

## REGIONAL FERTILITY TRENDS IN MOZAMBIQUE

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This article increases our knowledge of Mozambique's demography by assessing the nature and magnitude of fertility decline, using the 1980 and 1997 censuses and the 1997 Demographic and Health Survey. Several robust methods, including P/F ratios from census and birth history data, the own-children procedure (census data), and estimates of censored parity progression ratios (adjusted for truncation bias) are used to identify fertility trends. Regional differences in fertility trends are discussed in the light of the proximate determinants of fertility. Fertility decline has started in Mozambique but the magnitude of the decline differs among the three administrative regions in the country. In Southern Region the fertility decline is well established, while in Northern and Central regions the decline is still incipient.

**Keywords:** Africa, Sub-Saharan Africa, Mozambique, fertility, fertility trends, proximate determinants, regional differences, pathological infertility, marriage, contraceptive use

Although there is increasing evidence of fertility decline in many countries of sub-Saharan Africa (Cohen 1993, 1998; Mturi and Hinde 1994; Kalipeni 1995; Kirk and Pillet 1998; Hinde and Mturi 2000; Caldwell and Caldwell 2001; Muhwava 2002), it is still unclear whether a trend towards low fertility has begun in Mozambique. In the more recent analyses of fertility trends in sub-Saharan Africa, either Mozambique was omitted (Kirk and Pillet 1998), probably owing to unavailability of data, or no fertility change was reported (Kalipeni 1995; Cohen 1998).

Most fertility-related studies in Mozambique are either reports based on censuses (CCR 1983; INE 1998b) and national surveys (Gaspar and Ruiz 1994; Gaspar *et al.* 1998; INE 1998a), or micro-areas studies (Agadjanian 1995; Lopes and Santos 1995a, b, 1996; Mazive 1999), mainly on Maputo City, the nation's capital. Before 1980 the total fertility rate (TFR) remained almost unchanged at between six and seven children per woman (Gaspar 1989); more recent estimates suggest that the TFR remained above six in the 1980s, declining slightly to between 5.6 and 6.0 in the late 1990s (CCR 1983; Gaspar *et al.* 1998; INE 1998a, b). Thus, at first glance, it would seem that Mozambique has experienced a slow decline in fertility in the 1990s (INE 1998b), but because the TFR is not a robust measure to trace changes in fertility

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behaviour (Feeney 1988; Luther and Pejaranonda 1991) a more comprehensive assessment of fertility trends is necessary.

In this paper more robust methods of identifying fertility trends are applied to recently available census and survey data to assess fertility trends in Mozambique. The study reconstructs the birth histories from the 1997 census by applying the own-children method and uses the birth histories from the 1997 Demographic and Health Survey (DHS) to identify fertility change and to analyse the extent to which those changes are related to changes in the timing or spacing of births. It also assesses, by an analysis of parity progression, whether the fertility decline, if any, is due to changes in the onset of reproduction, the spacing of births or the proportion of women reaching high-order parities. The analysis is carried out at the national level as well as for the three major administrative regions, Northern, Central and Southern.

### **The study context**

Mozambique is a southeastern African country with a projected population of 18 million people in 2003 (INE 1999b). After gaining independence from Portugal in 1975, Mozambique went through 16 years (1976–1992) of civil war between the socialist government of the ruling FRELIMO (Front for the Liberation of Mozambique) and the RENAMO (National Resistance Movement) opposition movement. Civil war and the socialist economic development model of central planning with a policy of rural collectivization and state monopoly of all marketing and financial services, adopted after independence, led to economic hardship in the 1980s. In response, in 1987, the Mozambican government introduced an Economic Rehabilitation Program funded by the International Monetary Fund and the World Bank, which reversed the declining Gross Domestic Product (GDP) of the late 1980s to high positive growth in the 1990s (Government of Mozambique and UNICEF 1993). Despite exceptional GDP growth, especially since the end of the civil war in 1992, Mozambique remains one of the world's poorest countries. The per capita income was estimated at US\$230 in 1999 (World Bank 2000: Table 1), and about 70 per cent of the population lived below the poverty line of US\$1 a day in 1997 (Ministry of Planning and Finance 1998).

The country is divided into three regions that are distinct in both cultural characteristics and level of development, and access to resources, infrastructure and services. Northern region is predominantly matrilineal and Muslim whereas Central and Southern Regions are patrilineal and Christian. In socio-economic development, Southern Region is the most developed and Northern Region the poorest. For example, in 1998 the United Nations Human Development Index (HDI) score and real GDP per capita in Southern Region were twice as high as in Northern and Central Regions. Less than 25 per cent of the population in Northern and Central Regions had access to health services (including antenatal care, childbirth in a maternity ward or health centre, doctor, nurse or midwife in the village), compared with half in Southern Region. In 1997, only 40 per cent of the population was literate (28% in Northern, 37% in Central and 61% in Southern) and there was a large difference between the sexes: only 25 per cent of females were literate compared with 55 per cent of males (Arnaldo 2003: 15).

**Table 1** Estimates of total fertility rate by region, Mozambique, 1980 and 1997

Region	Total fertility rate						% Change (Censuses)	
	1980 Census		1997 Census		1997 DHS		P/F	RGM
	P/F	RGM	P/F	RGM	P/F	RGM		
Northern	7.4	6.7	6.6	6.4	6.8	6.5	-10.8	-4.5
Central	8.7	7.9	7.0	6.7	6.7	6.7	-19.5	-14.4
Southern	6.5	6.2	5.2	5.1	4.9	5.3	-20.0	-16.5
Mozambique	7.7	7.1	6.4	6.1	5.9	6.2	-16.8	-14.4

Source: Computed from the 1980, 1997 censuses, 1997 DHS.

### Fertility data in Mozambique

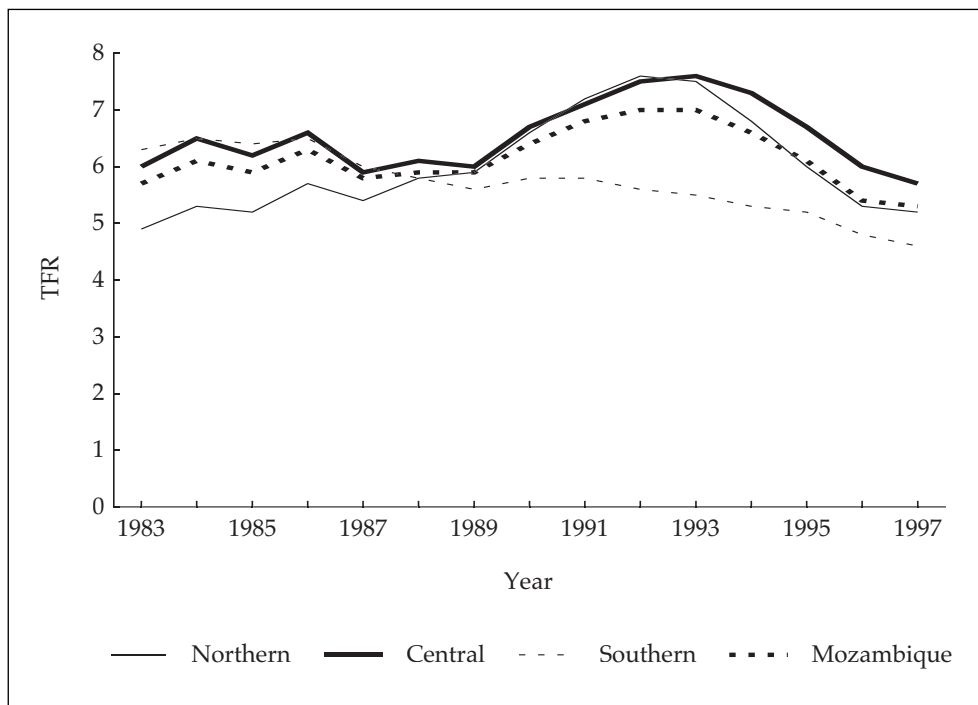
Although Mozambique has a long history of census taking, dating back to 1930 (INE 1999a), data from censuses conducted before 1980 were unavailable for this analysis. Thus, the assessment of fertility trends in this study relies mainly on the 1980 and 1997 censuses and the 1997 DHS. The estimated TFR was 7.1 in 1950, falling slightly to 7.0 in 1960 and then to 6.6 in 1970, before rising to 7.1 in 1980 (INE n.d.). The increase in TFR from 1970 to 1980 may partly reflect the poor quality of data in the 1970 census, which may have led to an underestimation of TFR in comparison to the 1980 census (Gaspar 1989); but it may also be due to a reduction in pathological infertility following the post-independence government's efforts in providing universal and free access to health services and vaccination campaigns that contributed to the reduction of gonorrhoea and other STDs associated with infertility (Segall 1977).

Table 1 presents TFRs from the 1980 and 1997 censuses estimated using the P/F ratio (United Nations 1983) and the Relational Gompertz Model (RGM) (Brass 1981; Zaba 1981). The estimates from the two methods are fairly consistent although with small differences reflecting differences in the underlying assumptions and sensitivity to reporting errors. Except for the 1997 DHS, the estimates derived from the P/F ratio are consistently higher than those from the RGM, reflecting the omission of current births caused by the misperception of the reference period of one year. Overall, the TFR appears to have declined from 1980 to 1997, with the largest decline being observed in Southern Region and the smallest in Northern Region.

### Trends in annual TFR from 1983 to 1997

The previous section has shown that there was a 14 per cent decline in the national TFR from 1980 to 1997. To assess if such a decline was consistent throughout the period considered, the own-children method (Cho, Retherford and Choe 1986) was applied to data from the 1997 census to generate estimates of fertility for the 15 years before the census. Children were matched to their mothers on the basis of age,

**Figure 1** Own-children estimates of total fertility rate by region, Mozambique, 1983–1997



Source: Computed from 1997 Census.

sex and relationship to the head of household. Life table survival ratios for both children and women were obtained from the West Family of the Coale and Demeny Regional Model Life Tables (Coale and Demeny 1983), selected on the basis of the  ${}_5q_0$  values estimated from the census child survivorship data using the Trussell variant of the children ever born/children surviving method (United Nations 1983: 73–96). Mortality was assumed constant over the period of estimation since improvement in mortality was hindered by civil war (see Gaspar 2002) and also because own-children estimates are not very sensitive to errors in the level and pattern of mortality (Retherford *et al.* 1979; Cho *et al.* 1986).

Figure 1 shows the annual TFRs for the period 1983–1997 obtained from the 1997 census by the application of the own-children method. The estimates are three-year moving averages (except for 1983 and 1997 where two-year averages were used), used to lessen the distortions due to age misreporting and the possible effects of period adverse factors that may not be related to long-term trends (Cho *et al.* 1986: 6; Kinfu 2000: 67–68). The national estimates and those of Northern and Central Regions do not give clear evidence of a consistent fertility decline during the period of estimation, which appears to refute the 14 per cent decline suggested in the previous section. Nevertheless, there was a consistent decline for Southern Region, from more than six children per woman in the early 1980s to just under five children per woman in 1997.

The relatively low levels of fertility observed between 1987 and 1989, nationally and for Central and Southern Regions, are likely to be related to the effects of civil war and economic hardship. In this period the war was more intense and Central Region was the most affected. According to Lindstrom and Berhanu (1999: 255) civil war may result in significantly lower completed fertility for younger cohorts of women and can delay marriage. In their study in Ethiopia, they found that spousal separation was the main mechanism by which the intensity of military conflict affected fertility. Agadjanian and Prata (2001, 2002) found that in Angola war had a negative effect on fertility. Also, civil war as well as the failure of economic programs under the socialist regime may have led to an economic crisis in the late 1980s, when Mozambique recorded its lowest GDP, about 80 US dollars per capita (Mozambique 1998: Graph 4.1). It has been argued that economic crisis may depress fertility (Lee 1990; National Research Council 1993; Palloni, Hill and Aguirre 1996; Eloundou-Enyegue, Stokes and Cornwell 2000). However, a study in Cameroon (Eloundou-Enyegue *et al.* 2000: 68) suggests that an 'economic crisis-induced' fertility decline is likely to be confined to urban areas, because of their vulnerability to market shocks.

The national TFR and those for Northern and Central Regions increased from 1990 to 1994. Such a trend may be genuine or an artefact of age misreporting. The period of high levels of fertility, 1990–1994, coincides with two major historical events, the end of the civil war in 1992 and the first democratic elections in 1994, which may have been used in the estimation of age, resulting in more children reported at ages between three and six years. This hypothesis is strengthened by the fact that this pattern is only clearly evident in Northern and Central Regions, where because of low levels of education the reporting of age was poor. On the other hand, the rise of TFR after 1990 may be a response to economic growth and political stability brought by the introduction of the Economic Rehabilitation Program in 1987 (Mozambique 1998) and the beginning of peace talks between the Government and the RENAMO rebel movement which led to the end of civil war in 1992. However, the effect of reporting errors cannot be ruled out.

### **Cohort and period fertility from birth histories**

This section assesses fertility trends from 1997 DHS birth histories by applying Hobcraft, Goldman and Chidambaram's (1982) method. Table 2 presents the resulting cohort-period age-specific fertility rates for successive five-year periods before the survey for the country as a whole as well as for the three regions. These rates show a modest decline in fertility in the two most recent periods (5–9 and 0–4 years) before the survey. The decline appears to occur at all ages, which is consistent with the Caldwell, Orubuloye and Caldwell (1992: 220) prediction of a new type of fertility transition in Africa in which the fertility decline would not be accompanied by a change in the age distribution of fertility as happened in historic Europe and in the developing countries of Asia and Latin America, but with higher declines at ages over 30. Between the periods 5–9 and 15–19 years before the survey, there is an increase in fertility at older ages, possibly due to improved health care and a consequent reduction in primary and secondary infertility (Arnaldo 2003: Chapter 7); and a decrease at younger ages. For the periods 15 or more years before the survey the rates show an unclear trend suggesting the presence of distortion in the data,

**Table 2 Cohort-period age-specific fertility rates and percentage change<sup>a</sup> by region, Mozambique, 1968–1997**

Age	Period before the survey										
	0-4	$_{0-4}\Delta_{5-9}$	5-9	$_{5-9}\Delta_{10-14}$	10-14	$_{10-14}\Delta_{15-19}$	15-19	$_{15-19}\Delta_{20-24}$	20-24	$_{20-24}\Delta_{25-29}$	25-29
Mozambique											
15–19	0.173	–4.8	0.182	–5.0	0.191	–2.4	0.196	–0.9	0.198	3.9	0.190
20–24	0.230	–1.5	0.234	–0.8	0.236	–1.9	0.240	2.8	0.234	27.2	0.184
25–29	0.257	–7.6	0.278	–0.6	0.280	–0.7	0.282	26.9	0.222		
30–34	0.203	–20.9	0.256	–2.2	0.262	10.9	0.236				
35–39	0.174	–15.6	0.206	5.3	0.195						
40–44	0.113	–15.6	0.133								
45–49	0.056										
TFR <35	4.3		4.8		4.8		4.8				
Northern Region											
15–19	0.202	0.7	0.200	–0.2	0.201	–4.1	0.209	–4.2	0.218	7.8	0.203
20–24	0.231	–13.1	0.266	–8.0	0.289	16.6	0.248	17.9	0.210	35.5	0.155
25–29	0.243	–16.0	0.290	0.8	0.287	11.3	0.258	27.8	0.202		
30–34	0.197	–32.7	0.293	11.3	0.263	21.8	0.216				
35–39	0.160	–19.1	0.198	9.5	0.181						
40–44	0.120	–1.1	0.121								
45–49	0.043										
TFR <35	4.4		5.2		5.2		4.7				
Central Region											
15–19	0.181	–8.0	0.196	–1.6	0.199	–2.5	0.205	–2.4	0.210	7.0	0.196
20–24	0.253	2.9	0.246	10.6	0.222	–5.9	0.236	–1.1	0.239	36.8	0.175
25–29	0.274	–8.3	0.298	–0.6	0.300	17.9	0.254	1.5	0.250		
30–34	0.201	–24.7	0.267	5.2	0.254	–3.7	0.264				
35–39	0.192	–19.0	0.237	2.0	0.232						
40–44	0.114	–40.4	0.191								
45–49	0.075										
TFR <35	4.5		5.0		4.9		4.8				
Southern Region											
15–19	0.125	–8.4	0.136	–3.0	0.140	–7.3	0.151	–5.7	0.160	9.8	0.146
20–24	0.187	–4.6	0.196	–17.9	0.239	–0.4	0.240	–0.9	0.242	26.9	0.191
25–29	0.208	–12.1	0.237	–11.3	0.267	–10.9	0.300	20.7	0.248		
30–34	0.182	–9.6	0.201	–20.6	0.253	–0.8	0.255				
35–39	0.135	–21.1	0.172	–12.5	0.196						
40–44	0.097	–15.9	0.115								
45–49	0.042										
TFR <35	3.5		3.9		4.5		4.7				

a  $\Delta$  denotes percentage change.

Source: Computed from 1997 DHS.

probably due to omissions and birth displacement, which tends to be greater for earlier periods. As the female literacy rate is low in Mozambique (26% in 1997), the data are more likely to have been affected by reporting errors since women, especially older ones, may have found it difficult to reckon the dates of births for their children, especially those borne many years before the survey. The data for the five-year period before the survey may have suffered little from misdating because the survey was conducted about five years after the end of the war (1992), making it easier for women to distinguish post-war from pre-war births.

In regional perspective, the rates show some differences in fertility trends. The age-specific fertility rates for Southern Region show declining fertility, beginning as early as 15 years before the survey. For Northern and Central Regions the rates do not show a consistent pattern of decline, although a declining trend is apparent for the most recent period. These different trends by region are also supported by the cumulated TFR of women below 35 years of age, which for Southern Region declined consistently from 4.7 children per woman 15–19 years before the survey to 3.5 in the five-year period before the survey. For Northern and Central Regions the decline is only apparent from the period 5–9 years before the survey. For Northern Region the increase in fertility for the period 10–14 to 5–9 years before the survey is consistent with the trend suggested by the own-children estimates in the previous section.

The TFRs for women below the age of 35 obtained from the DHS birth histories for 1983 to 1997 can be compared with those obtained from the own-children method. Table 3 presents such a comparison by five-year time period. For the whole country, the trends shown by the two sets of data are similar, but the TFR from the census is slightly higher in the most recent period and lower in earlier periods before the census than the estimates from the DHS. For Southern Region the two sources show identical trends. For Northern and Central Regions, the census shows increasing fertility, with higher values for the most recent period, while the DHS show high values in the remote periods before the survey and declining fertility in the most recent period. These inconsistencies may be related to differential reporting errors. As discussed earlier, the own-children TFR for 1993–97 may be over-estimated because of age misreporting relating to the use of the 1992 end of civil war and 1994 democratic election as historical events in the estimation of age. The difference between DHS and own-children estimates for Northern Region in the period 1983–87 may be due to underestimation of the latter.

The availability of birth history data also allows the computation of P/F ratios without interpolation or use of an external model (Hobcraft *et al.* 1982). Hobcraft *et al.* (1982: 299) recommend the exclusion of the common cells (common for a cohort's experience and the equivalent period cumulative fertility) so that the ratios are more sensitive indicators of the difference between cohort and period fertility since the common cells tend to force the ratios towards unity (Hobcraft *et al.* 1982: 299). Table 4 presents the P/F ratios obtained by the application of this method. For Southern Region the ratios for the two most recent periods before the survey are mostly above one and show an increasing trend over age, which is indicative of fertility decline. However, as in the other two regions and the country as a whole, the ratios for the 45–49 age group are less than those for the 40–44 age group, suggesting omission of births by older women. For the country as a whole and for Central and Northern Regions, the P/F ratios for the most recent period before the survey

**Table 3** Comparison of total fertility rate for women below age 35 by time period, Mozambique, 1983–1997

	1993–97	1988–92	1983–87
Mozambique			
DHS birth histories	4.3	4.8	4.8
Census own-children method	4.4	4.5	4.4
Northern Region			
DHS birth histories	4.4	5.2	5.2
Census own-children method	4.7	4.8	4.0
Central Region			
DHS birth histories	4.5	5.0	4.9
Census own-children method	4.9	4.7	4.6
Southern Region			
DHS birth histories	3.5	3.9	4.5
Census own-children method	3.4	3.8	4.6

Source: Computed from 1997 Census and 1997 DHS.

are above one (except for the last age group), but there is no clear increase with age of woman. For the period 5–9 years before the survey the ratios do not show a clear trend. This implies that the fertility decline, if any, in these regions is smaller and more recent than that in Southern Region. The P/F ratios for periods 10–14 years or more before the survey are near unity and show a decreasing pattern with age. For Northern Region the ratios are lower than one at all ages and indicate increasing fertility over time, which is consistent with the previous analysis (see Tables 2 and 3).

### Trends in parity progression

In the above analyses aggregate measures of period fertility were used to assess trends. However, such measures do not distinguish the impact of family size limitation from the temporary effects of changes in age at marriage and length of birth intervals (Collumbien, Timæus and Acharya 1997: 10). Since trends in fertility reflect changes in both the pace and quantum of reproduction (Collumbien *et al.* 1997), it is important to assess changes that are due to behavioural change. To detect a decline in family sizes resulting from the adoption of birth control within unions, parity-specific measures should be examined. A good measure for such a task is the parity progression ratio (PPR), defined as the proportion of women who having had  $n$  births go on to have  $n+1$  births; however, it can be calculated precisely only for cohorts of completed fertility. In order to investigate recent trends in fertility it is necessary to estimate parity progression for cohorts of women who are still in the



**Table 4** P/F ratios from birth histories by region, Mozambique, 1972–1997

Age	Period before the survey				
	0–4	5–9	10–14	15–19	20–24
Mozambique					
20–24	1.191	1.180	0.956	1.168	0.854
25–29	1.099	1.044	1.046	0.980	0.535
30–34	1.089	1.059	0.991	0.659	
35–39	1.164	1.024	0.733		
40–44	1.152	0.793			
45–49	0.927				
Northern Region					
20–24	1.091	1.231	0.806	1.049	0.958
25–29	1.195	1.066	0.855	0.888	0.478
30–34	1.192	0.981	0.809	0.578	
35–39	1.219	0.878	0.586		
40–44	1.110	0.652			
45–49	0.829				
Central Region					
20–24	1.189	1.025	1.152	1.143	0.831
25–29	1.020	0.982	1.130	1.001	0.483
30–34	1.038	1.035	0.969	0.715	
35–39	1.146	0.943	0.794		
40–44	1.089	0.810			
45–49	1.002				
Southern Region					
20–24	1.099	1.034	1.081	1.064	0.904
25–29	1.082	1.176	1.057	0.990	0.473
30–34	1.209	1.174	1.063	0.635	
35–39	1.240	1.221	0.771		
40–44	1.329	0.945			
45–49	1.077				

Source: Computed from 1997 DHS.

reproductive ages. Since PPRs cannot be measured when fertility is incomplete,  $B_{60}$ , the proportion of women moving to the next order within 60 months (Rodriguez and Hobcraft 1980), is used instead in this analysis.  $B_{60}$ , or the censored parity progression ratio, is a good approximation of the PPR because only a small proportion of births occur more than five years after the previous one (Brass and Juarez 1983: 6; Collumbien *et al.* 1997: 10–11). However,  $B_{60}$  is subject to two types of bias caused by the nature of incomplete birth histories: censoring and selectivity (Rodriguez

and Hobcraft 1980). To adjust for this bias, the truncation approach (Brass and Juarez 1983) was applied.

Table 5 presents the adjusted censored parity progression ratios estimated using incomplete birth histories from the 1997 DHS for the whole country and for the three regions. The national ratios are close to 95 per cent at low birth orders for the oldest cohort (aged 45–49), declining to between 80 and 90 per cent for progressions from parities five to eight, with a further decrease to about 75 per cent for the progression to the ninth birth. Overall and consistent with the regional pattern in TFR, the highest ratios are found in Central Region and the lowest in Southern Region. For example, 88 per cent of women 20–24 in Central Region who already had two children progressed to a third birth, against 77 per cent in Northern and 65 per cent in Southern Region.

Inspection of progression ratios by cohort of women shows a decreasing trend in progression from older to younger cohorts. The reductions in the ratios are greater at higher birth orders: progression to the second birth for women aged 25–29 (0.889) is six per cent lower than that for women aged 45–49 (0.949) and for progression to the fourth birth the difference is even larger, 15 per cent. However, greater reductions at higher orders may not mean necessarily that family restriction is more severe at higher than lower orders, since the measures are for different time periods (Brass, Juarez and Scott 1995: 3). Progression from first to second birth for women aged in their 40s at the time of the survey took place many years before the progression from first to second birth for women in their twenties. Thus, the trends in progression from first to second birth for the youngest age group may be comparable with trends in higher-order progressions for the older age groups, and the difference in the strength of these trends may therefore be due to acceleration over time rather than the effect of family size (Brass *et al.* 1995: 3).

Regional comparison of trends in parity progression ratios suggests a more pronounced pattern of decline in Southern Region. For instance, progression from third to fourth birth for the cohort aged 25–29 is 26 per cent lower than that for the cohort aged 45–49 in Southern Region, 11 per cent lower in Central and 12 per cent lower in Northern Region. This greater suggested fertility decline in Southern Region is consistent with the trends shown by the above analysis of period measures. However, in all regions the progression ratios show some fluctuation that may be related to sampling errors and reporting errors.

Table 6 presents censored parity progression ratios by time period computed from Table 5 following Brass *et al.* (1995). Consistent with earlier evidence, these values indicate that changes in parity progression ratios more than ten years before the survey were small and varied in direction. Evidence of decline in the ratios is seen from the late 1980s, which seems consistent with the conclusion by Brass *et al.* (1995: 6) that transition to lower fertility through family limitation became widespread in sub-Saharan Africa in the 1980s. Brass *et al.* (1995: 6) found that in most countries there was a correlation between reductions in parity progression ratios and increased contraception.

The reduction in parity progression ratios seems to occur at the same pace across all ages and birth orders, which is again consistent with the prediction by Caldwell *et al.* (1992: 220). The apparent high speed of decline in the last five years before the survey for the progressions to sixth and eighth births (Mozambique), third and sixth births (Northern Region), seventh birth (Central Region), and to third birth

**Table 5 Censored parity progression ratios<sup>a</sup> by age of women and region, Mozambique, 1997**

Age	Progression from parity i to i+1							
	1 to 2	2 to 3	3 to 4	4 to 5	5 to 6	6 to 7	7 to 8	8 to 9
Mozambique								
15–19	0.672							
20–24	0.872	0.785	0.764					
25–29	0.889	0.878	0.813	0.791	0.832	0.677		
30–34	0.970	0.904	0.883	0.791	0.781	0.780	0.794	0.757
35–39	0.958	0.921	0.946	0.903	0.875	0.765	0.670	0.680
40–44	0.999	0.989	0.937	0.899	0.898	0.833	0.800	0.727
45–49	0.949	0.963	0.954	0.920	0.896	0.860	0.837	0.743
Northern Region								
15–19	0.725							
20–24	0.879	0.766	0.863					
25–29	0.883	0.885	0.837	0.765	0.835			
30–34	0.955	0.961	0.907	0.781	0.716	0.772		
35–39	0.958	0.880	0.942	0.924	0.899	0.798	0.814	
40–44	0.977	0.943	0.914	0.951	0.894	0.902	0.896	0.839
45–49	0.936	0.968	0.951	0.883	0.892	0.832	0.847	0.739
Central Region								
15–19	0.309							
20–24	0.892	0.882	0.670					
25–29	0.932	0.913	0.859	0.793	0.968			
30–34	0.973	0.917	0.896	0.788	0.898	0.764		
35–39	0.989	0.958	0.955	0.920	0.949	0.771	0.560	
40–44	0.998	0.994	0.957	0.872	0.872	0.861	0.842	0.893
45–49	0.983	0.975	0.962	0.946	0.926	0.882	0.827	0.778
Southern Region								
15–19	0.688							
20–24	0.842	0.653						
25–29	0.846	0.820	0.705	0.820				
30–34	0.976	0.857	0.852	0.791	0.674	0.810		
35–39	0.928	0.911	0.934	0.872	0.778	0.724	0.650	
40–44	0.999	0.978	0.931	0.889	0.918	0.777	0.720	0.495
45–49	0.934	0.948	0.950	0.926	0.873	0.857	0.834	0.714

a The minimum number of cases considered was 100.

Source: Computed from 1997 DHS.

**Table 6** Censored parity progression ratios and percentage change<sup>a</sup> by time period and region, Mozambique, 1997

Progression i to i+1:	Years preceding the survey								
	0	${}_0\Delta_5$	5	${}_5\Delta_{10}$	10	${}_{10}\Delta_{15}$	15	${}_{15}\Delta_{20}$	20
Mozambique									
1 to 2	0.872	-1.9	0.889	-8.3	0.970	1.2	0.958	-4.1	0.999
2 to 3	0.832	-6.6	0.891	-2.4	0.913	-4.5	0.955	-2.1	0.976
3 to 4	0.813	-8.0	0.883	-6.6	0.946	1.0	0.937	-1.8	0.954
4 to 5	0.791	-6.6	0.847	-6.0	0.901	-0.9	0.909		
5 to 6	0.781	-10.8	0.875	-2.5	0.898	0.2	0.896		
6 to 7	0.773	-3.3	0.799	-5.6	0.846				
7 to 8	0.670	-16.3	0.800	-4.4	0.837				
Northern Region									
1 to 2	0.879	-0.5	0.883	-7.5	0.955	-0.3	0.958	-2.0	0.977
2 to 3	0.826	-10.5	0.923	0.3	0.920	1.0	0.911	-4.6	0.955
3 to 4	0.837	-7.7	0.907	-3.7	0.942	3.0	0.914	-3.8	0.951
4 to 5	0.773	-9.3	0.852	-9.1	0.937	2.2	0.917		
5 to 6	0.716	-20.3	0.899	0.5	0.894	0.2	0.892		
6 to 7	0.785	-7.7	0.850	-1.9	0.867				
7 to 8	0.814	-9.2	0.896	5.9	0.847				
Central Region									
1 to 2	0.892	-4.3	0.932	-4.2	0.973	-1.6	0.989	-1.4	1.003
2 to 3	0.898	-1.9	0.915	-2.4	0.937	-3.9	0.976	-0.9	0.984
3 to 4	0.859	-4.1	0.896	-6.1	0.955	-0.2	0.957	-0.5	0.962
4 to 5	0.791	-7.4	0.854	-4.7	0.896	-1.4	0.909		
5 to 6	0.898	-5.4	0.949	8.8	0.872	-5.9	0.926		
6 to 7	0.768	-5.9	0.816	-6.4	0.871				
7 to 8	0.560	-33.5	0.842	1.8	0.827				
Southern Region									
1 to 2	0.842	-0.4	0.846	-13.4	0.976	5.2	0.928	-7.1	0.999
2 to 3	0.737	-12.2	0.839	-5.1	0.884	-7.9	0.961	-1.9	0.979
3 to 4	0.816	-4.2	0.852	-8.8	0.934	0.3	0.931	-2.0	0.950
4 to 5	0.805	-3.2	0.832	-5.6	0.881	-3.0	0.908		
5 to 6	0.802	-2.0	0.818	-10.9	0.918	5.2	0.873		
6 to 7	0.767	-3.2	0.792	-3.0	0.817				
7 to 8	0.650	-9.8	0.720	-13.7	0.834				

a  $\Delta$  denotes percentage change.

Source: Computed from 1997 DHS.

**Table 7 Measures of the proximate determinants of fertility by region, Mozambique 1980 and 1997**

Region	SMAM			1997		
	1980	1997	% change	Non-susceptible period (months) <sup>a</sup>	Contraceptive use (%) <sup>a</sup>	% 45-49 childless
Northern	16.3	15.5	-4.4	21.9	2.1	9.4
Central	17.2	17.9	4.1	20.4	4.1	6.5
Southern	19.2	21.4	11.7	20.2	9.6	7.7
Mozambique	17.5	18.1	3.8	20.4	5.1	7.8

a 1997 DHS.

Source: Computed from 1980, 1997 censuses and 1997 DHS.

(Southern Region) may be due to erratic values. According to Brass *et al.* (1995: 4), it would be expected that reductions in the higher parity progressions would be established earlier in time, but there is no evidence of this in Mozambique.

### The proximate determinants of fertility

The above evaluation of fertility trends has shown that evidence of fertility decline is stronger in Southern Region than in Northern and Central Regions. Since variations in fertility are mainly due to the proximate determinants (Bongaarts and Potter 1983), an analysis of these factors may reveal the likely causes of fertility trends in Mozambique and why fertility decline is faster in Southern Region than in the other regions. Thus, in this section four proximate determinants of fertility are analysed to assess the extent to which they influence fertility and contribute to the observed regional trends. Table 7 presents measures of the proximate determinants by region.

#### *Age at marriage*

Table 7 shows that among females marriage takes place late in Southern Region, and early in Northern Region, with Central Region occupying an intermediate position. According to Arnaldo (2002) this regional pattern of age at marriage may reflect ethnic composition. Southern and Central Regions predominantly consist respectively of the Tsonga and Sena/Ndau ethnic groups, which are patrilineal and give greater importance to bridewealth payments in the marriage process. Since the value of bridewealth is continuously rising, men in these societies may need more time to gather the necessary resources to meet the costs of marriage than those in Northern Region who are predominantly matrilineal Macua with no bridewealth payment at marriage (Arnaldo 2002: 15–16).

The national female singulate mean age at marriage (SMAM), an estimate of age at first marriage computed from proportions never married by age (Hajnal 1953), rose by only 0.6 years between 1980 and 1997. The largest rise in female SMAM occurred in Southern Region (2.2 years) while there was a slight decrease in Northern Region. The trend in age at first marriage can also be assessed by computing the female median age at marriage by cohort at the survey. Figure 2 shows the result of such a computation by region. The median is almost the same for the cohorts aged 35–39 and over and decreases with age of woman (except in Northern Region) for the younger cohorts, implying an increasing age at marriage, which is consistent with the trends shown by the change in female SMAM between 1980 and 1997 (Table 7).

### *Breastfeeding and non-susceptible period*

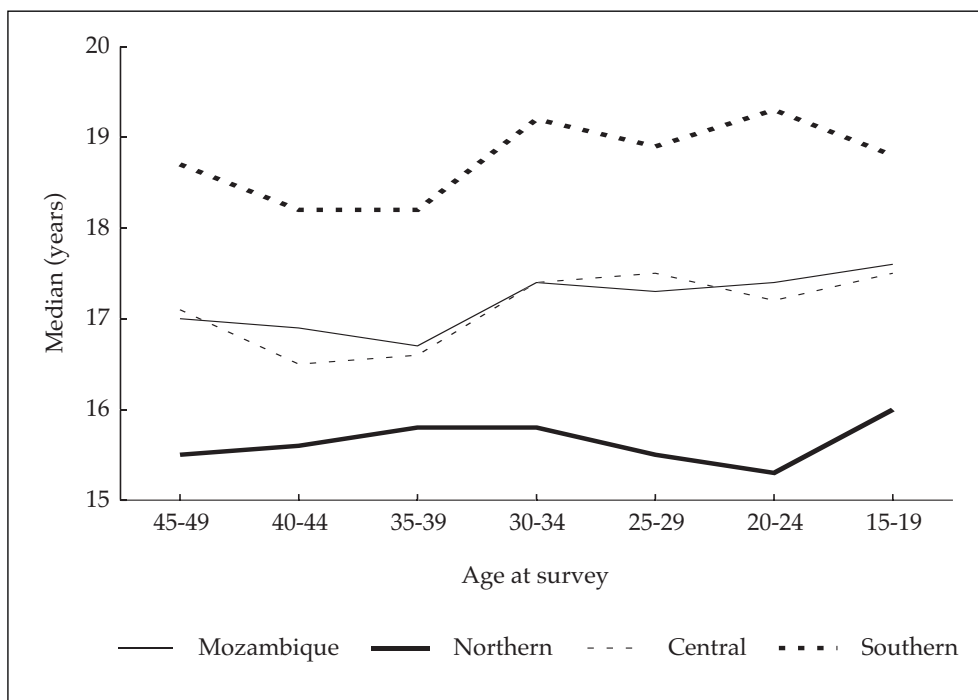
Breastfeeding in Mozambique is both universal and long. Over 98 per cent of the children born during the three years preceding the 1997 DHS were breastfed by their mothers. On average women breastfed their children for two years and there were no significant differences between cohorts, implying no change over time. Lengthy breastfeeding and postpartum sexual abstinence combine to give a non-susceptible period of 20.4 months, with the duration in Northern Region being about two months longer than in Central and Southern (see Table 7). This difference is probably due to difference in the abstinence period. Among the Macua, the predominant ethnic group in Northern Region, women are expected to abstain from sexual intercourse for the entire duration of breastfeeding (Martinez 1989), whereas women in Central and Southern Regions, where the Sena/Ndau and Tsonga ethnic groups predominate, can resume sexual relations before weaning; but they rarely resume before at least one year after the birth of the child (Ivens-Ferraz de Freitas 1971; Junod 1974).

### *Pathological infertility*

Mozambique is among the countries with high prevalence of infertility. The prevalence of infertility rose from 1950 to 1970, declining thereafter. According to the United Nations (1981), official reports during the 1950s and 1960s noted a high prevalence of infertility-related diseases such as malaria, tuberculosis and venereal diseases, and much of the population did not have access to adequate treatment. In Southern Region, the effect of high labour migration to South Africa and Maputo City in spreading venereal diseases, and the high prevalence of polygyny, were thought to have interacted to produce high rates of infertility (United Nations 1981: 37).

Arnaldo's (2003) analysis of the 1997 DHS found that both primary and secondary infertility were highest in Northern Region, intermediate in Southern Region and lowest in Central Region. Primary infertility, as measured by the percentage childless after at least seven years of marriage, ranged from 1.8 per cent in Central Region to 5.0 per cent in Northern Region, with a national average of 3.6 per cent, whereas secondary infertility ranged from 15.9 per cent in Central Region to 25.1 per cent in Northern Region, with a national average of 21.3 per cent (Arnaldo 2003: Table 7.2).

Regional differences in the prevalence of infertility-related diseases such as STDs and malaria may be one potential explanation for this pattern: a nationally

**Figure 2** Median female age at first marriage<sup>a</sup> by cohort, Mozambique, 1997

a Median computed through life table techniques to account for censoring.

Source: Computed from 1997 DHS.

representative AIDS prevention survey conducted in 1996 found that the prevalence of STDs was highest in Northern Region and lowest in Central (PSI-Mozambique 1998: 27). Risk-taking behaviour (having one or more non-regular sexual partners including prostitutes) was also highest in Northern Region, followed by Southern Region and then Central Region. Part of the explanation for this regional pattern of infertility lies in cultural practices. The population of Northern Region is ethnic Macua, characterized by a high prevalence of infertility due to an early age at first sexual intercourse and first marriage, high marital instability and encouragement of female extramarital sexual relations contrasting with the Sena/Ndau of Central Region where unions are stable and there is no tolerance of extramarital sexual relationships (Arnaldo 2003: Chapter 7).

### *Contraceptive use*

Contraceptive use in Mozambique remains low. This is partly because the family planning program was officially adopted only in 1978, two years after the country's independence, and partly because the program has not been strong. Poor coverage of health posts and centres, which was worsened by 16 years of civil war, and husbands' concerns that family planning encourages prostitution and adultery have been barriers to universal access to family planning services (United Nations 1981: 32; Monreal 1991: i-3; McCharen and Mondlane 1999).

Comparison of the 1987 Women's Reproductive Behaviour Survey (Monreal 1991) and the 1997 DHS shows that the percentage of women aged 15–49 currently using modern contraception increased from 11.4 per cent in 1987 to 15.2 per cent in 1997 in urban areas, and declined in rural areas from 3.3 per cent in 1987 to 2.3 per cent in 1997. This apparent decline in contraceptive use for rural women is probably an artefact of poor coverage of rural areas by the 1987 survey. There are large urban–rural differences and a large difference between Maputo City and other urban areas.

As a whole, the contraceptive prevalence is highest in Southern Region and lowest in Northern Region. Higher contraceptive use in Southern Region than in Northern and Central Regions is largely due to the fact that Southern Region includes Maputo City, where contraceptive use is far higher than anywhere else in the country. For example, 80 per cent of all urban current users of modern contraceptives in Southern Region in 1987 lived in Maputo City (Monreal 1991: 7–6), and the 1997 DHS data show that half of all women aged 15–49 who were currently using modern contraceptives in Southern Region lived in Maputo City. However, even if Maputo City is excluded, Southern Region still has the highest level of contraceptive use, though the difference between regions, especially between Southern and Central Regions, is considerably reduced. This partly reflects the influence of Maputo City in spreading modern reproductive behaviour to other areas of Southern Region: because of improved transport many people travel daily to Maputo City either to sell their agricultural products or to look for jobs (see Arnaldo 1996).

## Discussion

This analysis has shown that the TFR declined from 7.1 children in 1980 to 6.1 in 1997, with the corresponding regional values being 6.7 and 6.4 in Northern Region, 7.9 and 6.7 in Central Region, and 6.2 and 5.1 in Southern Region. These figures represent a fertility decline between the two censuses of 14 per cent for Mozambique as a whole and 5, 14 and 17 per cent for Northern, Central and Southern Regions respectively.

However, application of more robust methods, namely analysis of period and cohort fertility from DHS birth histories, P/F ratios from birth histories, censored parity progression ratios and the own-children method from the 1997 census, showed that fertility decline was well established only in Southern Region. In fact, the decline is most evident in the nation's capital, Maputo City (see Arnaldo 2003: Chapter 3). In Northern and Central Regions, this analysis failed to identify any clear indication of a consistent trend towards lower fertility. As 74 per cent of the population live in these two regions, the decline in fertility in Southern Region has not had a substantial effect at the national level.

The evidence of fertility decline in Southern Region showed that the decline, which started in the early 1980s, has been gradual and has been occurring across all age groups and birth orders. This pattern of decline is consistent with that observed in other sub-Saharan countries and with the Caldwell *et al.* (1992) prediction that fertility decline in this region would not be accompanied by a change in the age pattern of fertility, as in historic Europe and developing countries of Asia and Latin America.



The regional differences in fertility trends suggested by this analysis reflect, in part, the regional differences in socio-economic development. Caldwell and colleagues identified three conditions under which fertility decline is likely to occur in a sub-Saharan African country: an infant mortality rate not above 70 per thousand live births; nearly all girls going to primary school and at least 30 per cent attending secondary school; and at least 25 per cent of currently married women practising family planning with 20 per cent using modern methods (Caldwell *et al.* 1992: 212–213; Caldwell and Caldwell 1993: 244). Although Caldwell's thresholds refer to the national level and evidence of fertility decline may exist without meeting any of these conditions (e.g. Hinde and Mturi 2000, for Tanzania), they may be a useful guide at the subnational level if used flexibly. Considering these thresholds, Southern Region is clearly the most likely to experience fertility decline. In 1997, the national infant mortality rate, 145 per thousand live births, was twice Caldwell's threshold, the contraceptive prevalence rate was five per cent, and only 38 per cent of girls of school age (6–15) were attending school. However, in Southern Region, the infant mortality rate was 95 per thousand live births, against 163 in Northern Region and 157 in Central Region (Mozambique 1999: Table 23); 10 per cent of married women used modern contraceptives, against two per cent in Northern and four per cent in Central Region; and 64 per cent of school-age girls were attending school, against 25 and 30 per cent in Northern and Central Regions respectively.

Further to these specific thresholds, Southern Region is the most prosperous region and improvements in education and mortality have been greater than in either Northern or Central Region. In addition, Southern Region is more culturally homogeneous (87 per cent of the population were Tsonga in 1997) than Northern and Central Regions, which facilitates the spread of new reproductive ideas that are important for fertility decline (Cleland and Wilson 1987). In Northern and Central Regions such a spread of ideas is hindered not only by language diversity but also by the fact that only a small proportion of the population can speak Portuguese, the official language. According to the 1997 census, only 27 per cent in Northern Region and 35 per cent in Central Region of the population aged 15 and over could speak Portuguese, compared with 60 per cent in Southern Region. Further, the population of the mostly rural southern provinces outside Maputo City has more frequent and regular interactions with the capital, which facilitates the adoption of modern reproductive behaviour, already in place in Maputo City. In nineteenth-century Europe, such diffusion and frequent contacts with people outside the local social system (from a central source) were important in determining the onset of fertility decline (Watkins 1990, 1991).

When a society begins to abandon traditional reproductive patterns and adopt modern reproductive behaviour the relative effects of prolonged breastfeeding and postpartum abstinence in reducing fertility diminish while that of contraception becomes increasingly important (Frank and Bongaarts 1991). The analysis by Arnaldo (2003: Chapter 9) shows that only in Southern Region is there evidence that fertility decline has begun with the fertility-reducing effect of contraceptive use being higher (16%) than in Northern (3%) and Central (8%) Regions, and that of postpartum infecundability being less (46%) than in Northern (67%) and Central (61%) Regions.

Finally, on the basis of the present analysis, fertility in Mozambique may be expected to continue to decline in the future. Regional differences in fertility trends are likely to widen as better socio-economic conditions in Southern Region make the family planning program adopted in the early 1980s more likely to succeed there first, leading to a much faster fertility decline, than in Northern and Central Regions.

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