

# 1. Introduction

The study of fertility has long provoked the interest of demographers and other social scientists, due to its central role in shaping the current and future growth of populations. As today's fertility presents a reasonably accurate picture of the future needs of a population, measures of current fertility provide a basis for policy makers to assess the future socio-economic needs of the population. Thus, fertility indicators become the most urgently needed indicators from a census or a population survey. For this reason, analysis of fertility levels and trends remain one of the most important components of a census analytical report.

To formulate or evaluate policies concerning population growth, information is needed not only on the number of births, but also on trends of birth rates and other measures of fertility over time and, equally importantly, on the age-structural distribution and changes over time, of the population.

Data on both current and retrospective fertility has been routinely collected in all censuses of Maldives since modern census-taking in the country began in 1977. In the Census of 2006, fertility data was collected from all women aged 15 years and above. On current fertility, the respondents were asked whether she had delivered a live birth in the year preceding the Census. On retrospective fertility, women were asked to report the number of live births they delivered throughout their reproductive life. All fertility information collected in the census was gender disaggregated.

Data on both current and retrospective fertility collected in a census is subject to certain types of errors. The most common type of error occurs due to misplacement of events i.e., reporting events of one year ascribed to another year. For example, births which took place in the year 2005 being mistakenly reported to have occurred in 2006; particularly those which occurred towards the end of the year might be reported to have occurred in the following year. Data on retrospective fertility are often underreported due to recall lapse. Children born alive and died soon after the birth are often omitted in the reported number of births due to lapse in recalling such events. This effect tends to increase with the age of the mother. These possible errors should be kept in mind while interpreting the various measures of fertility discussed in this chapter.

## 2. Reported Fertility

The following measures were obtained using the data on the number of live births during the one year preceding the census:

### 2.1 Crude Birth Rate (CBR)

Crude birth rate is the number of births in a given year per thousand of the population in the same year. The denominator is usually the mid-year population. It is a crude measure because not all persons in the population are at the risk of giving birth. More refined measures of fertility are given below

### 2.2 General Fertility Rate (GFR)

GFR is the total number of live births occurring per thousand women in the reproductive period (15-49 years) in a given year. This is a slightly refined measure compared to the Crude Birth Rate, which is the number of live births in a given year per thousand of the population, irrespective of the likelihood of exposure to childbearing

### 2.3 Age-specific Fertility Rate (ASFR)

ASFR is the number of live births occurring in women of a given age group (usually five-year age groups) per woman or per thousand women at mid-year in a given year. It is usually calculated for women in five-year age groups for ages 15 to 49 years. Age-specific fertility rates follow a fairly standard pattern among women in all populations, with rates starting from zero at very young ages, rising to a peak sometimes in the twenties and then gradually declining until it reaches zero again at around age 50. Slight variations in the pattern occur, depending on differences in age at first marriage, level of contraceptive prevalence, desired family size, status of women in society, level of participation of women in out-of-home employment, and many other factors that influence child-bearing in a society.

### 2.4 Total Fertility Rate (TFR)

TFR is a summary measure independent of the age and sex composition of the population. It represents the average number of children a group of women would have at the end of their reproductive years if they had children according to a set of age-specific fertility rates pertaining to a particular year.

### 2.5 Gross Reproduction Rate (GRR)

GRR is a refined version of the TFR in that GRR refers to the number of daughters a woman is likely to produce by the end of her reproductive period, given the current age schedule of fertility rates

## 2.6 Summary Measures of Fertility

Data on current fertility was used to compute selected summary measures of fertility. These measures are presented by Republic, Male' and Atolls using data on births in the year preceding the census as reported by women, and the number of women enumerated in the 2006 Census of Maldives. Comparison is made with estimates from the 1990 and 2000 Censuses presented in the Analytical Report of the 2000 Census. Comparisons between the three censuses are given in Table 1.

Table 1: Summary measures of fertility based on reported birth data from Census, Maldives, 1990, 2000 and 2006

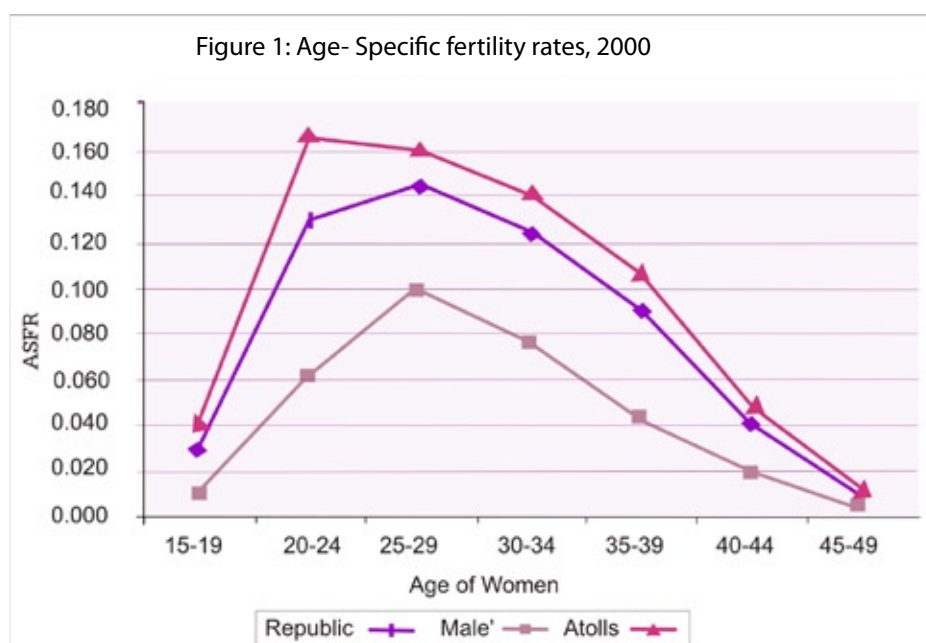
Fertility Index	Year of Census		
	1990	2000	2006
<b>General Fertility Rate(GFR)</b>			
Republic	202.68	86.08	66.81
Male'	121.11	46.18	46.02
Atolls	235.02	103.66	80.74
<b>Total Fertility Rate(TFR)</b>			
Republic	6.40	2.84	2.15
Male'	3.88	1.58	1.47
Atolls	7.40	3.37	2.60
<b>Gross Reproduction Rate(GRR)</b>			
Republic	3.16	1.40	1.05
Male'	1.98	0.80	0.71
Atolls	3.63	1.65	1.28

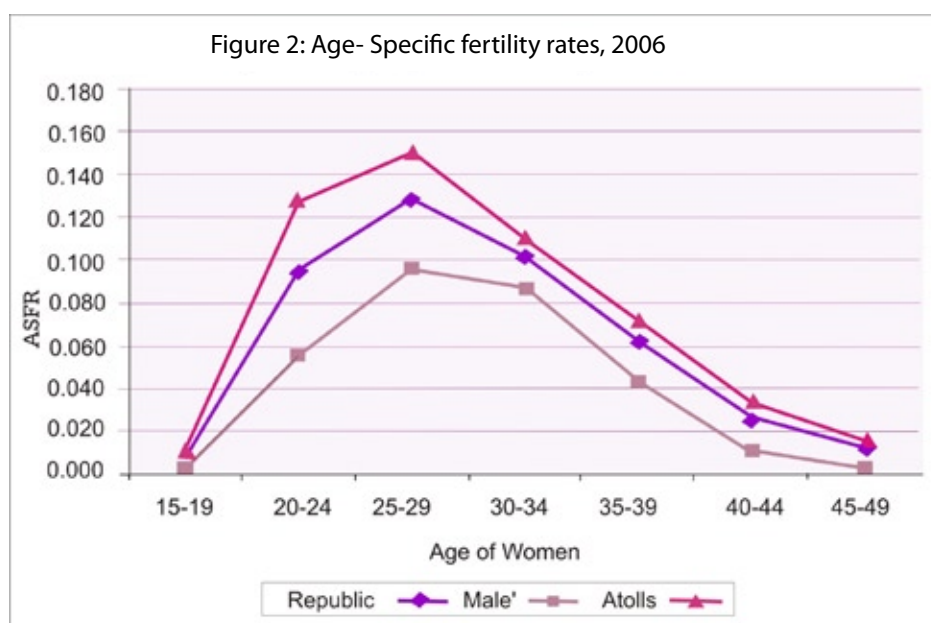
Comparing the trends it can be observed that fertility in the Maldives declined rapidly between 1990 and 2006. The GFR declined by two thirds during this period (1990-2006). Similarly, it can also be seen that in both census years fertility levels were, as expected, much lower in Male' than the atolls. In fact, according to current fertility data collected in the Census, fertility in Male' sank below one at GRR = 0.80 in 2000 and continued to decline, reaching 0.71 by 2006, while in the atolls, it hovered above one at GRR = 1.65 in 2000 but has almost reached replacement level by 2006 at 1.28. However, it can also be seen that the gap in the levels of fertility between Male' and the atolls has declined significantly during the period.

The acceleration of fertility decline in the Maldives in the recent past can also be seen from the pace of decline in the TFR. In 1990 the TFR for the whole country was as high as 6.4, with the rural population contributing to this high national TFR. By 2006 the national TFR has declined to 2.15. The TFR for the atoll population was 7.4 in 1990, declining to 2.6 in 2006. The corresponding TFR for Male' was 3.9 in 1990, coming down to 1.5 in 2006.

### 3. Age-Specific Fertility Rates

Direct estimates of ASFRs by region are presented in Figure 1 and Figure 2. These figures show significant differences in the levels and age pattern of fertility between Male' and the atolls. While the level of fertility at all ages is relatively higher in the atolls compared to Male', the fertility pattern in the atolls also shows an early child-bearing pattern in 2000, with the peak age of childbearing being 20 to 24. In the case of Male' the ASFR peaks at the age group 25 to 29. This shows the effects of delayed marriage and childbearing in Male' where the effects of modernization are stronger than in the atolls. As with all other aspects of development in the particular context of the Maldives, the urban trends in delayed fertility are quickly replicated in the atolls. As can be seen from the figures, there has been a shift in the peak childbearing age of women in the atolls from the 20-24 age group to the 25-29 age group between 2000 and 2006. Similarly, it also appears that more and more women in Male' are continuing to delay their fertility well into their thirties, thereby having a significant effect on their completed lifetime fertility.





## 4. Cumulative or Completed Fertility

Data on the number of children ever born by age group of women is used to analyze the levels and trends of fertility. Mean children ever born by age of mother is described in the literature in different ways: life time fertility, parity, cumulative fertility and completed fertility. Cumulative fertility by age of women, as reported in the censuses of 1990, 2000 and 2006 are given in Table 2.

Table 2: Reported cumulative fertility by age group of women and year of census, major regions, Maldives

Age Group of Women	Republic			Male'			Atolls		
	1990	2000	2006	1990	2000	2006	1990	2000	2006
15-19	0.284	0.067	0.154	0.127	0.026	0.054	0.360	0.093	0.263
20-24	1.817	0.800	1.086	1.206	0.393	0.771	2.053	1.033	1.261
25-29	3.533	2.150	1.799	2.665	1.355	1.386	3.877	2.511	2.022
30-34	5.039	3.629	2.811	3.991	2.532	2.081	5.418	4.081	3.228
35-39	6.412	5.116	3.928	5.088	3.803	2.915	6.896	5.656	4.524
40-44	7.257	6.271	5.232	6.336	4.812	3.966	7.581	6.811	5.894
45-49	7.290	7.198	6.328	6.458	6.003	4.974	7.534	7.671	6.975

Source: Figures for 1990 obtained from Ministry of Planning, Human Resources & Environment, 1996 (unpublished,

The following observations can be made from the above table. i) expected, the mean number of children ever born increases monotonically with the age of women, reaching its peak in the highest age group observed i.e., 45 to 49 years. This observation generally holds true for 1990, 2000 and 2006. ii) for all except the youngest two age groups of women, the average parity has declined significantly from one census to the other. Despite the significant decline in average parities, the completed fertility, as observed from the cumulative fertility of women aged 45 to 49 years, remains one of the highest in the SAARC region. This is due to the prevalence of high parities in the recent past. iii) While completed fertility of Maldivian women remains high, it has declined significantly over the past 16 years, leading to a rapid decline in current fertility in the Maldives. iv) Women living in the atolls have significantly more children in all age groups than women of the same age groups living in Male’.

## 5. Indirect Estimates of Fertility

Data on retrospective fertility can be used to derive estimates of recent fertility by using certain indirect estimation techniques. Based on an original proposition by Brass (1964), for adjusting reported data on births in the past year by comparing this data with the lifetime fertility of a woman (children ever born), several methods of estimating fertility using information on children ever born have been developed. He argues that even if the estimate of fertility rate derived from data on recent fertility could not be accepted due to the likelihood of errors in accurately reporting events corresponding to the period of reference, the age pattern of fertility provided by such data could be accepted, since the proportionate error might be more or less constant with mother’s age. Similarly, the likelihood of younger women, having experienced fertility more recently, to report their lifetime fertility more accurately than older women makes their lifetime fertility more reliable. Brass proposes the use of the two most reliable parts of this information to scale the age pattern of fertility from the reported births in the past year to match the level of fertility observed from the lifetime fertility of younger women.

Arriaga (1994) proposes a method based on the original Brass methods. The underlying assumptions of Arriaga’s technique are as follows: the completeness of reporting of births used to estimate the age-specific fertility rates is the same for all age groups of women; reporting of the average number of children ever born per woman is complete (at least for women under 30 years or 35 years of age); changes in fertility produce a linear change in the average number of children ever born per woman at each particular age of women (mainly at ages 15 to 35 years) between the two dates; and fertility occurs only between exact ages 15 and 50 years. Judging from the age pattern of mean parities and current fertility rates in Figures 1 and 2 and Table 2, these assumptions appear to be justified for the population of Maldives.

Estimates of fertility obtained by using Arriaga’s method are subject to two sources of errors: errors in the data on children ever born and errors in the age-specific fertility rates. These factors should be kept in mind when interpreting the estimates of fertility derived from such indirect techniques of estimation.

Table 3 shows estimates of TFR by the Arriaga method from data on reported age-specific fertility, adjusted on the basis of children ever born, by age of mother, from the Censuses of 2000 and 2006. It can be observed that the estimates of Total Fertility Rates by the indirect method are lower for the Republic and for the Atolls but slightly higher for Male' compared to the direct estimates in Table 1 for the 2006 Census, but higher for the 2000 Census. The slight upward adjustment for the 2000 Census estimates and the slight downward adjustment for the estimates from the 2006 Census can be partly explained by the half-year correction made in the calculation of the estimates by the indirect method presented here. The most important point here is that both direct and indirect estimates of fertility for the Maldives show that fertility levels have declined to very low levels by 2006 and that the decline has been very rapid. While the level of fertility is much lower in Male' compared to the atolls, the pace of fertility decline in the atolls has been instrumental in the overall fertility decline in the Maldives during the past decade or so.

Table 3: Indirect estimates of fertility by the arriaga method  
( ASFRs Adjusted on the Basis of Adjustment Factors for Age  
Groups 20-29), Censuses of 2000 and 2006

Region	TFR/Year	
	2000*	2005*
Republic	2.36	1.91
Male'	2.59	1.72
Atolls	3.83	2.04

\* Adjusted to september of given year.

## 6. Fertility Differentials

The urban-rural differences in the levels and trends in fertility discussed above prompt us to examine these differentials more closely for more focused policy interventions. It is therefore important to analyze fertility levels by geographic divisions, educational levels and labour force participation. Due to the smallness of the population and the relatively small numbers of events (births) occurring in a given year in the country, estimates of fertility using direct methods may not be the most appropriate to study differentials by small groups of the population. However, the level of data disaggregation at the time of this analysis does not provide the kinds of inputs required for indirect estimation of fertility by geographic and socio-economic characteristics; these estimates will be provided by the direct method based on reported births in the year preceding the census by age of women.

## 7. Geographical Differentials

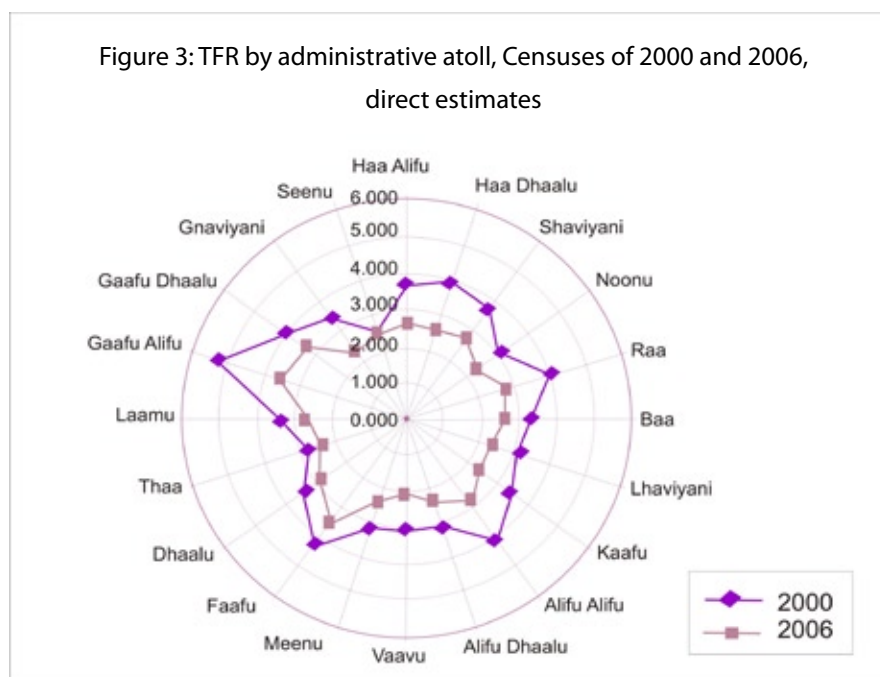
Table 4: Total fertility rate (TFR) by administrative atoll, 2000 and 2006 Censuses

Administrative Atoll	2000	2006
North Thiladhunmathi (Haa alifu)	3.667	2.641
South Thiladhunmathi (Haa Dhaalu)	3.889	2.585
North Miladhunmadhulu (Shaviyani)	3.602	2.725
South Miladhunmadulu (Noonu)	3.089	2.282
North Maalhosmadulu (Raa)	3.958	2.762
South Maalhosmadulu (Baa)	3.283	2.479
Faadhippolhu (Lhaviyani)	3.085	2.267
Male' Atholhu (Kaafu)	3.324	2.499
North Ari (Alifu Alifu)	4.064	2.779
South Ari (Alifu Dhaalu)	3.058	2.277
Felhidu Atholhu (Vaavu)	3.029	1.980
Mulakatholhu (Meemu)	3.088	2.312
North Nilandhe (Faafu)	4.189	3.466
South Nilandhe (Dhaalu)	3.272	2.761
Kolhumadulu (Thaa)	2.676	2.311
Hadhdhummathi (Laamu)	3.333	2.695
North Huvadhu (Gaafu Alifu)	5.202	3.459
South Huvadhu (Gaafu Dhaalu)	3.976	3.268
Fuvammulaku (Gnaviyani)	3.394	2.261
Addu (Seenu)	2.442	2.446

It can be seen from Table 4 and Figure 1 that fertility has declined significantly throughout the Maldives. Comparing all atolls, the lowest TFR in 2000 was observed in Addu (2.442) while the highest was in Gaafu Alifu (5.202). In 2000, three Atolls had TFRs above 4, these being Alifu Alifu, Faafu, and Gaafu Alifu. However, 15 Atolls had TFRs between 3 and 4. By 2006, the geographical pattern of fertility has changed significantly. TFRs lower than Addu's was observed in seven Atolls, while TFR in Addu remained almost stagnant, and three Atolls had TFRs of three or higher. The lowest TFR in 2006 was observed in Vaavu (1.980) and the highest in Faafu (3.466). The small size of the population in Vaavu (1502) and the small number of annual births reported by all women (26) in the 2006 Census is likely to influence the low fertility observed for Vaavu.

Figure 3 shows the geographical pattern of fertility in the Maldives very clearly. It shows that the pattern of fertility distribution has changed and that fertility levels have declined, although some of the atolls that experienced higher levels of fertility in 2000 continue to experience comparatively higher levels of fertility in relation to the rest of the atolls.

Figure 3: TFR by administrative atoll, Censuses of 2000 and 2006, direct estimates



## 8. Educational Differentials

It is well known that the fertility of a woman is negatively associated with her level of education. Education exposes women to information, empowers them, makes them more likely to be employed outside their home environment and makes them more aware of their own health and the health of their children – all of which are negatively associated with the number children she will have during her reproductive life.

Table 5: Total fertility rate by level of mothers education, direct estimates, Maldives

Education Level	Total Fertility Rate	
	2000	2006
Primary (Grades 1-5)	3.04	2.68
Middle (Grades 6-7)	2.68	2.59
Secondary (Grades 8-10)	2.23	1.93
Tertiary (Above Grade 12)	1.35	-

It can be seen from Table 5 that as the level of mother's education increases, the level of fertility as indicated by the Total Fertility Rate declines significantly. It can also be observed that fertility has declined significantly for each educational category of women during the intercensal period. It should, however, be noted here that there was a large category of women that did not report their level of education and hence were not included in the analysis. The fertility level of those who did not report their educational level was calculated as 1.07. For 2006 as well, it was not possible to compute the fertility level for 'tertiary and above'.

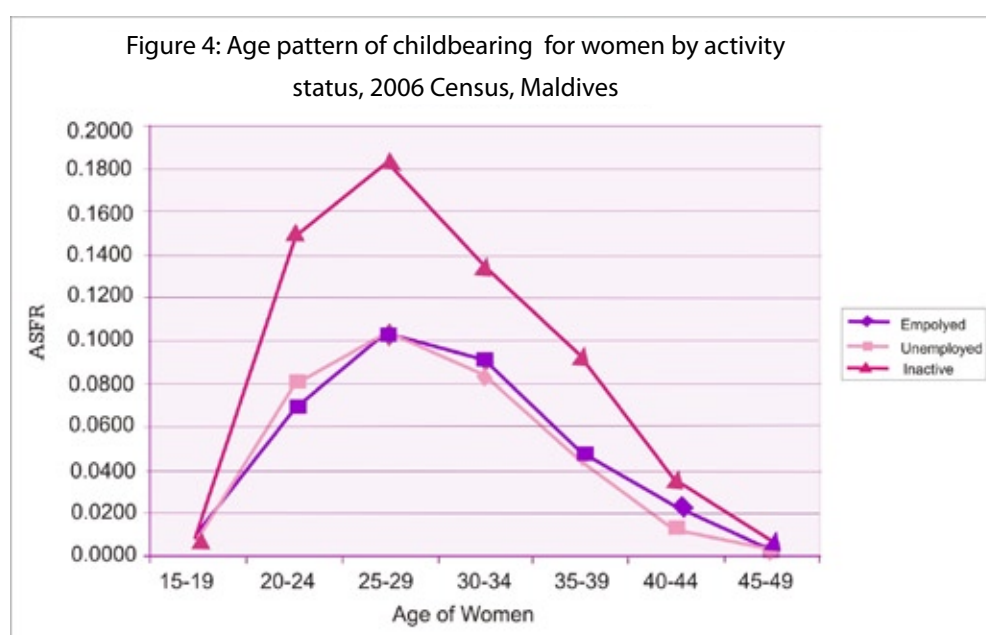
## 9. Fertility Differentials By Status In Employment

Educational level and employment status are positively correlated variables and hence display a similar type of association with fertility. Economically active women are more likely to experience lower fertility than those who are not economically active. This is because such women are more likely to be educated and therefore more involved in making decisions on family size, more likely to delay their first birth and more likely to limit their family size through child-spacing and by desired family size. Economically inactive women are more likely to marry early and start early child-bearing and are less likely to be involved in making decisions about their family size. Table 6 shows that there is a significant difference between the levels of fertility of economically active women (employed women and unemployed women) and those who are not economically active.

Table 6: Fertility by activity status of women, 2006 Census

Activity status	TFR
Employed	1.71
Unemployed	1.65
Not Economically Active	3.04

Figure 4 further illustrates the differences in the levels of fertility between the two groups of women. While the peak age of childbearing remains the same for both categories, economically inactive women have a much higher level of fertility at all age groups compared to the economically active group of women. Furthermore, the age pattern of fertility for economically active women is shifting towards the older age groups with the levels of fertility of women in the age group 25-29 leveling out with the next age group of women.



# 10. Conclusion

This preliminary analysis of fertility shows that with the socio-economic developments that have occurred in the country during the past decades, fertility levels continue to fall steadily in the Maldives. The fertility experience of the Maldives complies with the contemporary theoretical arguments and empirical knowledge of the fertility of human populations. The rapidity of change of fertility in the Maldives can be compared with fertility experiences of other small island countries which have gone through rapid fertility declines in the recent years.

In order to devise effective and sustainable policies for the social and economic development of the Maldives, it is imperative to gain a thorough understanding of the dynamics of fertility in the Maldives and the implications of rapid fertility decline. This can be achieved through a more detailed and in-depth analysis of the existing individual level data from the censuses and various surveys, supported by micro-level inquiries of a qualitative nature. It is recommended that such detailed research be conducted at the earliest opportunity, as the country is now at a crucial moment in its demographic and age-structural transition. Current policy decisions regarding the population, particularly those that have an impact on fertility levels, will have serious and long-lasting implications on the sustainability of the socio-economic development of the nation.