Fertility Developments in South Africa since 1990

Introduction

The decline in South African fertility during the past four decades is now well known. Most researchers agree that fertility in South Africa started declining in the 1960s (Caldwell and Caldwell, 1993; Chimere-Dan, 1993, 1994, Sibanda, and Zuberi, 1999). However, the precise date and the factors responsible for such a decline are not fully understood (Garenne and Joseph , 2002). Some researchers believe that sustained fertility decline began in early 1960s () whereas other researchers suggest fertility transition in South Africa began in late 1960s (). There is also a debate regarding when South Africa will complete fertility transition (Camlin, Garenne, and Moultrie, 2004; Anderson, 2003). In addition, it has been observed that fertility decline accelerated after the 1980s, probably following the intensification of the national family planning programme since 1974.

In almost all countries that have experienced fertility decline the factors responsible for such a transition are matters of debate among demographers, both within the countries and abroad. In general, the factors that are frequently mentioned as underlying the decline include the changing roles and aspirations of women, postponement of marriage, and the impact of family planning and increasing use of reliable contraceptives in particular. Various researchers have not taken into account the distinction between the underlying variables (such as social norms about family, or economic conditions) and the intermediate variables (factors affecting exposure to intercourse and conception, and factors affecting gestation and successful parturition) through which the underlying variables affect fertility (Davis and Blake, 1956).

There still remain a number of issues that are not well understood regarding the nature and patterns of fertility decline in South Africa. For instance, did fertility decline start in urban areas before spreading to the rural areas of the country? Which of the four metropolitan areas showed early signs of fertility transition? Was the transition uniform in all provinces? Did fertility increase before embarking on the downward trend as suggested by Dyson and Murphy?

This article attempts to fill this void by examining the possible impacts of changes in nuptiality and marital fertility patterns on fertility in South Africa. Its purpose is to quantify the components of the decline in South Africa since 1990s in such a way as to facilitate future research on the underlying and intermediate variables which are likely to affect fertility.

This paper has three major objectives. The first is to describe the changes in fertility in South Africa since 1990. The second is to determine some of the factors that might have contributed to the observed patterns of fertility during the period under review and the third objective is to identify the important intermediate variables that are amenable for policy towards further fertility reduction that will ensure the completion of fertility transition in the country (TFR=2.1). None of the objectives are easy to achieve considering the dearth of comparable nationally representative demographic data.

Data and Methods

Data

South Africa like most countries has three potential sources for population data: vital registration system, census and sample surveys. Since the year 1823 South Africa has carried out population censuses on a regular basis with interruptions during war times. Unfortunately most of these censuses did not enumerate the African population who constitute more than 70% of the country's population. After independence in 1994 two full censuses were carried out in 1996 and 2001 (Statistics South Africa, 1999; 2003). The 1996 census the first attempt to enumerate all the population groups in the country. The third census is scheduled to take place in 2011 ().

South Africa has maintained a vital registration system of live births and deaths for the white population since the beginning of the 20th century. Vital statistics for the Asians and coloured have been published since 1940s. Although compulsory, registration of birth events is estimated to be at about 90 percent, with lower levels in rural areas. Thus, the numbers births and deaths provided by Statistics South Africa have to be considered as less accurate.

Lastly, like many less developed countries, South Africa has implemented Demographic and Health Surveys (in 1998 and 2003). The present study is based on data collected by the 1998 and 2003 South African Demographic and Health Surveys (SADHS) (Department of Health, 1999, 2003). The Demographic and Health Surveys (DHS) project is the worldwide research project initiated by the United States Agency for International Development (USAID) to provide data and analysis on the population, health, and nutrition of women and children in developing countries. The DHS were designed to provide estimates for key indicators such as fertility, contraceptive use, infant and child mortality, immunization levels, coverage of antenatal, maternal and child healthcare and nutrition, as well as on the socioeconomic backgrounds of respondents and their households. The survey results are intended to assist policy makers and planners in assessing the current health and population programs and in designing new strategies for improving reproductive health and health services in South Africa. In this study the two SADHS were used to provide estimates of key population and health indicators including fertility and child mortality rates for the country as a whole and for nine provinces. The 1998 SADHS covered 11,735 women from 16,957 households, while the 2003 SADHS covered 7,041 women from 7,756 households (Department of Health, 1999, 2003).

Quality of data on the ages of women and children

Accurate reporting of ages of women and children is essential for accurate estimation of fertility from survey data. In obtaining age data, respondents in the South African DHSs were asked to report both their birth dates (month and year) and their ages in completed years. If a respondent gave neither her birth date nor her age, the interviewer was instructed to probe and to try to estimate the respondent's age by referring to national events, other members of the household, the date of the respondent's first marriage or birth, or in any other way that was plausible.

In order to quantitatively evaluate the quality of age-reporting, demographers proposed several indices (Swanson and Siegel 2004). The Whipple index, among those most widely used, is specially designed for measuring a digit preference of 0 and 5 and age heaping. While the

Whipple index was originally computed for data between ages 23 and 62, we redefine it for our purposes as follows:

If there were neither digit preference nor age heaping, the Whipple index would be 100. If all persons in the population reported their ages as ending in 0 or 5, the Whipple index would be 500. The values of the Whipple index are thus in a range between 100 and 500. The United Nations (1955) notes that if Whipple index values are less than 105, then age distribution data are deemed to be "highly accurate"; if the values are between 105 and 109.9, they are "fairly accurate"; if between 110 and 124.9, "approximate"; if between 125 and 174.9, "rough"; and if 175 or more, "very rough" (United Nations 1955: 39-45).

Table 1 presents the Whipple and Myers indices calculated for the total age distributions as well as for the age distributions according to province of residence and population group in South Africa. Generally, the age distributions in the two surveys indicate little digit preference. The quality of the reported age statistics is better for the White and Asian population than African and coloured populations.

Table 1: Whipples and Myers Indices for South Africa, its provinces and population groups, 1998 and 2003

	Whipples		**Myers**	
	1998	**2003**	**1998**	**2003**
Western Cape	86.8	87.6	6.8	8.8
Eastern Cape	101.6	106.1	6.3	15.3
Northern Cape	104.7	113.8	7.8	14.1
Free State	103.8	114.1	12.5	13.2
Kwazulu-Natal	113.7	100.0	9.7	12.0
North West	109.9	110.2	13.4	9.4
Gauteng	99.1	111.9	6.2	16.9
Mpumalanga	105.7	106.0	10.6	14.3
Limpopo	104.4	84.9	10.1	16.9
African	106.2	106.0	5.5	7.5
Colored	84.4	98.5	10.8	4.2
White	99.8	95.1	17.4	14.1

Asia	110.4	97.7	9.7	17.8
Total	103.4	103.8	4.6	5.5

Methods of Analysis

Prior to the introduction of the democratic processes in South Africa little was know about the nature and patterns of fertility in the country, especially among the now-white populations (African, Coloured and Asian). With the democratization of the country that began in early 1990s and culminated in the first democratically elected government in 1994, several comprehensive studies on fertility have been conducted (Moultrie, and Timaeus, 2003; Udjo, 1997,1998,2003; 2004; Sibanda and Zuberi, 1999;). However, as new sources of data become available it is necessary to update the available demographic estimates. Moreover in situation of deficient demographic data, there is need to apply as many techniques as possible in order to establish robust levels, trends and differentials in fertility. One such method is the Rele method. Rele(1967) developed a method of estimating fertility (TFR) from the reported Child Woman Ratios (CWR). It is based on the finding that in a stable population the relationship between GRR and CWR, can be approximated by a linear equation. That is

$$GRR = a + b\ CWR \qquad \text{..................} \quad (x)$$

where a, b are constants and GRR and CWR are as defined above.

Using thirty six stable populations, generated from United Nations (1955) model life tables, Rele has presented regression coefficients for the equation and for each level of mortality as defined by e(0) ranging from 20 to 60 years in multiples of 10.

The method was tested for its validity using data from the developed countries where it was possible to compare fertility estimates derived from this method with measures obtained from the vital registration system. It was then applied to Latin American countries where the estimates were found to be consistent with those obtained from other indirect procedures. Since then Rele(1987, 1988) has further demonstrated the applicability and relevance of the method by using data from the Asian section of the developing countries and subsequent studies by other researchers have further confirmed that the method produces acceptable estimates (El-Shalakan,1989; Mhloyi and Mazur,n.d, Palamuleni, 1993).

In theory the estimated level of mortality should refer to the period when the children were born. In practice this creates some problems especially in statistically underdeveloped countries where mortality statistics are far from being complete and our knowledge about the level is just as minimal as that of fertility.

Another problem arises from the fact that the method is based on the original UN model stable population which have since been superseded by more robust models - Coale and Demeny(1966, 1983), Brass(1971), United Nations1982).

The method has several advantages. First and foremost, it is simple to use and less demanding in terms of data and parameters since the level of mortality can be specified to the nearest multiple of ten.

Another attractive aspect of the method, especially as regards to the South Africa situation, lies in the fact that Rele attempted to choose "indices which makes the assumption of quasi-stability less crucial in the estimation procedure" (Rele,1967) and, as he later concluded, he managed to come up with a procedure which give rise to plausible estimates in populations which are "far from stable".

The method is also relevant for developing countries with a long series of censuses and surveys of acceptable quality in that it allows one to obtain fertility measures for two different periods in the past. This stems from the fact that children aged 0-4 years were born in the last five years whereas those aged 5-9 years were born 5-10 years before the enumeration. It follows then that on average the estimated TFR calculated from these age groups refers to the respective periods 2.5 and 7.5 years preceding the enumeration. Therefore, in countries where fertility data is lacking and the reported age statistics are reasonably good, the method provides an ingenious way of measuring any changes in fertility during the last eight years or so. But in view of the nature of the reported statistics in South Africa this approach is not attempted here. Moreover if the censuses and surveys are available at five (or ten) years interval the calculated CWR from one survey can be compared with corresponding CWR calculated from another survey. This may be useful in determining the quality of data and the robustness of the derived estimates (Rele 1987, 1988).

Furthermore some researchers have made suggestions to modify the Rele's original technique to improve on its shortcomings (Rao, 1980; Bhat,1998 and Mishra et. al., 1994). This study has however made use of the original Rele method.

Bongaarts' model

Factors influencing fertility can be classified into two groups, namely intermediate fertility variables (or proximate determinants) and socioeconomic variables. The former, of interest because of its direct impact on fertility, consists of a set of biological and behavioural factors through which social, economic and cultural conditions can affect fertility. Stated otherwise, in the absence of these determinants, human fertility may reach a theoretical maximum of total fecundity (TF), accounting for an average of 15.3 births per woman. Thus, fertility differentials between regions and across time within the same region can always be traced to changes in one or more of the proximate determinants.

While Davis and Blake (1956) were the first to identify a set of 11 proximate determinants known as "Intermediate Fertility Variables", their classification did not get wide acceptance because it could not be easily incorporated in fertility analysis. Consequently, Bongaarts (1978) reclassified this list of determinants into seven variables, namely, marriage pattern, contraceptive use, induced abortion, lactation infecundability, spontaneous abortion, frequency of coitus and sterility. However, after various studies, Bongaarts (1982, 1987) realized that some of these factors are more relevant than others in determining the magnitude of fertility change. In fact, only four of them (proportion married, contraceptive use and effectiveness, induced abortion and postpartum infecundability) are the most important in explaining fertility variation, accounting for up to 96% of fertility change in some populations (Bongaarts, 1978; 1982; Bongaarts and Potter, 1983). In addition, it has been empirically shown that changes in these proximate determinants of fertility account for much of the variations in fertility among populations (Chuks, 2003; Casterline, 1994; Letamo & Letamo, 2001; Horne, 1992; Jolly & Gribble, 1993).

The fertility-inhibiting effects of the most important determinants are quantified in Bongaarts' model by four indices, each assuming a value between 0 and 1. When the index is close to 1, the proximate determinant will have a negligible inhibiting effect on fertility, whereas when it takes a value of 0, it will have a large fertility-inhibiting effect. It is important to note that due to the non-availability of data on abortion, the index of abortion has been taken as 1, and, therefore, its contribution to fertility decline is virtually nil.

Bongaarts (1982) symbolized these four indices as follows: C_m being the index of proportion married; C_c as the index of contraception; C_a is the index of induced abortion; while C_i is the index of postpartum infecundability. The main equation of the model is thus:

$$TFR= C_m*C_c*C_a*C_i*TF$$

Where TFR is the Total Fertility Rate and TF is the Total Fecundity.

Regarding the estimation of the four indices, Bongaarts proposed the following treatments:

Index of Marriage:

$$C_m= \sum\{m(a)*g(a)\}/ \sum g(a)$$

Where, m(a) is the age specific proportions currently married and g(a) is the age specific marital fertility rate. In other words,

$$C_m= TFR/ TM$$

Where TM is the total marital fertility rate.

The index of marriage equals one when all women of reproductive age are in a union and zero when no women are in a union. Implicit in the use of the index is the assumption that only women in unions are exposed to the risk of childbirth. This assumption does not hold in many parts of sub-Saharan Africa, especially in Southern Africa, where substantial proportions of births are reported by women who describe themselves as single or never married. This may result in the calculated C_m being greater than 1. Anthropological studies indicate that the Western concept of marriage is not necessarily the appropriate paradigm to be applied to all of sub-Saharan Africa. Union formation may be an extended process, and births do occur outside of union.

The fact that nonmarital births occur raises a problem for the Bongaarts model (which Bongaarts recognized). If births to unmarried women are excluded from the analysis, the TFR is underestimated, but the TMFR is estimated accurately. If, on the other hand, these births are included in both, the TFR is calculated accurately, but the estimated TMFR is inflated, giving the impression that marriage patterns reduce fertility by a much greater fraction than is actually the case.

To circumvent this problem and to maintain a consistent definition for other variables in the Bongaarts' model using women currently in union only, Jolly and Gribble (1993) introduce a variable, M_o, to the model. M_o captures the effect on total fertility of births outside union. M_o relates total fertility calculated by using all births to total fertility from using births only to women in union. C'_m, a modified version of C_m, captures the effect on total fertility of the specific observed union pattern, under the assumption that no births occur outside unions. The product of M_o and C'_m is C_m, the usual definition of the effects of marriage patterns on fertility used in the Bongaarts model.

The index of contraception, C_c, equals one if no form of contraception is used and zero if all fecund women use modern and effective methods. Owing to the unavailability of information on the sensitive issue of induced abortion, we have assumed that the overall total induced abortion rate is zero. Finally, the index of postpartum infecundability, C_i, equals one in the absence of breastfeeding and zero when infecundability is permanent.

It is calculated as the average birth interval in the absence of breastfeeding, divided by the average length of the interval when breastfeeding takes place.

Theoretically, the value of each index ranges from 0 to 1. The complement of each index represents the proportionate reduction in fertility attributed to each determinant of fertility; the smaller the index value, the greater the fertility-reducing effect of the variable. Multiplying all of the indices together by the total fecundity rate of 15.3 produces the predicted TFR for the population. The predicted TFR will typically differ from the observed TFR because of the underreporting of births, underreporting of any of the behaviors measured by the indices, or the omission of proximate determinants that are influential in determining fertility levels, such as induced abortion.

Index of Contraceptive Use:

C_c= 1 - 1.08* u*e

Where, u is the proportion currently using contraception among married women of reproductive age; e is the average use effectiveness of contraception and 1.08 is the sterility correction factor. The method specific use-effectiveness level (e_i) is adopted from Bongaarts and Potter (1983). The weights are, in effect, equal to the proportion of women using a given method (u_i). Table 2 presents use-effectiveness of different contraceptive methods.

Table 2: Use-effectiveness of Different Contraceptive Methods

Contraceptive Method	Use-effectiveness
Pill	0.90
IUD	0.95
Injection	0.99
Sterilisation	1.00
Others	0.70

Source: Bongaarts and Potter (1983)

Index of Postpartum Infecundability:

C_i= 20/ 18.5 + i

Where i is the average duration (in months) of postpartum infecundability caused by breastfeeding or postpartum abstinence. According to Bongaarts, 20 is the average birth interval (in months in absence of breastfeeding and postpartum abstinence, while 18.5 is the sum of 7.5 months of waiting time to conception, 2 months of time added by spontaneous intrauterine mortality and 9 months of full term gestation. In absence of breastfeeding, the average duration of postpartum infecundability is assumed to be 1.5 months. The index of postpartum infecundability (i) can be estimated indirectly using the following equation:

$$i = 1.753 * e^{0.1396 * B - 0.001872 * B * B}$$

Where B = mean or median duration of breastfeeding in months.

Index of abortion:

C_a = TFR/(TFR+(b*TA))

Where TA is the total abortion rate equal to the average number of induced abortions per woman at the end of the reproductive period if induced abortion rates remain at prevailing levels throughout the reproductive period. B is the number of births averted per induced abortion which may be approximated by the equation b = 0.4 (1+u). Owing to unavailability of requisite information on induced abortion, we assume that the overall total induced abortion rate is zero. However, the effect of this variable will be automatically subsumed in the estimation of the total fecundity.

Having obtained the indices, it is possible to calculate the various levels of fertility by means of multiplication with the corresponding indices. The model relating fertility to the intermediate variables takes the following form:

Total Fecundity Rate (TF) = 15.3

Total Natural Marital Fertility Rate (TN) = $TF*C_i$

Total Marital Fertility Rate (TM) = $TN* C_c*C_a$

Total Fertility Rate (TFR) = $TM* C_m$

These are the four different types of fertility levels identified from which the impact of the proximate determinants can be obtained. With the inhibiting effects of all proximate determinants present, a population's actual fertility level is measured by TFR. If the fertility-inhibiting effect of delayed marriage and marital disruption is removed without other changes in fertility behaviour, fertility will increase to a level of TM. If all practices of contraception and induced abortion are also eliminated, fertility will increase to a level of TN. Removing lactation and postpartum abstinence will, in turn, increase fertility to TF (Bongaarts, 1982).

Results

Fertility Estimates

The CWR can be calculated in various ways but CWR derived from children aged 0-4 and women aged 15-49 was found to be closer to linearity than CWR based on children aged 0-4 and women aged 15-44 years (Rele,1967). Consequently the use of the former is recommended, unless children under the age of 5 are severely under-enumerated, in which case the CWR calculated using children aged 5-9 and women aged 20-54 is recommended. The CWR for South Africa and its provinces calculated using the 1996 and 2001 population censuses and 2007 Community Survey are given in Table 3 below.

Table 3: Child Woman Ratios and Estimated TFR for South Africa and its provinces, 1996, 2001 and 2007

	$CWR_{(0-4)}$			$CWR_{(5-9)}$			TFR		
Province/Country	1996	2001	2007	1996	2001	2007	1996	2001	2007
Eastern Cape	475.0	390.8	417.4	647.9	589.5	305.7	4.1	3.8	2.9
Free State	348.7	325.8	342.7	446.0	404.5	197.2	2.9	2.8	2.2
Gauteng	307.5	267.8	331.2	308.5	270.2	157.3	2.2	2.0	1.9
Kwazulu Natal	419.7	384.0	385.6	512.2	497.4	254.9	3.4	3.5	2.6
Mpumalanga	440.0	402.5	402.8	539.8	499.2	248.0	3.6	3.6	2.6
Northern Cape	403.0	363.1	339.7	476.6	418.4	189.9	3.2	3.1	2.1
Limpopo	525.1	427.2	440.6	729.6	627.6	319.2	4.6	4.1	3.0
North West	421.8	363.9	394.2	501.9	443.3	207.1	3.4	3.1	2.4
Western Cape	339.5	303.0	326.7	373.9	338.5	167.1	2.5	2.8	2.0
African	437.4	375.6	405.6	539.5	480.2	476.0	3.6	3.2	3.3
Coloured	381.1	338.1	333.0	444.6	395.6	363.5	3.1	2.7	2.6
Asian	282.4	224.2	219.3	338.4	284.8	279.3	2.2	1.8	1.8
White	227.6	198.6	191.5	270.5	239.1	201.0	1.7	1.5	1.4
South Africa	406.2	352.0	374.4	492.6	442.0	431.5	3.3	3.3	2.4

For South Africa as a whole CWR has declined from 492 in 1996 to 442 in 2001 and 222 in 2007. There are variations by province and population group. On the one hand, high values in excess of the national averages are observed in Limpopo, Mpumalanga, Eastern Cape, North West, Northern Cape and Kwazulu-Natal. On the other hand, low values are observed Gauteng, Western Cape and Free State. In 1996 CWR range from 308.5 in Gauteng to 729.6 in Limpopo. In 2001 CWR varied from 270.2 in Gauteng to 627 in Limpopo. Similar values for 2006 were 157.3 and 31.9 respectively. All the three data sets indicate that Eastern Cape, Kwazulu-Natal, Mpumalanga, Limpopo and North West had CWR higher than the national average whereas

CWR estimates for Free State, Gauteng, Northern Cape and Western Cape were lower than the national average. CWR by population group ranged from a high estimate for the African population, closely followed by that of the coloured population, then that of the Asian population and s low estimate for the white population.

All provinces and population group show a declining trend in CWR overtime.

From the calculated CWR several tentative points regarding fertility levels and differentials in South Africa can be suggested. Firstly, the ratios indicate that the level of fertility in the country is very low. Secondly, they seem to suggest marked inter- and intra-regional differentials in fertility.

Generally speaking, the CWR is not a very satisfactory measure for comparing fertility levels of the various regions and districts. For instance, Gauteng being the most urbanized province in the country, is likely to be characterized by a lower level of infant and child mortality, and by a greater proportion of the younger and more fertile women in the adult female population due to the selective effects of rural-urban migration. However, the small difference observed between the rural and urban areas suggest the absence of rural-urban differentials in terms of fertility behaviour. Thus it can be argued that migration have a negligible effect on the reported CWR. The effect of the other distorting factor - mortality - will be eliminated through the application of the technique.

A more useful and simpler summary measure of fertility, is the child-woman ratio (the ratio of young children to women of reproductive age group at a given period of time). A commonly used age category of women and children that is applied to compute this ratio is the number of children aged under five years and women who are aged 15 to 49 years. The ratio does not directly refer to any actual number of births in the incidence of childbearing, but rather to the child population between the ages of 0-4 years; assuming that the children were enumerated correctly by age, they ought to be the survivors of births during the five-year period preceding the census.

The CWRs presented in Tables 3 were used to estimate TFR in South Africa. Table 3 presents fertility estimated based on Rele method. According to this procedure, TFR based on 1996 and 2001 censuses was 3.3 children per woman. This suggests that fertility has remained constant between the 1996 and 2001 censuses.

Table 3 also indicates that there are variations by province. In both 1996 and 2001 censuses the provinces of North West, Kwazulu-Natal, Mpumalanga, Eastern Cape and Limpopo had TFR above the national average whereas the remaining provinces of Gauteng, Western Cape, Free State, Northern Cape had TFR below the national average.

The estimated TFR in 1996 range from 4.6 in Limpopo to 2. in Gauteng. Two provinces (Limpopo and Eastern Cape had TFR in 1996 greater than 4 children per woman Four provinces (Mpumalanga, Kwazulu-Natal, North West and Northern Cape) had TFR between 3 and 4 children per woman. Three provinces (Free State, Western Cape, Gauteng) had TFR below 3 children per woman. A similar pattern is observed in 2001 with one exception in that Eastern Cape joins the provinces with TFR below 3 and 4.

Table 3 further indicate that fertility is declining in all the provinces with a possible exception of Western Cape where fertility appears to be increasing and Kwazulu-Natal where fertility remained more or less constant.

According to Table 3 TFR varies by population group. TFR for Africans was the highest, closely followed by that of Coloured population, then Indians and lowest for Whites. Furthermore both Table 1 and Figure x indicate that TFR is declining for all population groups during the intercensal period 1996-2001. TFR for the Africans declined from 3.6 to 3.2 children per woman. TFR for the Coloureds declined from 3.1 to 2.7 children per woman.

TFR for the Indians declined from 2.2 to 1.8 children per woman. This means that during the period under review the Indian population in South Africa completed its demographic transition. TFR for the White population declined from 1.7 to 1.5 children per woman.

The estimates of TFR calculated using Rele method compare favourably with estimates from other sources of data. For instance the 1998 SADHS indicate that TFR for Africans was the highest at 3.1 children per woman, closely followed by Coloured at 2.9 children per woman, then Indians at 2.2 children per woman and lowest for Whites at 1.9 children per woman ()

The TFR estimates presented in Table 3 and figure 2 suggest stagnation in the pace of fertility decline between 1996 and 2001 and an acceleration of fertility decline between 2001 and 2007. Further studies should explore the plausible factors responsible for such a pattern. However it should be mentioned that Swart (2003) prophesised that fertility will increase after 1994

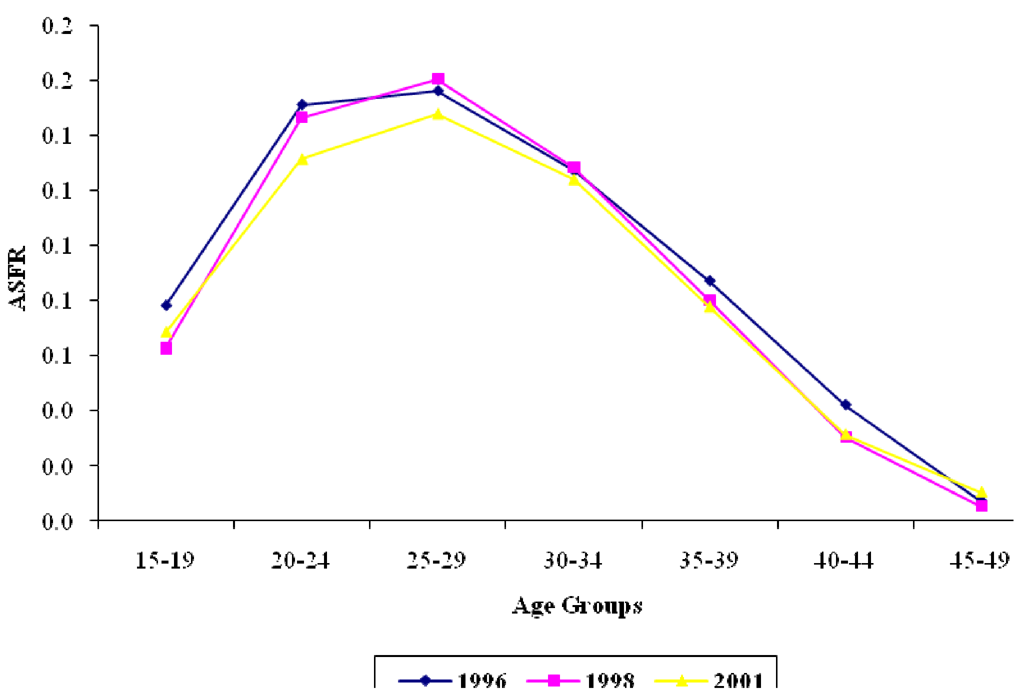
Age Pattern of fertility in South Africa

Table 4: Age Specific Fertility Rates and Total Fertility Rates for South Africa, 1996-2003

	1996	1998	2001	2003
15-19	0.078	0.063	0.069	0.046
20-24	0.151	0.146	0.131	0.127
25-29	0.156	0.160	0.148	0.112
30-34	0.127	0.128	0.124	0.101
35-39	0.087	0.080	0.078	0.042
40-44	0.042	0.030	0.031	0.027
45-49	0.007	0.005	0.010	0.006
TFR	3.2	3.1	3.0	2.3

15-19	12.0	10.2	11.6	10.0
20-24	23.3	23.9	22.2	27.6
25-29	24.1	26.1	25.0	24.3
30-34	19.6	21.0	21.0	21.9
35-39	13.4	13.0	13.1	9.1
40-44	6.5	4.9	5.3	5.8
45-49	1.1	0.8	1.7	1.3
	100.0	100.0	100.0	100.0

Figure 1 Age Specific Fertility Rates for South Africa, 1996-2003



The results in Table 4 indicate that all age groups shared the decline in fertility rates, resulting in a lower TFR. For example, according to the 1998 and 2003 SADHS data, the fertility rates for the age group 20-24 declined from 146 to 127 births per 1,000 women, while they were 160 and

112 for age group 25-29, respectively. The fertility rates for age group 40-44 show a small change from 30 to 27 births per woman and even a negligible change is observed in age group 45-49. In other words, the decline has been more rapid among younger than older women and the smallest decline was observed for women in the age group 45-49. The shift in the younger age group may be due to the fact that South African women marry later and postpone the birth of their second child. An increase in the level of women's education, participation in the labor market, and participation in family planning programs may have also contributed to this recent phenomenon. These factors will be discussed below.

Parity Progression Ratios

Fertility change can also be traced by examining cohort parity progression ratios (PPRs). The PPR is defined for parity i as the proportion of women who proceed to the next birth, i+1, among those who have had an ith birth. PPRs show the proportion of women who proceed from one event in the childbearing sequence to the next. Older women (45-49) are chosen so that their PPR will be closer to their final PPR. Table 4 and figure 2 presents PPRs for South Africa based on 1996 and 2001 censuses and 1998 and 2003 demographic surveys.

Overall, other things being equal, the fertility measures utilised in this section have shown that during the twelve-year (1992 to 2004) period under consideration, fertility in South Africa has been declining.

Table 5: Estimates of TFR based on PPRs for South Africa, Provinces and Population Groups, 1996, 1998, 2001 and 2003

	1998	2003	1996	2001
Western Cape	3.0	3.4	3.7	2.8
Eastern Cape	4.3	4.0	4.5	3.6
Northern Cape	4.1	3.6	3.8	3.3
Free State	3.9	3.6	4.1	3.3
Kwazulu-Natal	3.7	2.5	4.5	3.5
North West	4.2	3.5	4.0	3.4
Gauteng	3.3	3.1	3.2	2.8
Mpumalanga	4.9	4.0	4.6	3.7
Limpopo	5.1	4.7	4.5	4.1
African	4.4	3.8	4.1	
Coloured	3.4	3.5	3.6	
Asian	2.9	2.5	3.3	
White	2.6	2.0	2.2	
Total	3.7	3.3	4.2	

Cohort fertility rate has declined from 4.2 in 1996 to 3.7 in 1998 and to 3.3 in 2003.

Proximate determinants of fertility in South Africa

To improve an understanding of the causes of fertility decline in South Africa it is necessary to analyze the mechanisms through which socio-economic variables influence fertility.

Marriage

The role of marriage in determining fertility levels in societies where most of child bearing is confined within marriage is well documented. Changes in the proportion married as well as increases in age at marriage have been identified as one of the factors responsible for fertility decline in some North African countries (Fargues, 1989; National Research Council, 1982).

In comparison with other African countries, age at first marriage is and has been high in South Africa. This is one aspect in which the South Africans' experience in the past four decades differs from most other African countries. Although recent studies have questioned the existence of early and universal marriage in Africa, available data indicate that for most part of this century, the average age at first marriage in South Africa was late by African standards.

In addition to late marriages, marriage patterns in South Africa have been undergoing some changes. First, the proportion of women married is declining. For all women of the reproductive age group, the percentage married has decreased from 35% in 1996 to 31% in 2001 and to 28% in 2007. Similar percentages for males are 33%, 26% and 25% respectively. Second, the prevalence of polygynous unions is declining. The proportion of women in polygynous unions declined from 12.5% in 1998 to 3.9% in 2003 (Department of Health, 1999, 2003).

Thirdly, age at marriage is increasing. Singulate mean age at marriage for South Africa as a whole has increased from 30.6 years in 1996 to 32.5 years in 2007 for males and from 28.3 years in 1996 to 29.6 years in 2007. For both males and females these indicate that mean at marriage has risen by 2.0 years in eleven years, which is a tremendous increase. If this trend were to continue at the same rate by 2018 the average age at marriage for females would have been about 32 years.

Again, the national average masks the large differences among regions and between the urban and rural settings. Age at marriage is higher in the urban areas. The provinces of Gauteng, Western Cape, Free State could be categorized as having low mean age at first marriage, Mpumalanga, Limpopo, North West and Northern Cape as moderate mean age at first marriage while Eastern Cape and Kwazulu-Natal have high SMAMs for both males and females in 1996, 2001 and 2007. The higher SMAM for females in the Eastern Cape and Kwazulu-Natal probably reflects (among other things) the effect of male out migration that these regions are known for.

The current economic condition in South Africa, whose improvements may not immediately translate to improvements in the lives of a greater proportion of the population, has also been noted to favor increased age at marriage.

The economic crises have made it more difficult (than it was in the seventies and eighties) for men to harness resources to meet marriage and childbearing obligations. It has been expressed in media that marriage is generally delayed as many boys and girls postpone marriage in order to consolidate their careers and earning capacities.

Contraceptive use

Contraceptive use has a direct negative impact on fertility and the fertility inhibiting effect of contraception has been demonstrated by several studies (). In fact most studies, including those conducted in South Africa, have attributed fertility decline in Africa to increased use of contraceptives (). knowledge of contraception methods is nearly universal in South Africa. According to the 1998 SADHS, 96.5% of all women aged 15-49 years knew at least one modern method of contraception. Although the percentage decreased in 2003, it was still relatively high at 93.6%. Use of contraception among currently married women is estimated to be 56.3 percent (UN Population Division, 2007).

Breastfeeding, postpartum amenorrhoea, abstinence, and infecundability

Lactation (breastfeeding) and postpartum practices (amenorrhoea and abstinence) are associated with fertility. Postpartum amenorrhoea refers to the temporary disappearance of menstruation after childbirth at which period a woman becomes non-susceptible to conception. Various studies have established a direct relationship between the length and intensity of breastfeeding and the duration of postpartum amenorrhoea (Bongaarts & Potter, 1983; Gutmann & Fliess, 1993; Mbamaonyeukwu, 2000, Chuks, 2003; Letamo & Letamo, 2001). Postpartum abstinence refers to the period of voluntary sexual inactivity following childbirth. Thus, women are considered infecundable if they are not exposed to the risk of conception either because they are amenorrhoeic or are abstaining from sexual intercourse after childbirth. Stemming from its defining characteristic, postpartum infecundability is one of the four proximate factors through which economic, social and other factors operate to influence fertility. Prolonged breastfeeding is known to extend the inter birth interval. After each birth, a woman experiences an interval of postpartum amenorrhea, during ovulation does not occur. This interval is usually extended by intensity and frequency of breastfeeding because suckling suppresses ovulation. The average duration of postpaturm amenorrhea is about two months if a woman does not breastfeed and as long as two years is breastfeeding is prolonged.

The duration of postpartum insusceptibility is negatively correlated with education and is lower in the urban area. Thus, it is possible to assume that the length of postpartum insusceptibility will decline in the face of modernization. So far, significant declines have not been observed and recent campaigns in favor of long period of breastfeeding to secure better child health may even reverse any declining trend.

Table 6 shows the mean duration (in months) of breastfeeding, postpartum amenorrhoea, abstinence and infecundability for 1998 and 2003. The table reveals that South African women breastfeed their infants for about 15 months. This is quite encouraging, especially when viewed against the background of the nutritional benefits of breast milk. The table further shows that this scenario has not changed much over the years.

Furthermore, Table 6 shows that the mean duration of postpartum amenorrhoea among South Africa women has remained unchanged at 10.5 months in both 1998 and 2003. This shows that other things being equal, in the absence of contraception, South Africa women are likely to become pregnant sooner rather than later. Postpartum abstinence and postpartum infecundability (PPI) are considered. In fact, while PPI was 16 months in 1998 and increased slightly to 17 months in 2003. The mean duration of postpartum abstinence among South African women has increased from 10.5 months in 1998 to 13.3 months in 2003.

Table 6 Mean duration of breastfeeding, amenorrhea, abstinence and insusceptibility for South Africa, 1998 and 2003

Year	Breastfeeding	Amenorrhoea	Abstinence	Insusceptibility
1998	15.3	10.5	10.5	16.0
2003		10.9	13.3	17.0

Source:

Abortion

The impact of abortion on fertility has also been documented. An increase in abortion rate has usually been accompanied by a decline in fertility especially in high to medium fertility populations. However, despite abortion being legal in South Africa, data on abortion are very scanty to allow for a detailed examination of abortion on fertility.

The role of the four proximate determinants on the decline of fertility in South Africa

The indices of marriage, contraceptive use and postpartum infecundability and the implied TFR (assuming TF=15.3), as obtained from using Bongaarts' model for the years 1998 and 2003 are presented in Table 7 and illustrated in figure 4 below. In analysing these findings, it should be kept in mind that the lower the value of an index, the higher the percentage reduction in the TFR due to that index.

Table 7: Indexes of Proximate Determinants for South Africa, provinces and population group, 1998

	C_m	C_c	C_i	Implied TFR
Western Cape	0.450	0.738	0.813	4.1
Eastern Cape	0.411	0.738	0.687	3.2
Northern Cape	0.528	0.837	0.718	4.9
Free State	0.265	0.746	0.718	2.2
Kwazulu-Natal	0.363	0.854	0.720	3.4
North West	0.403	0.715	0.737	3.2
Gauteng	0.339	0.764	0.733	2.9
Mpumalanga	0.366	0.756	0.689	2.9
Limpopo	0.255	0.873	0.633	2.2
African	0.379	0.758	0.685	3.0
Coloured	0.462	0.843	0.804	4.8
White	0.070	0.964	0.980	1.0
Asian	0.128	0.991	0.911	1.8
South Africa	0.448	0.787	0.706	3.8

Table 8: Indexes of Proximate Determinants for South Africa, provinces and population group, 2003

	C_m	C_c	C_i	Implied TFR
Western Cape	0.2721	0.8706	0.826	3.0
Eastern Cape	0.4747	0.7819	0.767	4.4
Northern Cape	0.3946	0.8596	0.759	3.9
Free State	0.4064	0.8169	0.762	3.9
Kwazulu-Natal	0.5091	0.8384	0.846	5.5
North West	0.6012	0.7906	0.751	5.5
Gauteng	0.3920	0.8392	0.749	3.8
Mpumalanga	0.4303	0.7959	0.707	3.7
Limpopo	0.3964	0.8527	0.656	3.4
African	0.4860	0.8050	0.631	3.8
Coloured	0.3706	0.8864	0.568	2.9
White	0.1559	0.8210	0.855	1.7
Asian	0.1732	0.9843	0.971	2.5
South Africa	0.4389	0.8285	0.629	3.5

Decomposition of the role of the four major determinants on fertility decline between 1992 and 2004

Table 9 indicates the magnitude of the total inhibiting effect being accounted for each proximate determinant in 1998 and 2003. The difference between the total fecundity and the estimated TFR demonstrates the resultant inhibitory effect of each determinant. The total inhibiting effect is prorated by the proportion of the logarithm of each index to the sum of logarithm of all indices.

The results indicate that in 1998 57.8% of the births that were inhibited were due to the effect of marriage, 17.2% were due to contraception and 25.0% were due to postpartum infecundability. Similarly, in 2003, the three proximate determinants of marriage, contraception and postpartum infecundability inhibited 55.8%, 12.8% and 31.4% of the births, respectively. These indices suggest that marriage has the strongest inhibiting impact, followed by postpartum infecundability whereas contraception has the lowest fertility-reducing impact.

On the one hand the analyses in the preceding paragraph indicate that the impact of marriage and contraception on fertility is on the decline. On the other hand the impact of breastfeeding on fertility appear to be increasing .

as a result of reduced intensity of breastfeeding. The decline in breastfeeding is likely to increase in future as the status of women improves. The impact of conception is increasing over time.

The inhibiting impact of contraception in greatest in Western Cape, Northern Cape, North West, Free State and Gauteng in 1998.

Table 9 Decomposition of the Change in the Proximate Determinants in South Africa between 1998 and 2003

		1998			2003	
	Marriage	Contraception	Breastfeeding	Marriage	Contraception	Breastfeeding
Western Cape	61.0	23.2	15.8	79.8	8.5	11.7
Eastern Cape	56.7	19.4	24.0	59.3	19.6	21.1
Northern Cape	55.6	15.6	28.8	68.6	11.2	20.3
Free State	68.0	15.0	17.0	65.5	14.7	19.8
Kwazulu-Natal	67.6	10.5	21.9	66.3	17.3	16.4
North West	58.7	21.6	19.7	49.4	22.8	27.8
Gauteng	65.1	16.2	18.7	66.9	12.5	20.6
Mpumalanga	60.6	16.9	22.5	59.4	16.1	24.5
Limpopo	69.8	6.9	23.3	61.4	10.6	28.0
African	59.7	17.0	23.3	51.6	15.5	32.9
Coloured	66.5	14.7	18.7	59.1	7.2	33.7
White	97.9	1.4	0.7	84.0	8.9	7.1
Asian	95.3	0.4	4.3	97.5	0.9	1.6
South Africa	57.8	17.2	25.0	55.8	12.8	31.4

The future of fertility in South Africa

The aim of this section is to examine the possibility of the decline of South African fertility to the replacement level. The leading factors likely to be involved in the fall of fertility to such a low level were briefly discussed. The data presented in this paper and evidence from other studies () shows that fertility for certain population groups (say Asian and White populations) have already declined to below-replacement level whereas fertility for the Africans and coloureds are slowly approaching that level.

Fertility preferences

Declines in desired fertility are expected to generate declines in actual fertility (Sathar and Casterline, 1998), especially if associated with increased contraceptive use. Table 10 indicate that the percentage of women who desire not to have more children increased from 5.1% in 1998 to 10.3% in 2003. The increase in the percentage of women who desire not to have more children is observed in all provinces (with exception of Free State) and all population groups. The observed increase in the percentage of women who desire not to have more children provides some ground to predict further declines in South African's fertility in the future.

Table 10 Percentage of Women who who desire not to have more children, South Africa 1998 and 2003

	1998	2008
Western Cape	7.1	10.2
Eastern Cape	4.2	8.2
Northern Cape	4.0	8.6
Free State	8.0	6.1
Kwazulu-Natal	4.3	19.7
North West	5.4	7.1
Gauteng	6.6	8.9

Mpumalanga	3.2	8.8
Limpopo	2.8	9.4
African	5.4	9.1
Coloured	5.6	9.4
White	3.4	10.2
Asian	1.3	22.3
South Africa	5.1	10.3

Continuing fertility decline

Several reasons justify further fertility decline in South Africa. First, as discussed earlier, there are still significant provincial as well as rural and urban differences in fertility in South Africa. Some provinces (such as Limpopo and Mpumalang) still have high fertility, while others (Gauteng and Western Cape) have experienced below replacement fertility.

It is very likely that high fertility provinces will soon join the low-fertility provinces, thus the gap between the high and low fertility provinces will be reduced further. This will bring the fertility at the national level lower. Below-replacement fertility will be reached by most of the provinces of South Africa even if the socio-economic characteristics do not become similar to the national level.

However, achievement of such low levels in remote provinces such as Limpopo may not be as fast as other provinces due to their ethnic and religious diversity. The study of Provincial fertility levels and patterns showed that, although the trend of fertility has been more-or-less similar in all provinces of South Africa, there exits substantial variations among the provinces. Thus, a reasonable degree of provincial variation is inevitable.

Second, the process of urbanization is another reason for the fertility decline in the future. The proportion urban has increased from 55.1 percent in 1996 to 57.5 percent in 2001 (Statistics SA, 2003). According to Population Reference Bureau (2003), apart from South Africa, the following are the most highly urbanized countries in Africa in which over 50 per cent of the population lived in urban areas: Libya (86%), Morocco (57%), Tunisia (63%), Western Sahara (95%), Mali (55%), Djibouti (83%), Seychelles (63%), Equatorial Guinea (73%), Botswana (54%). According to the 1996 Census the percentage of the population living in urban areas ranges from 12% in the Limpopo to 97% in Gauteng in 2001. Gauteng, Western Cape, Free State and Northern Cape are the most urbanised provinces in South Africa, while Limpopo, Eastern Cape, Mpumalanga, North West, Kwazulu Natal are the least urbanised provinces. The same picture emerges when one considers 2001 census data.

Third, the level of education is increasing rapidly. Children of all social classes, particularly the poor, have access to education, and the small educational differences in the society will be reduced further in the future. The level of girls' education has increased over the last two decades and the gap between male and female education has narrowed substantially. This has resulted in relative gender equity in South Africa and women have major roles in fertility decision-makings.

Although the level of female employment is still low, given the 'rising expectation' for South African women it is highly likely that the level of women's labour force participation will increase in the future. Age at first marriage for women has increased significantly.

Last but not the least, the impact of globalization on the country's social life should not be ignored. No specific country or region can be seen in isolation from other countries in the exchange of ideas and culture today. However, resilience of cultures should also not be underestimated.

Lastly, whether or not fertility decline in South Africa will continue unabated remain to be seen. The trend in fertility is likely to be influenced by the HIV/AIDS. HIV/AIDS has been observed to affect fertility and its proximate determinants in a number of ways (Guy, 1999; Ntozi, 2002). First, there can be a change in attitude and behaviour in people such that they decide to refrain from premarital sex and multiple sexual partners and postpone marriage indefinitely. The recent increase in age at first marriage in South Africa could in part be attributed to this phenomenon. Second, in contrast to most infectious diseases, which take their heaviest toll among the elderly and the very young, this virus takes its greatest toll among young adults such that many women die before completing their reproductive years (Guy, 1999; Ntozi, 2002). Third, contraceptive use might increase due to the recommendations put forward for the usage of the condom because of its HIV preventive qualities. Fourth, infected mothers might decide to terminate their pregnancies in order to avoid infecting their babies. All these four mentioned changes have a suppressing effect on fertility. Fifth, mothers in fear of transmitting the virus to their babies might decide not to breastfeed and take short periods of postpartum abstinence so that their partners do not engage in extramarital affairs, thus attracting early pregnancies and as a result enhance fertility (Ntozi, 2002). Lastly, women infected by HIV might have lower fertility because of secondary sterility and foetal loss brought by the disease and its associated infections. The last two factors increase fertility levels. However, to gain a full understanding of the impact of HIV/AIDS and fertility in South Africa a separate study on these aspects should be conducted in the country.

Conclusion

The analysis shows that, the fertility level of South Africa is low; TFR has declined from around 3 births per woman in mid 1990s to around 2.5 births per woman in mid 2000s. Although the factors responsible for such a trend are not fully understood, the high contraceptive prevalence and the effectiveness of the utilized contraceptive methods and the changing patterns of marriage as reflected by rising at marriage and increasing proportion single partly explain why fertility in South Africa is low.

The present article has also attempted to assess the role and relative importance of the three proximate determinants of fertility with respect to the recent declines in fertility in South Africa using the two DHS surveys conducted in the country. The findings show that the fertility-inhibiting effect of marriage is more significant than the effects of postpartum infecundabiity and contraception. The effect of postpartum infecundability is next in importance in inhibiting fertility. However, the results reveal that there is an increase in the importance of postpartum practices in the recent past. The percentage reduction attributable to PPI increased from 25% in 1998 to 31.4% in 2003. On the other hand, the inhibiting effects of marriage decrease from 57.7% in 1998 to 55.8% in 2003 whereas the inhibiting effects of contraception declined from 17.2% to 12.8% over the same period.

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