Chapter II

2 Population Structure

2.1 Population Size, Growth, Distribution and Density

The size, growth and distribution of the population within a country's territory depend on both historical factors and current-day characteristics. While early settlers tend to locate in a particular part of a country because of land ownership, food and water possibilities, weather conditions, and perhaps geological considerations, subsequent current populations may locate for completely different reasons. In many developing countries, the modernisation process introduced by the industrialised countries permitted the emergence of urban areas, with very high population growth rates and corresponding high densities.

The above population factors are equally important in determining overall development strategies for any country. As people both produce and consume goods, development plans regarding production, consumption, investment, health status, education status, economic activities, living status, housing, etc. should take population factors into consideration.

This Chapter discusses population size, growth and distribution, presents some of the most frequently used indices, and considers the analysis and measurement of population density.

2.1.1 Population Size

According to the final results, the total enumerated population of Niue is 1788 with 897 males and 891 females with a sex ratio of 101 males per 100 females. About 97.1 percent of this population live in private household, 1.2 percent in non-private institutional arrangements, while 1.7 percent are regarded as "moving population". The household population consists of 49.9 percent of males and 50.1 percent of females, Institutional population consists 73 percent males and 27 percent females while moving population consist of 47 percent males and 53 percent females. (Table 1).

The percentage distribution of males and females in each enumerated areas is presented in TableA1.

Table A1. Percentage Distribution of Males and Females by Area

Area	Male		Female		Total		Male %	Female %
	Num	%	Num	%	Num	%	%	%
Makefu	48	55.17	39	44.83	87	4.87	2.68	2.18
Tuapa	62	48.06	67	51.94	129	7.21	3.47	3.75
Namukulu	9	64.29	5	35.71	14	0.78	0.50	0.28
Hikutavake	28	43.08	37	56.92	65	3.64	1.57	2.07
Toi	15	48.39	16	51.61	31	1.73	0.84	0.89
Mutalau	63	47.37	70	52.63	133	7.44	3.52	3.91
Lakepa	43	48.86	45	51.14	88	4.92	2.40	2.52
Liku	34	46.58	39	53.42	73	4.08	1.90	2.18
Hakupu	114	50.22	113	49.78	227	12.70	6.38	6.32
Vaiea	38	61.29	24	38.71	62	3.47	2.13	1.34
Avatele	60	48.00	65	52.00	125	6.99	3.36	3.64
Tamakautoga	71	50.71	69	49.29	140	7.83	3.97	3.86
Alofi South	186	51.96	172	48.04	358	20.02	10.40	9.62
Alofi North	126	49.22	130	50.78	256	14.32	7.05	7.27
Total	897	50.17	891	49.83	1788	100.00	50.17	49.83

Table A1 shows that 50.17 percent of the total population are males and 49.83 percent are females. The most populated area is Alofi South. The table indicates that 20.02 percent with 10.40 percent males and 9.62 percent females live in Alofi South, 14.32 percent with 7.05 percent males and 7.27 percent females in Alofi North, while 12.70 percent with 6.38 percent males and 6.32 percent females in Hakupu village. Less than one percent of the total population can be found only in Namukulu village and that percentage is 0.78 percent with 0.50 percent males and 0.28 percent females. Over 22 percent of the total population live in Tamakautoga, Mutalau and Toi villages.

In Namukulu and Vaiea villages more than two thirds of their village population are males population and only one third are females. Out of 14 villages listed in Table 1, 6 villages are male dominated and 8 villages are females dominated. The males dominated villages are Makefu, Namukulu, Hakupu, Vaiea, Tamakautoga and Alofi South. Females dominated villages are Tuapa, Hikutavake, Toi, Mutalau, Lakepa, Liku, Avatele and Alofi North. The sex ratio is 101 males per 100 females.

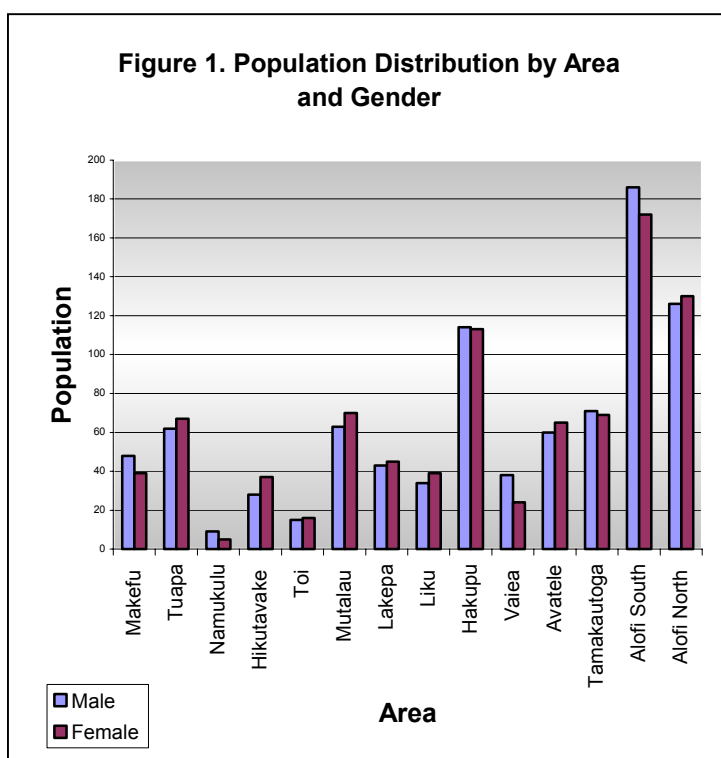**Figure 1. Population Distribution by Area and Gender**

Figure 1 shows the population by area and Gender. It shows that majority of Niue people are living in Alofi South and males exceed females in that area followed by Alofi North and female exceeds males in Alofi North. The figure shows that in Hakupu and Toi villages males and females are almost equal. Figure 1 also shows that Namukulu is the least populated in Niue having only 14 people with 9 males and 5 females. The second least populated village is Toi village with 15 males and 16 females.

Table A2. Population Size by Area and Population Change, Niue 1997 and 2001

Area	Population 2001	Population 1997	Population Change
Makefu	87	95	-8
Tupa	129	168	-39
Namukulu	14	28	-14
Hikutavake	65	68	-3
Toi	31	35	-4
Mutalau	133	148	-15
Lakepa	88	125	-37
Liku	73	92	-19
Hakupu	227	258	-31
Vaiea	62	46	16
Avatele	125	143	-18
Tamakautoga	140	150	-10
Alofi south	358	443	-85
Alofi North	256	289	-33
Total	1788	2088	-300

Table A2 shows population size and change during the inter-census period 2001 and 1997 by villages. Overall, it shows a decrease of 300 people, a decrease by about 14 percent. All the villages lost people except Vaiea, which gained 16 people. These 16 people have migrated from Tuvalu (see Table 43 in Part II).

2.1.2   Population Growth

Due to the impact of the three demographic processes, fertility, mortality and migration, all populations change continuously. In a `closed' population (that is a population closed to <u>migration</u>), change is an entirely  `natural' process since only births and deaths affect it. In this case, population change is therefore called <u>`natural'</u> <u>increase</u>. If in- and/or out-migration also affect a population, change in population size is called <u>population growth</u>.

During the entire period 1997-2001, international migration has very much affected Niue's population size. The rate of natural increase (RNI) is a difference between births and deaths in a population. In the case of Niue, during the 12 months before the census, there were 33 births and 8 deaths recorded resulting in natural population gain of 25 persons. The RNI indicates what the population growth rate would have been in the absence of migration.

As a result of high international out-migration Niue has experienced depopulation. The annual intercensal growth rate for the period 1997-2001 was estimated at –3.8 percent per annum.

2.1.3   Age and Sex Distribution

The distribution of a population by age and sex is one of the most basic types of information needed in planning for the future. For example, an analysis of educational requirements, labour force projection, family composition, retirement, migration, or voting practices, etc, would not be complete without considering information on age and sex. Age and sex are important variables in demographic analysis as well. The study of fertility and mortality without considering age would permit only a partial understanding of these phenomena.

Age is the central variable in most demographic as well as socio-economic analysis. Virtually all information collected during a census or any other data collection exercise varies with age. Most information presented in census tables are cross-classified by age (and sex). During all previous censuses in Niue, a considerable effort was therefore made to establish the age of respondents as accurately as possible. This

is not an easy task in many countries. Until recently, only a small proportion of the population was familiar with chronological age whereas birth certificates and other documentation containing date of birth or age were hardly ever available.

Given the importance of the age structure with respect to social and economic characteristics, it is imperative that the information on the population age sex structure be as accurate as possible. Below are measures derived to establish the accuracy of age-reporting during the 2001 census. It then interprets changes in the age-sex structure during the intercensal periods, but particularly during the most recent interval 1997-2001, by comparing the age-sex pyramids, as well as a number of indices that have been derived from the age-sex structures.

2.1.4   Detecting Age Misreporting

Population data are often subject to age misreporting and the Niue data are no exception. Irregularities in the age distribution produced by respondents misreporting their age can be detected in graphical cohort analysis, where age misreporting may be suggested by the repetition of a similar age pattern for different cohorts (as opposed to the parallelism expected for the same cohort). Comparing data from two censuses shows if the age pattern of the population at the two census dates is consistent. For example, there could be a shortage of people in the age 20 to 29 years in the 2001 census compared to the earlier census (16 to 25 years in the 1997 census). Migration can cause distortions of the age pattern and, therefore, the age of migrants as well as the direction of migration movement should be analysed. Any overall repetitive pattern should be interpreted as errors in the data, which thus would need some adjustment before in-depth analysis

Age misreporting in the process of enumerating the population in a census can come from two sources. One source is the respondent, who either wilfully misreports his or her age or gives an approximation if the true age is unknown. The other source of error is the interviewer who estimates the age of a respondent who does not know his or her age. In either case, the result of this age-guessing process is that ages are often rounded to end in the digits 0 and 5.

2.1.5 Digit Preference

Irregularities in reporting single years of age can be detected by using indices or graphs. There are several frequently used indices for detecting digit preference: Myers (1940), Whipple (US Bureau of Census, 1971), and some others. These indices not only provide an overall idea of the extent of age misreporting but also indicate the preference for certain ending age digits. The analysis also can be done graphically by constructing a typical population pyramid by single years of age or a line graph by single years of age. The single age pyramid or the line graph should show age misreporting in the country's population in certain ages (such as 30, 40, 50, and 60 years). Information on age containing such errors requires adjustment.

Two indices of age misreporting for the <u>resident</u> population based on census data classified by age and sex have been calculated.[2] The results are presented in the summary table below. The Indices for the previous censuses were not calculated because data are not available.

Indices of accuracy of age reporting of the resident population by sex derived from the 2001 census data

	Myers'	Index	Whipples'	Index
	M	F	M	F
Niue	5.5	4.5	93.8	103.5

Myers' Index measures the excess or deficit of persons reporting ages ending in any of the 10 digits, expressing these deviations as percentages. The larger the value of this index, the greater the preference for certain digits. The range of this index is from a minimum of 0 to a maximum of 180. In a population with a Myers' Index of 0, there is no preference or dislike for any of the 10 terminal (unit) digits of age (that is, accurate age reporting). If Myers' Index is 180, all ages have been reported/recorded with the same terminal digit (that is, inaccurate age reporting). Although Myers' Index for 2001 is still higher than 0, there is clearly no problems with age reporting in Niue than in some other countries in the Pacific region.

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[2] For an example of the computation of the 3 indices of the accuracy of age reporting used in this Report, see the United Nations, 1955. <u>Methods of Appraisal of Quality of Basic Data for Population Estimates</u>, Manual II, Population Studies, No. 23, Department of Economic and Social Affairs, Population Branch, UN, New York.

Whipple's index detects a preference for ages ending in zero, five, or both. If age reporting is consistent, this index should fluctuate slightly around 100. The higher the value of the index, the higher the preference for digits zero and five. The Whipple's index for each sex in 2001 was between 90 and 105, indicating better reporting (see the above summary table).

Whipple's index is calculated using age data for population aged 23-62 years. The range of 23-62 years is selected because the phenomenon of age heaping is most typically found in this range and the data at younger and older ages are often subject to errors and irregularities of other types. The value of Whipple's index is very close to 100 when there is no particular concentration of ages ending in 0 and 5 are reported. **These indices show that age reporting in Niue 2001 Census was fairly accurate.**

2.1.6 Age/Sex composition

The percentage distribution of total population by broad age group, median age for both sexes, males and females as well as dependency ratios are presented in Table A3. The median age of all persons, males and females are 29.0 years, 28.5 years and 29.0 years respectively.

Table A3. Percentage Distribution of Total Population by Broad Age Group, Gender, Sex Ratio, Median Age and Dependency Ratio, Niue 2001

Age Group	Sex Ratio	Total		Male		Female	
		Num	%	Num	%	Num	%
Total	101	1788	100	897	100	891	100
Under 15 years	105	529	29.6	271	30.2	258	29.0
15 - 59 Years	102	999	55.9	504	56.2	495	55.6
60 Years and Above	88	260	14.5	122	13.6	138	15.5
Median Age		29.0 Years		28.5 Years		29.0 Years	
Dependency Ratio		78.98					

2.17 Dependency ratio

For the purposes of this Report, the Dependency Ratio has been defined as the population under the age of 15 and the population age 60 and over ('dependent' population) divided by the population in the age-group 15 to 59 (`working' age population) multiplied by

Estimates, Manual II, Population Studies, No. 23, Department of Economic and Social Affairs, Population Branch, UN, New York.

100. The 'old age' cut-off point age 60 has been chosen instead of the internationally recommended age 65. The reason for this is that Niue is a small population and economy and consequently a low official retirement age.   The Age Dependency Ratio gives only a very approximate picture of the real dependency situation in the country.   Ideally, the level of economic dependency should of course be determined in an in-depth sample survey.

The Age Dependency Ratio can be divided into two parts, the <u>Youth</u> Dependency Ratio and the <u>Old Age</u> Dependency Ratio. The former only takes youths under the age of 15 into account. It is clear that in Niue the <u>overall</u> Age Dependency Ratio is high because the <u>youth</u> component is high. The <u>Old Age</u> Dependency Ratio is high compared to other Pacific Island countries.   Users are again reminded that the internationally recommended Old Age Dependency Ratio is based on the population age <u>65 and over.</u> The 'real', internationally comparable level of old age dependency in Niue is therefore even lower than that suggested by the data in Table A3 above. The ratio for 2001 is 78.98 which is lower than 1997 dependency ratio of 84.5.   It could mean that more people are entering into work than dependent even though the people in the working age group are migrating out.

2.1.8   Median Age

The Median Age is that age where 50 percent of the population is younger and 50 percent older. As shown in Tables A3, the Median Age for males as well as females in 2001 is clearly not low, as is to be expected of a population with a high level of emigration and moderate level fertility, and changed only a little between 1997 and 2001. Median age in Niue is 29.0 years for all persons that is higher than 27.0 years at 1997. Males and females median ages are 28.5 years and 29.0 years respectively (Table A3).

2.1.9   Sex Ratio

The sex-ratio is the number of males per 100 females. In most populations where the age-sex structure is not distorted, the sex-ratios for subsequent 5-year age groups are expected to decrease gradually with increasing age. This is due to the fact that in the majority of populations, the mortality risk at all ages is higher for males than for females. In addition to that, the average sex-ratio <u>at birth</u>, that is the number of live born male per 100 live born female children in one year is not 100. The worldwide average sex ratio at birth is usually assumed to be close to 105. There is evidence that this ratio may be somewhat higher or lower for certain populations. Incomplete and often quite inaccurate data from civil registration systems and

health department records in some countries in the Pacific Region suggest that the sex ratio at birth may be somewhat higher than 105. This seems particularly the case for some Melanesian populations, although conclusive evidence is not available.

The sex ratio by broad age group in Table A3 also shows that there are more males than females in the age group less than 14 and 15-59 and these ratios are 105 and 102 respectively. But in older ages 60 years and above, the table shows that there are more females than males and the sex ratio at is age is 88, which means that there are 88 males for every 100 females. It is due to gender differentials in mortality, because women usually have higher life expectancy than men.

2.1.10 Age/Sex Structure

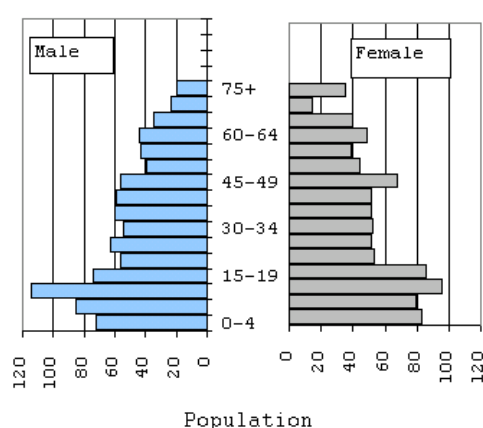Figure 2. Population Pyramid by Age and Sex, Niue 2001

Figure 2 presents Population Pyramid of Niue, based on the 2001 census. It shows that it is shrinking at the age of 0-4(base of the pyramid) even though fertility increases from 3.0 in 1997 to 3.2 in 2001. The "indent" in age group 20-29 years is obvious as a result of emigration. It also shows that more females than males at these age groups left the country during the most recent intercensal period. Another striking feature is that there are more females than males in age group 60 and above as a result of sex differential mortality. That is, women generally have high life expectancy than men.

The pyramid also shows that population aged 10-14 years has the highest percentages compared to the rest of the age groups. The percentage of males at age group 0-4 is 8.0 and for females at the same age group is 9.3. Both males and females percentages at age group 0-4 are lower than that of age group 10-14. The percentages of age group 0-4 for both sexes, males and females are lower than that of 5-9 and 10-14 age groups.

It is obvious from the pyramid and from Table A4 that Niue is experiencing depopulation as a result of decreasing fertility and emigration to other countries. Percentage distribution of population by age and sex is presented in Table A4.

Table A4. Percentage Distribution of Total Population by Five Year Age Group and Sex

Age	Both Sexes		Males		Females	
	Num	*%*	*Num*	*%*	*Num*	*%*
Total	1788	100	897	100	891	100
0-4	155	8.7	72	8.0	83	9.3
5-9	164	9.2	85	9.5	79	8.9
10-14	210	11.7	114	12.7	96	10.8
15-19	160	8.9	74	8.2	86	9.7
20-24	109	6.1	56	6.2	53	5.9
25-29	114	6.4	63	7.0	51	5.7
30-34	106	5.9	54	6.0	52	5.8
35-39	111	6.2	60	6.7	51	5.7
40-44	110	6.2	59	6.6	51	5.7
45-49	124	6.9	56	6.2	68	7.6
50-54	83	4.6	39	4.3	44	4.9
55-59	82	4.6	43	4.8	39	4.4
60-64	93	5.2	44	4.9	49	5.5
65+	167	9.3	78	8.7	89	10.0

2.1.11 Population Density

Crude population density has been used to analyse the concentration of population. Population density has been calculated by dividing the total population of Niue by the corresponding total surface area of the country.

The appropriate measure of density depends on the purpose of the analysis. For example, if a large part of a country is uninhabited because it is comprised of corol or rocks, the average density may be quite low, even though most of the people live in crowded conditions in a small part of the country. Hence, it may be more appropriate to estimate population densities omitting surface areas of uninhabited parts of the country. For this reason, densities are sometimes calculated as persons per unit of agricultural or arable land.

The total population of Niue is 1788, while total land area is 259km^2. The crude (arithmetic) population density is defined as the number of persons per km^2 at the time of the censuses is 6.9 person per km^2 at the time of the 2001 census.

Crude population density gives a rather misleading picture of the real population-land situation in Niue. A far more meaningful measure of population density as mentioned above is the number of persons per km^2 of land that is used for agriculture (`arable land'). These physiological densities provide a far more realistic picture of the population-land situation than the crude population densities. Since there are no data on the effective arable land, related population densities have not been calculated.