.
- Life expectancies are from indirect demographic methods of CEBCS +/- parental survivorship data, with imputed life tables.

Micronesia, Federated States of**Nauru****New Caledonia****Niue**

- Estimates of infant mortality in recent periods of around 10 deaths per 1000 live births should be interpreted with caution as only one infant death reported in the 5 years (2006-2011) was used for the calculation of this estimate [Niue Census Report 2011]. While this figure may be plausible, 10 years ago Niue's infant mortality was 29.4/1000 (4 infant deaths recorded over 1997-2001) [Niue Census Report 2011].
- No estimates of under-five mortality are published in the World Health Organisation Western Pacific Country Health Information Profiles (CHIPS) for Niue.

Northern Mariana Islands, Commonwealth of

- Under-five mortality estimates for the Northern Marianas are only published in the World Health Organisation Western Pacific Country Health Information Profiles (CHIPS) 2006 Revision.

Palau**Papua New Guinea****Samoa****Solomon Islands****Tokelau**

- The Tokelau Ministry of Health reported no deaths to the Secretariat of the Pacific Community in 2011, however, single year estimates are not considered sufficient in such a small population.

Tonga**Tuvalu****Vanuatu****Wallis and Futuna**

- No estimates of under-five mortality are published in the World Health Organisation Western Pacific Country Health Information Profiles (CHIPS) for Wallis and Futuna.

