CENSUS 2011

Fertility in South Africa

ISBN: 978-0-621-43202-2
Report no.: 03-01-63

Statistics South Africa

The South Africa I know, the home I understand

Census 2011:
Fertility in South Africa

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Report No. 03-01-63

Pali Lehohla
Statistician-General

Census 2011: Fertility in South Africa/Statistics South Africa

Published by Statistics South Africa, Private Bag X44, Pretoria 0001

Stats SA Library Cataloguing-in-Publication (CIP) Data
Census 2011: Fertility in South Africa/Statistics South Africa. Pretoria: Statistics South Africa, 2015

86 pp
Report No. 03-01-63
ISBN 978-0-621-43202-2

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Enquiries

Diego Iturralde
Tel: 012 310 8922
Fax: 086 670 9723
Email: diegoi@statssa.gov.za

Lesego Olga Masebe
Tel: 012 310 6914
Email: olgam@statssa.gov.za

Preface

Evidence based decision-making has become an indispensable practice universally because of its role in ensuring efficient management of population, economic and social affairs. It is in this regard that Statistics South Africa (Stats SA) is mandated to provide the state and other stakeholders with official statistics on the demographic, economic and social situation of the country to support planning, monitoring and evaluation of the implementation of programmes and other initiatives. In fulfilling its mandate prescribed in Statistics Act, (Act No. 6 of 1999), Stats SA has conducted three Censuses (1996, 2001 and 2011) and various household based surveys. Censuses remain one of the key data sources that provide government planners, policy-makers and administrators with information on which to base their social and economic development plans and programmes at all levels of geography. Census information is also used in monitoring of national priorities and their achievement, and the universally adopted Millennium Development Goals. This demand for evidence-based policy-making continues to create new pressures for the organization to go beyond statistical releases that profile basic information and embark on the production of in-depth analytical reports that reveal unique challenges and opportunities that the citizenry have at all levels of geography. This analytical work also enhances intellectual debates which are critical for policy review and interventions.

The above process is aimed at enabling the organization to respond to and support evidence-based policy-making adequately, build analytical capacity and identify emerging population, socio-economic and social issues that require attention in terms of policy formulation and research. The monograph series represents the first phase of detailed analytical reports that are theme-based addressing topics of education, disability, ageing, nuptiality, age structure, migration, fertility, and mortality among others.

The fertility monograph describes and analyses the levels and trends of South African fertility. It provides the most robust estimates of current levels of fertility using 2011 census data and explores patterns of fertility behavior amongst women in South Africa.

Acknowledgements

Statistics South Africa wishes to express special thanks to the following persons for the contribution they made in the compilation of this thematic report:

Lesego Olga Masebe, Chantal Munthree, Diego Iturralde and David Baloyi

The organization's gratitude goes to the following reviewers for the constructive criticism, guidance, encouragement and technical expertise provided:

Dr John Kekovole, Dr Sandile Simelane and Dr Sulaiman Bah

The staff at Data Processing Center, you are indebted for giving assistance when most needed.

Executive summary

This monograph uses data from Census 2011 to provide levels, trends and differentials in fertility. The vital registration system in South Africa is incomplete, i.e. not all births are registered; hence, indirect demographic techniques were applied to census data to derive fertility indicators.

The results indicate that fertility has continued to decline. Census 2011 fertility data suggest an estimated 2,67 total fertility rate (TFR) in South Africa. The results also point to the variation in fertility by population group and province. The level of fertility of the black African (2.82) and coloured (2,57) population groups remains higher than that of the white and Indian/Asian population groups who reproduce below replacement with TFR of 1,70 and 1,85 respectively. For all population groups there is a decline in TFR over time; however, the TFR for the coloured population slightly increased from 2,41 in 2001 to 2,57 in 2011. This may perhaps be a reflection of data quality. Total fertility rate is the lowest in the provinces of Gauteng and Western Cape, while the highest TFRs are found in Limpopo and Eastern Cape. Differences in the TFR across provinces may reflect the different levels of socio-economic status as well as the dominance of specific population groups in provinces.

Information on the proportion of women having a child as well as subsequent childbearing describes a pattern of fertility behaviour, and is useful in better understanding family formations and the factors influencing fertility transition in South Africa. The decline in the parity progression ratio (PPR) among women aged 45–49 between 1996 and 2011 as well as the fertility preference of two children, confirms the decline in TFR over time.

The analysis of PPR by socio-demographic characteristics suggests that the propensity to progress to higher birth orders is higher amongst specific subgroups of women, i.e. black African women, women with no education, non-urban women, or married women. This is consistent with the various studies that evaluate the effect of indirect determinants of TFR, age at first birth and parity. Of significant importance is the fertility preference of two children in South Africa, which began as early as 2007 and evident by 2011, across women of all population groups, education level, residence and marital status.

The age at which a woman first gives birth can and often does influence the number of children a woman will conceive in her lifetime (Bumpass et al., 1978). Findings suggest that women who give birth at an early age experience a higher number of births in their childbearing lifespan than women who have their first birth later in life. With an increase in age at first birth there is a decline in the mean number of children ever born.

The report is organised into six chapters. The first chapter presents an introduction that provides an overview of and background to fertility in the country. The chapter also scrutinises available methods and techniques of fertility estimation and data assessment. Chapter two assess the quality of data on age and sex, as well as recent and lifetime fertility collected from Census 2011. Chapter three investigates fertility behaviour by examining the pattern of average parities and parity progression over time. In Chapter four, an overview of available indirect methods used to estimate fertility are described, followed by derived estimates. Chapter five explores the age at first birth and the mean number of children ever born by socio-demographic characteristics. The last chapter presents conclusions and discussions.

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List of abbreviations and acronyms

ARSF	:	age ratio score for female
ARSM	:	age ratio score for male
ASFR	:	age-specific fertility rate
CEB	:	children ever born
CPPR	:	cumulative parity progression ratio
CS	:	Community Survey
DHS	:	Demographic and Health Survey
DoH	:	Department of Health
LSDS	:	Living Standards and Development Survey
MAC	:	mean age at childbearing
PPR	:	parity progression ratio
SRS	:	sex ratio score
Stats SA	:	Statistics South Africa
TBVC	:	Transkei, Bophuthatswana, Venda and Ciskei
TCEB	:	total children ever born
TFR	:	total fertility rate
UN	:	United Nations
VR	:	vital registration

Chapter 1: Background and methodology

1.1 Introduction

Understanding the demography of South Africa over time has been hampered by the inadequate census data and lack of reliable administrative data in the past. The collection of data was worsened by the granting of independence to the TBVC (Transkei, Bophuthatswana, Venda and Ciskei) states, leading to three independent censuses being conducted in 1980. The struggle to derive reliable fertility estimates continued until the early 1990s. However, with the political transition in the early 1990s, a scope for non-governmental agencies to collect new demographic data was created and allowed demographers to have access to previously restricted datasets. Amongst the surveys that were conducted post 1990, was the 1993 Living Standards and Development Survey (LSDS). Whilst the LSDS was primarily an economic and poverty study, it collected important demographic data related to fertility and mortality in South Africa (Moultrie and Timaeus, 2002). Statistics South Africa (Stats SA) contributed much to the debate on fertility behaviour of women in South Africa, using the 1995 October Household Survey and Census 1996 data (Udjo, 1997 and 1998). Subsequent to that, Stats SA successfully conducted Census 2001 and Census 2011, and Community Survey (CS) 2007, which provided an opportunity to further estimate the levels of fertility and explore its patterns and trends in the country.

The decline in the rates of fertility in South Africa is well documented (Caldwell and Caldwell, 1993; Moultrie and Timaeus, 2003; Chimera-Dan, 1997; Udjo, 1997; DoH, 1998). Albeit data sources used to derive estimates were defective and often fragmented, the decline of fertility in South Africa dates as far back as the 1950s (Caldwell and Caldwell, 2003; Sibanda and Zuberi 1999). Various studies point to South Africa leading the fertility transition in sub-Saharan Africa, declining from an average of 6 to 7 children per woman to 4,5 children per woman in the 1980s, and further decreasing to 3,3 children per woman in the 1990s (Chimera-Dan, 1993; Moultrie and Timaeus, 2003; Sibanda and Zuberi, 1999; Palamuleni, Kalule-Sabiti and Makiwane, 2007).

There has been much debate and mixed evidence regarding the rate at which fertility is declining. Caldwell and Caldwell (1993) contend that one may have expected a steeper decline, given the level of economic development of South Africa and the resources that have been invested in promoting family planning. Moultrie and Timaeus (2002) commented that the South African fertility transition, which began in the mid-1960s, has followed an unusually long and gradual trajectory with a pace of decline that accelerated since the early 1980s. The pace of decline in fertility follows that of less developed regions of the world but can be regarded as rapid when compared to the rest of sub-Saharan Africa (Anderson, 2003).

The focus of the monograph is four-fold. Firstly, the study seeks to assess the quality of fertility data and further establish the pattern of age-specific fertility rates and average parities over time. In addition, it will determine the level and trends of fertility, and lastly, investigate the patterns of fertility behaviour among women in the country.

1.2 Data and methodology

1.2.1 Introduction

The analysis of data is based on census data collected in South Africa in 2011. Various demographic techniques were used to evaluate the quality of data. Fertility estimates were derived using the Gompertz relational model and Feeney variant of the P/F ratio method. Descriptive analysis was employed to identify factors influencing age at first birth. Parity progression ratios were used to analyse fertility preference over time. Further analysis and assessment of quality of data involve frequency tables, proportions and cross tabulations.

1.2.2 Methods of evaluating the quality of data

1.2.2.1 Descriptive statistics

Some methods used frequency tables, cross tabulations and proportions to assess the quality of data. These methods are:

- interrogation of raw data to establish the extent of errors inherent in the data
- establishing the rates at which variables were imputed
- investigating the improbable and implausible parities relative to the age of the mother
- establishing the level of childlessness among the women

1.2.2.2 Average parities

The consistency of data on women's lifetime fertility was examined using average parities. Average parity is obtained by dividing the total number of children ever born to women in age group *i* by the total number of women in that age group irrespective of whether they are single, married or fertile. In general, it is computed as follows:

P(i)= CEB(i)/FP(i)

Where CEB(*i*) = the number of children ever borne by a women in age group *i*

FP(*i*) = the total number of women in age group i

i = different age groups considered (15–19 to 45–49)

The method requires that average parities should increase with the age of the mother. Also, analysis of average parities across cohorts should have a consistent pattern over time.

1.2.2.3 UN accuracy index

The United Nations (UN) age accuracy index was employed to measure the level of the quality of age-sex data. The index is computed as follows (Arriaga, 1994:23):

Age-sex accuracy index = 3*SRS + ARSM + ARSF

Where: SRS = sex ratio score (average of sex ratios)

ARSM = age ratio score for male (average of male age ratio deviations from 100)

ARSF = age ratio score for female (average of female age ratio deviations from 100)

According to the UN, data are accurate if the index is less than 20, inaccurate if the index is between 20 and 40, and highly inaccurate if the index is above 40.

1.2.2.4 The P/F ratio

The Brass (1968) P/F ratio method was used to provide a snapshot of reported errors in fertility data. The basic equation to calculate the P/F ratio is as follows:

P/F ratio = P_i/F_i

Where P_i = reported average parities

F_i = estimated parity equivalents

The average parity equivalents are estimated by interpolation using the observed period age-specific fertility rates f(i) and cumulated fertility values Φ(i) as follows:

$F(i) = \Phi(i-1) + af(i) + bf(i+1)$

Where *a* and *b* are constants and their values could be obtained from UN, 1983, pp34.

1.2.2.5 Identifying whether to use the El-Badry correction method

To assess whether parity unstated is in fact parity 0 or not, the proportion of unstated parity (U_i) and parity zero (Z_i) were calculated.

a. $U_i = N_{i,u} / N_i$

where U_i = proportion of women in age group *i* with unstated parity

$N_{i,u}$ = number of women in age group *i* with unstated parity

N_i = total number of women in age group *i*

b. $Z_i = N_{i,0} / N_i$

where Z_i = proportion of women in age group *i* who are reported childless

$N_{i,0}$ = number women in age group *i* with parity zero

N_i = total number of women in age group *i*

If the proportion unstated U_i is less than 2% in each age group, it is not necessary to apply the correction. But if the proportion of parity unstated in each age group exceeds 2%, it is worth to evaluate whether the correction method should be applied. This is done by plotting U_i and Z_i and assessing the results. If a strongly linear relationship between U_i and Z_i cannot be identified, even after excluding one or two data points from older women, the method cannot be applied.

1.2.3 Methods of estimating fertility

The problems associated with census data in developing countries described more than a decade ago by Brass (1996) and Cleland (1996) still apply to African censuses today. Attempting to estimate fertility using direct estimation techniques in Africa is still unrealistic (Moultrie and Dorrington, 2008). Demographers thus developed several methods that can indirectly estimate levels of fertility. Methods that use the number of children ever born, by age of women and number of births to women during the 12-month period prior to census as input data are, amongst others, the Brass P/F ratio, Relational Gompertz, Arriaga and Feeney P/F variant method.

1.2.3.1 The Brass P/F ratio

Moultrie and Dorrington (2008) noted that the Brass P/F ratio technique proposed by Brass (1964 and 1968) remains the most commonly applied technique to estimate fertility from limited and defective census data in Africa. The method is commonly used because it requires only data on cumulative fertility, classified by age of mother, and births in the past year by age of mother. One of its advantages is that it adjusts the age pattern of reported fertility derived from information on recent births by the level of fertility implied by the average parity of women in the reproductive age groups (UN, 1983). The assumptions involved in the Brass method are: (a) Fertility has been constant during the recent past; (b) The pattern of fertility is accepted; and (c) Younger women report their fertility more completely than older women. A glance at fertility trends over time observed in figure 17 suggests that the notion of constant fertility is not applicable to South Africa.

1.2.3.2 Arriaga's variant

As noted above, the major drawback of the Brass P/F ratio is the assumption of constant fertility. Arriaga (1994) proposed a method based on the original Brass P/F ratio that takes care of constant fertility based on the following assumptions: (a) The completeness of reporting of births that are used to estimate ASFRs is the same in all age groups; (b) Reporting of average number of children ever born per women is complete under the age of 30 or 35; and (c) Changes in fertility produce a linear trend of the average number of children ever born at each age of women particularly (15–35) between the two dates. The methods proposed by Arriaga (1983) have not been widely applied in sub-Saharan Africa partly because the technique ideally requires two, not too distant censuses, which are not always available in African countries (Moultrie and Dorrington, 2008).

In light of the above requirement, the method is not appropriate, as data on children ever born prior to Census 2011 can only be obtained from the Community Survey 2007. The application of the method will entail combining two data sources, and it is likely that the method might yield distorted estimates since they are from sources that applied different methodologies. Although data on Census 2001 are available, it could not be compared to data from Census 2011, as some of the methodologies of processing data on fertility from the two censuses are not comparable. Moultrie and Dorrington (2008) noted that where the quality of fertility data differs significantly, unreasonable trends in fertility may be produced.

1.2.3.3 The Relational Gompertz model

An improved and more versatile version of the Brass P/F method with the same input data is the Relational Gompertz model. The method fits a Gompertz function to data on average number of children ever born or ASFRs, by age of women to estimate fertility (Stats SA, 2010). While estimating fertility, the method corrects errors found in fertility data associated with incorrect births being reported in the reference period, and the under-reporting of lifetime fertility and errors of age reporting among older women (Moultrie et al., 2013). Another striking characteristic of the relational Gompertz model is that it is flexible enough to fit good data well, but bad data badly (Udjo, 2009). Lastly, the method provides estimates of TFR based on each 5-year age group in childbearing ages, which allows for inferences about trends in the level of fertility (Arriaga, 1994). The main development of the method was the extension of the model by Zaba (1981) who used the standard fertility schedule derived by Booth (1984). The limitations of the method is that the standard is chosen to be typical of populations with high fertility because the model is intended to be used to detect the kinds of errors that are found in data from such populations.

The relational Gompertz model entails a standard schedule of fertility by age which is modified mathematically until it fits the observed distribution. The modification involves three parameters of which two determine the relative shape of age-specific distribution and the third, the level of fertility. These parameters are the alpha, beta and total fertility rate. A further description of the model may be found in the UN Manual X (1983, pp, 25-26).

1.2.3.4 The Feeney variant of the P/F ratio method

A frequent criticism of the Brass P/F ratio method is that it was developed for use where fertility could be assumed to be constant over time. However, Feeney (1998) has shown that by reconceptualising the interpretation of the method but not changing the method in any material way, the method may be applicable to situations where fertility is falling. Feeney makes use of an observation by Norman Ryder (1983), that average parity of the cohort of women at mean age at childbearing is estimated to the total fertility rates that prevail at the time of survey. The method further proposes that the P/F ratio at the corresponding mean age at childbearing (MAC) for a given fertility schedule should be used as an adjustment factor despite the declining fertility. The method, however, will be applied based on the condition that the P/F ratio at MAC is above unity. If the ratio is below unity, it implies that current fertility is completely reported relative to lifetime fertility; hence, it will be meaningless to use the ratio to adjust for ASFRs. The implication is that the method will not be employed to adjust ASFRs for all populations (Stats SA, 2010)

Upon assessing all methods in relation to the assumptions, limitations and advantages, the relational Gompertz model and Feeney variant of the P/F ratio were found to be appropriate for the analysis of Census 2011 fertility data. The methods to be applied are informed by the following rules:

- If the observed fertility is below or equal to 2,1 (replacement fertility level) and the P/F at MAC is above one, the Feeney variant of the P/F ratio method ratio is employed
- Otherwise, if the observed fertility is above 2,1 and the P/F ratio at MAC is at unity or below unity, the relational Gompertz model is employed.

  N.B: the choice of the method based on the above rules was applied to all subpopulations (population groups, provinces and districts).

1.3 Parity progression ratio

A parity progression ratio (PPR) is the proportion of women who progress from parity to the next parity. PPRs have been calculated for cohorts of women defined by age. There is an assumption that there is no differential mortality by parity. Comparison of successive cohorts can give information on trends in fertility, although more reliable conclusions can be drawn if PPRs for the same cohorts can be compared across more than one census. However, the measure is generally applied to women at the end of their childbearing age, i.e. 45–49 (Preston, Heuveline and Guillot, 2001: pp 104). The parity progression ratio from parity *i* to parity *i*+1 is the proportion of the cohort who had at least i live births and who went on to have at least one more:

$PPR(i, _{i+1}) = P_i + P1/P_i$

Where $P_i + 1$ = number of women at parity *i*+1 or more
P_i = number of women at parity *i* or more

Chapter 2: Assessment of data

2.1 Introduction

Fertility questions that are often asked in censuses provide information on current births and lifetime fertility. In the 1960s, Brass and colleagues observed that these data are typically affected by a number of common errors. The most common error is the omission of births in lifetime fertility, which occurs when women tend to forget some of their children – especially those who are living in other households and who are no longer alive (Moultrie et al., 2013). The implication of this error is that the average parities fail to increase as the age of the women increases (UN, 1983). One other error in reported lifetime fertility is failure to report zero parity. It has been evidenced that enumerators neglect to record zero parity in the questionnaires, often leaving a blank response instead. The blank space makes it difficult to decide whether the value is really missing or if the women did not have children at all (El-Badry, 1961). Also, current fertility tends to be misreported at all ages due to misinterpretation of the reference period. Various studies investigating the reporting of age and statistics in developing countries have revealed enormous distortions of the age variable (Byrlee and Terran, 1981; Ewibank, 1969). In light of the above common errors experienced, the focus of this section is to assess the quality of data on age and sex, as well as recent and lifetime fertility collected from Census 2011.

2.2 Imputation rates

Editing is one of the processes used to inspect, and to correct where possible, responses according to predetermined specifications. It is important to establish the extent to which the rules were applied to variables before attempting to derive estimates from the data. Data on demographics and population were corrected using logical imputation and dynamic or hot-decking methods. Logical imputation refers to the editing process where imputation of values is calculated or deduced from other information in the household, while hot-decking is a way of finding values in datasets from the nearest neighbour to replace a blank or invalid value in a dataset. The UN (2001) noted that hot-decking "has become increasingly popular during data editing because it is easy and produces clean, replicable results".

During 2011 data processing, Statistics South Africa (Stats SA) established a team that designed edit specifications for each variable in the dataset. The team developed the following rules:

- No imputation;
- Logical imputation from non-blank;
- Logical imputation from blank;
- Hot-deck imputation from non-blank; and
- Hot-deck imputation from blank.

These imputation rules were used to calculate the rate at which variables were imputed.

2.2.1 Imputation rates on demographic variables

The results in Table 1 indicate the extent to which raw data on age and population group were edited among women aged 15–49. About 77,8% of national data on age of women aged 15–49 were not imputed. However, 19,1% of data on age were imputed from non-blank. This signifies errors of inconsistencies between recorded age in completed years and recorded date of birth. Nevertheless, it was logically corrected by subtracting age in completed years from year of birth. The assumption made to implement this logical edit was that the reported year of birth be given priority since people are more likely to recall their year of birth than age. With regard to population groups, more than 95% of data across all population groups were not subjected to editing rules. The rates reflected on the table and the methods used to impute suggest that data on age and population groups could be used in further analysis of fertility estimates.

Table 1: Distribution of women aged 15–49 years by age, population group and type of imputations applied to age and population group variables.

		Women 15–49	
Variables	**Imputation rule**	**Frequency**	**%**
Age	no imputation	9 545 969	77,8
	logical imputation (from blank)	193 484	1,6
	logical imputation (non-blank)	2 350 555	19,1
	hot-deck imputation (from blank)	137 186	1,1
	hot-deck imputation (non-blank)	48 521	0,4
	Total	**12 275 715**	**100,0**
black African	no imputation	9 469 283	95,3
	logical imputation (from blank)	374 910	3,8
	logical imputation (non-blank)	19 836	0,2
	hot-deck imputation (from blank)	69 908	0,7
	hot-deck imputation (non-blank)	975	0,0
	Total	**9 934 912**	**100,0**
coloured	no imputation	1 058 381	97,8
	logical imputation (from blank)	13 455	1,2
	logical imputation (non-blank)	1 593	0,1
	hot-deck imputation (from blank)	8 230	0,8
	hot-deck imputation (non-blank)	130	0,0
	Total	**1 081 789**	**100,0**
Indian/Asian	no imputation	291 731	97,1
	logical imputation (from blank)	5 625	1,9
	logical imputation (non-blank)	763	0,3
	hot-deck imputation (from blank)	2 213	0,7
	hot-deck imputation (non-blank)	27	0,0
	Total	**300 359**	**100,0**
white	no imputation	891 723	94,4
	logical imputation (from blank)	15 434	1,7
	logical imputation (non-blank)	2 084	0,2
	hot-deck imputation (from blank)	6 597	0,7
	hot-deck imputation (non-blank)	113	0,0
	Total	**915 951**	**100,0**

Source: Calculated from Census 2011 data

2.3 Quality of data on age

Errors found in age data are often unavoidable (Shryock and Siegel, 1976). The Age-sex Accuracy Index developed by the United Nations was employed to measure the level of errors in age data. The method is applicable to 5-year age groups rather than single-year age data, and takes into account the differential omission of persons in various age groups in addition to the age misstatements. The index uses sex ratios and age ratio scores for males and females to allocate a composite score that shows the level of the quality of a given age-sex population distribution (Shryock et al., 1976; Arriaga, 1994). According to the index, data are accurate if the score is less than 20, inaccurate if the score is between 20 and 40, and highly inaccurate if it is above 40.

The analysis in Table 2 indicates that nationally, the Age-sex Accuracy Index was less than 20, indicating that the data are accurate. However, the population group differentials portray a different pattern. The white and coloured population groups had higher accuracy scores of 13,5 and 16,2 respectively, whilst the black African and Indian/Asian population groups scored poorly with each positioned at an index of just over 20.

Table 2: UN Accuracy Index by population group, Census 2011

Population group	Description	UN Index
National	Age ratio score for males	4,1
	Age ratio score for females	3,8
	Sex ratio score	3,4
	Age-sex accuracy index	18,2
black African	Age ratio score for males	4,48
	Age ratio score for females	4,87
	Sex ratio score	4,0
	Age-sex accuracy index	21,3
coloured	Age ratio score for males	3,91
	Age ratio score for females	4,43
	Sex ratio score	2,63
	Age-sex accuracy index	16,2
Indian/Asian	Age ratio score for males	4,39
	Age ratio score for females	3,61
	Sex ratio score	4,84
	Age-sex accuracy index	22,5
white	Age ratio score for males	3,6
	Age ratio score for females	3,61
	Sex ratio score	2,12
	Age-sex accuracy index	13,57

2.4 Assessment of parity from raw data

The previous section indicates that demographic variables such as age and sex by population group are usable. However, considering that distorted parity data could affect the estimates of fertility, it was essential that the data on parity be interrogated. The assessment of parity and date of birth of the last child born from raw data was done to identify types and magnitude of reported errors with the purpose of establishing whether data should be edited or not.

2.4.1 Raw data on total children ever born

Tables 3 to 6 indicate the distribution of parity by age of women. Of all women who reported they never had children in Table 5, only 5,6% (227 353) were recorded as 0 in parity distribution, as recorded in Table 3. Given parity is reported by young women aged 0–10 years, it is apparent that the reported data are erroneous. The results reveal implausible parity reported among young women aged 15–24. For example, there are cases of women aged 15–19 and 20–24 who reported excessively high parities of six and above. This is in contradiction with spacing in births, and what has been documented thus far. Moultrie et al. (2013) noted that women aged 15–19 who started giving birth at age 12, would at a maximum have had 4 children when they completed their 19th birthday.

Table 3: Number of women who reported parity by age of mother (raw data)

	Parity																		
Age group	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17+	Missing	Total
0–4	126	1204	906	479	244	99	46	31	16	17	3	1	1	0	0	0	0	10	293	**3476**
5–9	84	633	548	265	99	58	28	10	6	9	3	1	0	1	0	0	0	9	151	**1905**
10–14	97	1192	328	130	51	27	10	2	3	4	0	2	0	0	0	0	0	4	288	**2138**
15–19	12391	217552	19459	1562	450	198	114	92	120	106	21	102	2	1	0	0	0	182	14551	**266903**
20–24	44267	745990	238106	40233	5982	1192	373	283	514	559	78	295	31	10	1	0	0	716	33255	**1111885**
25–29	49679	720565	513157	169870	42151	8907	1975	692	609	801	88	268	67	23	4	6	0	1036	42172	**1552070**
30–34	37150	415121	507918	267015	97065	31507	9442	2838	1208	975	132	181	58	38	21	9	1	1033	39123	**1410835**
35–39	29801	251031	429722	312644	154484	66319	27320	10377	4310	2109	502	245	91	48	27	12	3	999	37665	**1327709**
40–44	24077	167111	329329	284373	173177	90383	44694	20902	9559	4822	1889	706	298	152	61	29	12	857	35812	**1188243**
45–49	22321	133718	264784	251074	173468	102998	58149	30122	15325	7568	3426	1281	620	301	123	68	20	846	33713	**1099925**
50+	2657	19081	19956	12889	7206	3854	2116	1055	635	336	123	83	32	20	6	6	4	347	10195	**80601**
Unspecified	4703	39916	39036	21620	9999	4652	2229	1057	660	697	96	104	33	20	15	5	0	511	17796	**143149**
Total	**227353**	**2713114**	**2363249**	**1362154**	**664376**	**310194**	**146496**	**67461**	**32965**	**18003**	**6361**	**3269**	**1233**	**614**	**258**	**135**	**40**	**6550**	**265014**	**8188839**

Table 4: Percentage distribution of women who reported parity by age of mother (raw data)

	Parity																		
Age	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17+**	**Missing**	**Total**
0–4	3,6	34,6	26,1	13,8	7,0	2,8	1,3	0,9	0,9	0,5	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,3	8,4	**100,0**
5–9	4,4	33,2	28,8	13,9	5,2	3,0	1,5	0,5	0,5	0,5	0,2	0,1	0,0	0,1	0,0	0,0	0,0	0,5	7,9	**100,0**
10–14	4,5	55,8	15,3	6,1	2,4	1,3	0,5	0,1	0,1	0,2	0,0	0,1	0,0	0,0	0,0	0,0	0,0	0,2	13,5	**100,0**
15–19	4,6	81,5	7,3	0,6	0,2	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	5,5	**100,0**
20–24	4,0	67,1	21,4	3,6	0,5	0,1	0,0	0,0	0,0	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	3,0	**100,0**
25–29	3,2	46,4	33,1	10,9	2,7	0,6	0,1	0,0	0,0	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	2,7	**100,0**
30–34	2,6	29,4	36,0	18,9	6,9	2,2	0,7	0,2	0,2	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	2,8	**100,0**
35–39	2,2	18,9	32,4	23,5	11,6	5,0	2,1	0,8	0,8	0,2	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	2,8	**100,0**
40–44	2,0	14,1	27,7	23,9	14,6	7,6	3,8	1,8	1,8	0,4	0,2	0,1	0,0	0,0	0,0	0,0	0,0	0,1	3,0	**100,0**
45–49	2,0	12,2	24,1	22,8	15,8	9,4	5,3	2,7	2,7	0,7	0,3	0,1	0,1	0,0	0,0	0,0	0,0	0,1	3,1	**100,0**
50+	3,3	23,7	24,8	16,0	8,9	4,8	2,6	1,3	1,3	0,4	0,2	0,1	0,0	0,0	0,0	0,0	0,0	0,4	12,6	**100,0**
Unspecified	3,3	27,9	27,3	15,1	7,0	3,2	1,6	0,7	0,7	0,5	0,1	0,1	0,0	0,0	0,0	0,0	0,0	0,4	12,4	**100,0**

Table 5: Number of women who reported they never had children by parity and age of the mother (raw data)

	Parity																	
Age	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**17+**	**Missing**	**Total**
0–4	85	45	48	25	14	1	3	1	1	0	0	1	0	0	0	0	2	1990	**2216**
5–9	21	25	21	13	5	1	1	0	0	0	0	0	0	0	0	0	0	1146	**1233**
10–14	282	67	19	19	6	1	1	1	0	3	0	0	0	0	0	0	1	21717	**22117**
15–19	14003	6367	877	227	152	62	43	17	23	81	10	9	0	1	3	0	22	1459765	**1481662**
20–24	12041	22114	7342	1316	283	91	50	24	29	82	9	24	4	0	3	0	41	1027875	**1071328**
25–29	8103	21204	15766	5092	1290	343	70	33	40	89	13	27	4	2	2	0	38	588926	**641042**
30–34	4719	12647	16368	8133	2918	990	279	109	52	55	6	16	4	0	1	1	62	315391	**361751**
35–39	3406	7777	14580	10038	4644	1922	763	284	105	104	17	8	3	2	2	0	48	215007	**258710**
40–44	2651	5467	11621	9139	5211	2512	1186	553	275	140	31	19	11	8	1	1	33	162479	**201338**
45–49	2229	4275	9069	7795	5092	2690	1392	680	350	187	72	31	15	7	2	1	31	141211	**175129**
50+	724	783	896	578	297	135	68	34	19	9	2	8	4	2	1	1	22	38778	**42361**
Total	**48264**	**80771**	**76607**	**42375**	**19912**	**8748**	**3856**	**1736**	**894**	**750**	**160**	**143**	**45**	**22**	**15**	**4**	**300**	**3974285**	**4053245**

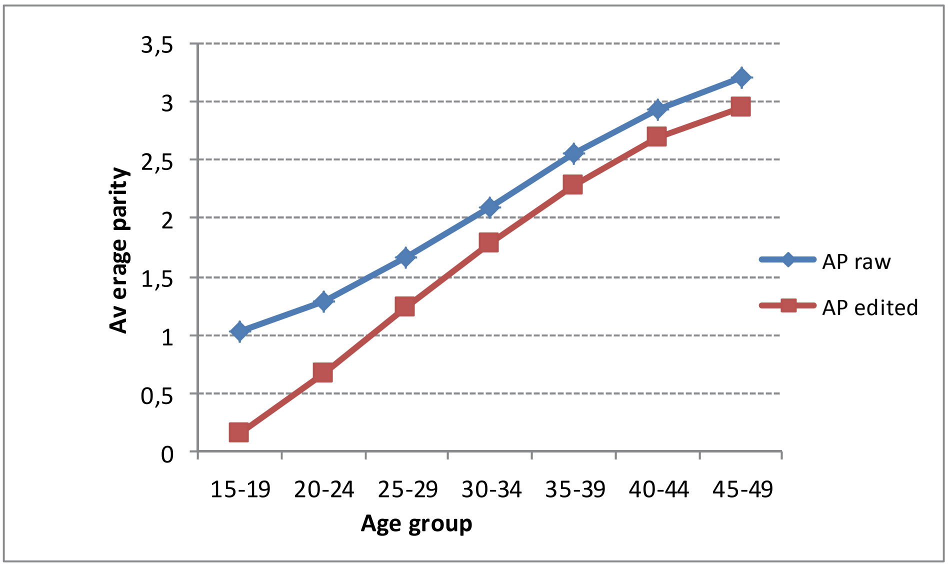
Table 6: Percentage distribution of women who reported they never had children by parity and age of mother (raw data)

	Parity																	
Age	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**17+**	**Missing**	**Total**
0–4	3,8	2,0	2,2	1,1	0,6	0,1	0,1	0,1	0,1	0,0	0,1	0,1	0,0	0,0	0,0	0,0	0,1	89,8	**100,0**
5–9	1,7	2,0	1,7	1,1	0,4	0,1	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	92,9	**100,0**
10–14	1,3	0,3	0,1	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	98,2	**100,0**
15–19	1,0	0,4	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	98,5	**100,0**
20–24	1,1	2,1	0,7	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	95,9	**100,0**
25–29	1,3	3,3	2,5	0,8	0,2	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	91,9	**100,0**
30–34	1,3	3,5	4,5	2,3	0,8	0,3	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	87,2	**100,0**
35–39	1,3	3,0	5,6	3,9	1,8	0,7	0,3	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	83,1	**100,0**
40–44	1,3	2,7	5,8	4,5	2,6	1,3	0,6	0,3	0,1	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	80,7	**100,0**
45–49	1,3	2,4	5,2	4,5	2,9	1,5	0,8	0,4	0,2	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	80,6	**100,0**
50+	1,7	1,9	2,1	1,4	0,7	0,3	0,2	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	91,5	**100,0**

2.4.2 Average parities (raw data)

Average parities calculated from data on children ever born could be distorted either by number of children reported or by errors in classification of women in particular age groups (UN, 1983). Figure 1 below compares the average parities by age, calculated from raw parity data and edited parity data. Although average parities show a consistent pattern of increase in parity with age of the mother, the pattern for women aged 25–29 and below is far higher when using raw data compared to edited data. This error corroborates the error of over-reporting of parities, particularly among young women, as discussed previously. The divergence in average parities, with higher average parities at all ages apparent in raw data, also confirms the reporting of implausible parity in the raw data across all age groups.

Figure 1: Average parities calculated from raw and edited data by age of the mother, Census 2011



2.4.3 Date of birth of the last child born (raw data)

In determining fertility estimates for 2011, the number of births occurring in the last 12 months prior to Census 2011 is crucial. This variable is derived from data on date of birth of the last child born. For that reason, its importance depends on quality of reported date of birth of the last child born.

Table 7 presents the raw data on the variable 'year of last child born', indicating the flaws inherent in the raw data. The results suggest that among all 5-year cohorts of women aged 15–49 who reported having children, over 90% reported a plausible year of last child born.

In addition, on average less than 6% of the cohorts in 15-49 age group had non-responses. Apart from errors related to the age of women falling outside the scope of fertility as well as missing data on year of last child born, year of the last child born data from raw data seems plausible and suggest that it could be used in estimation of fertility rates (Table 7).

Table 7: Distribution and percentage of year of last child born by age of the mother (raw data)

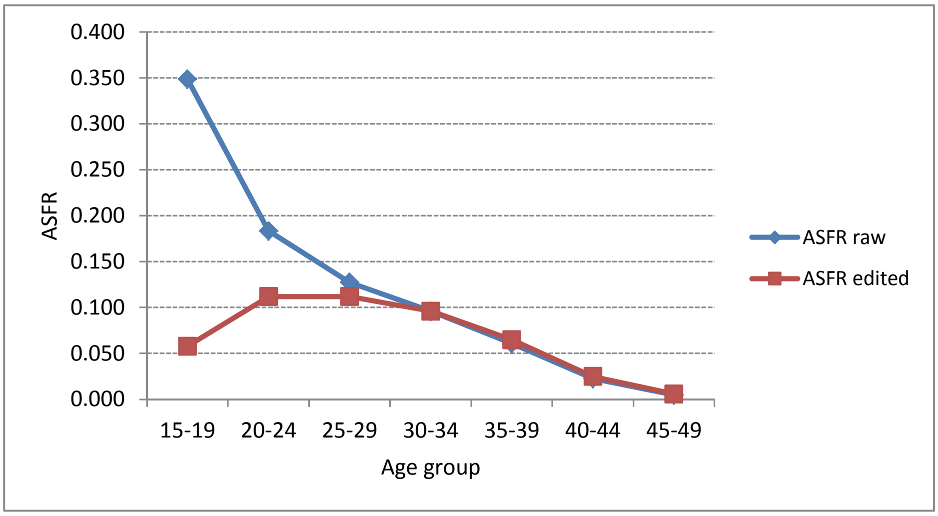
	Reported 1-3-digit year of last child born		Reported 4-digit year of last child born		Missing year of last child born		Total	
Age	No.	%	No.	%	No.	%	No.	%
0–4	4	0,12	3 022	86,9	452	13,0	3 478	**100,0**
5–9	7	0,37	1 665	87,5	231	12,1	1 903	**100,0**
10–14	7	0,33	1 776	83,0	356	16,6	2 139	**100,0**
15–19	517	0,19	244 131	91,5	22 252	8,3	266 900	**100,0**
20–24	1 975	0,18	1043 871	93,9	66 051	5,9	1 111 897	**100,0**
25–29	2 527	0,16	1465 769	94,4	83 774	5,4	1 552 070	**100,0**
30–34	2 127	0,15	1336 142	94,7	72 564	5,1	1 410 833	**100,0**
35–39	1 800	0,14	1260 971	95,0	64 935	4,9	1 327 706	**100,0**
40–44	1 561	0,13	1127 283	94,9	59 396	5,0	1 188 240	**100,0**
45–49	1 427	0,13	1041 812	94,7	56 684	5,2	1 099 923	**100,0**
50+	126	0,16	67 893	84,2	12 580	15,6	80 599	**100,0**
Missing	261	0,18	119 197	83,3	23 693	16,6	143 151	**100,0**
Total	**12 339**	**0,15**	**7 713 551**	**94,2**	**462 968**	**5,65**	**8 188 839**	**100,0**

2.4.4 Age-specific fertility rates (raw data)

The age-specific fertility rate (ASFR) is an indicator that influences the accuracy of fertility estimates if current fertility data are poorly reported. The reliability of current fertility is determined by the number of births in the last 12 months prior to census data. Amongst the errors that are often found, is the error caused by births outside the reference period that either include births outside the scope or exclude births that are in scope. Figure 2 gives ASFRs calculated from raw and edited data. Traditionally, the pattern of ASFRs, should have a concave shape that increases with age, peaks and begins to decline at older ages. In contrast to the expected pattern, the current fertility based on raw data indicates excessively high ASFRs among young women aged 15–19 and 20–24. Notwithstanding the common error created by the reference period, the deviation of raw ASFRs at ages 15–19 and 20–24 may be attributed to the omission of women who reported they never had children in parity data as mentioned earlier.

Given the extent of reported errors and implausible parities in the raw data discussed above, logical edit specifications were designed and applied to data to minimise the effect of these errors on the estimates.

Figure 2: Age-specific fertility rates calculated from raw and edited data by age of mother, Census 2011



2.5 Assessment of edited data

The process of editing is done to ensure the validity and consistency of individuals' records as well as the relationship among records in the household and to check the reasonableness of aggregated data. Although the intention of the editing process is to have a positive impact on the quality of data, increases in the number of edits may also have a negative impact (UN, 2010). In light of this, this section seeks to assess edited data using various demographic techniques.

2.5.1 Edited data on total children ever born

After implementing edit specifications, the distribution of parity and total children ever born by age of the mother in Tables 8 and 9 respectively were analysed. Amongst the many edit specifications that were designed, the consistency matrix was developed and implemented. The matrix removed implausible parities based on the age of the mother. Based on the idea that a woman could have only 1 child every 18 months (with the exception of twin births), and assuming she gave her first birth at the earliest age of 12 years, she could have had at most 4 children at the age of 19, as indicated in Table 8. On analysing parity from edited data, it was certain that data could be used to derive fertility estimates.

Table 8: Distribution of women (15–49) by parity and age of women (edited)

	Parity																		
Age	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**95**	**97**	**Total**
15–19	1527716	291576	34802	6197	1025	0	0	0	0	0	0	0	0	0	0	0	0	582689	6553	**2450558**
20–24	1017578	898301	296807	59514	14840	4284	1583	0	0	0	0	0	0	0	0	0	0	311077	8798	**2612782**
25–29	566391	846408	600123	208317	60334	15771	7044	3728	1312	0	0	0	0	0	0	0	0	166272	6725	**2482425**
30–34	290751	492473	588898	312162	121759	41096	16581	6289	3955	2205	898	211	0	0	0	0	0	91585	3407	**1972270**
35–39	188325	300345	498577	359106	182705	79329	37209	15229	8321	3998	2328	1252	687	127	0	0	0	63123	2061	**1742722**
40–44	137200	206532	389005	325900	201407	105206	56220	27314	14838	7537	4425	2314	1651	936	587	195	0	49734	1073	**1532074**
45–49	118294	170264	313890	287990	198588	117067	69561	37390	21537	10881	6667	3296	2416	1428	969	628	422	49657	686	**1411631**
Total	**3846255**	**3205899**	**2722102**	**1559186**	**780658**	**362753**	**188198**	**89950**	**49963**	**24621**	**14318**	**7073**	**4754**	**2491**	**1556**	**823**	**422**	**1314137**	**29303**	**14204462**

*Code 97 represents all women with parity inconsistent with the age of the mother
*Code 95 represents women with unstated parity

Table 9: Distribution of total children ever born by parity and age of the mother (edited)

Age	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total
15–19	291576	69604	18591	4100	0	0	0	0	0	0	0	0	0	0	0	0	**383871**
20–24	898301	593614	178542	59360	21420	9498	0	0	0	0	0	0	0	0	0	0	**1760735**
25–29	846408	1200246	624951	241336	78855	42264	26096	10496	0	0	0	0	0	0	0	0	**3070652**
30–34	492473	1177796	936486	487036	205480	99486	44023	31640	19845	8980	2321	0	0	0	0	0	**3505566**
35–39	300345	997154	1077318	730820	396645	223254	106603	66568	35982	23280	13772	8244	1651	0	0	0	**3981636**
40–44	206532	778010	977700	805628	526030	337320	191198	118704	67833	44250	25454	19812	12168	8218	2925	0	**4121782**
45–49	170264	627780	863970	794352	585335	417366	261730	172296	97929	66670	36256	28992	18564	13566	9420	6752	**4171242**
Total	**3205899**	**5444204**	**4677558**	**3122632**	**1813765**	**1129188**	**629650**	**399704**	**221589**	**143180**	**77803**	**57048**	**32383**	**21784**	**12345**	**6752**	**20995484**

2.5.2 Imputation rates of women aged 15-49 who reported date of birth of the last child born

As mentioned previously, imputation rates indicate the extent to which the variable has been edited. Table 10 below presents imputation rates of women who reported "date of birth of last child born". Findings from the reported raw data for the variable ‘year of birth of the last child born’ discussed earlier concur with those reflected in Table 7. Given that on average, 95% of women who reported year, month and day of the last child born were not imputed, it can be assumed that data on date of birth were correctly reported during data collection process.

Table 10: Distribution of women aged 15-49 who reported year, month and day of last child born by type of imputation applied

Date of last child born	Imputation rules	Women 15–49	
		Frequency	%
Year of birth	no imputation	11 929 190	97,2
	logical imputation (from blank)	39 809	0,3
	logical imputation (non-blank)	306 716	2,5
	Total	**12 275 715**	**100,0**
Month of birth	no imputation	11 957 477	97,4
	logical imputation (from blank)	41 783	0,3
	logical imputation (non-blank)	276 455	2,3
	Total	**12 275 715**	**100,0**
Day of birth	no imputation	11 158 828	90,9
	logical imputation (from blank)	83 837	0,7
	logical imputation (non-blank)	48 104	0,4
	hot-deck imputation (from blank)	919 815	7,5
	hot-deck imputation (non-blank)	65 131	0,5
	Total	**12 275 715**	**100,0**

Source: Calculated from Census 2011 data

2.5.3 Imputation rates of women aged 15-49 who reported parity

Table 11 indicates that two-thirds (65,7%) of data on women who reported total children ever born (TCEB) were not imputed. However, a noticeable 30% of data were logically imputed from non-blank. The changing of values of women who reported TCEB from non-blank was based on valid information of women who reported parity of children surviving and children dead[1]. On this note, data on women who reported parity can be confidently applied in developing fertility estimates.

[1] One of the edit specifications applied was to derive TCEB from children surviving and dead if TCEB was invalid
The formula of the edit specification designed was: Total children ever born = Total children surviving + Total children no longer alive

Table 11: Distribution of women aged 15-49 who reported parity by type of imputation applied

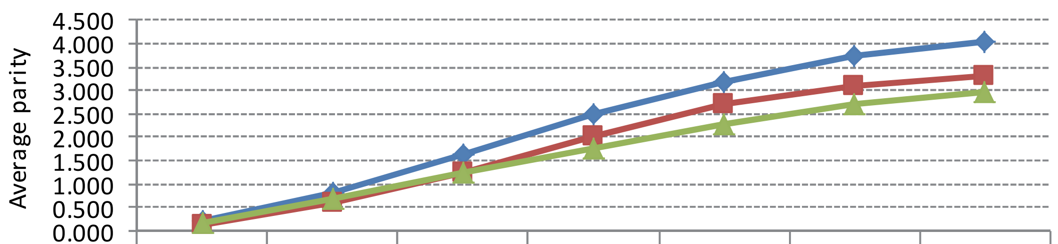
Variable	Imputation rules	Women 15–49	
		Frequency	**%**
Women aged 15-49 who reported parity	no imputation	8 068 086	65,7
	logical imputation (from blank)	520 545	4,2
	logical imputation (non-blank)	3 687 084	30,0
	Total	**12 275 715**	**100,0**

Source: Calculated from Census 2011 data

2.5.4 Cohort analysis of average parities

The pattern of average parities is used to assess the credibility of lifetime fertility. Average parities are calculated for each age group or cohort, by dividing the total number of children born to women in a particular age group by the total number of women in that age group, with appropriate allowance for women for whose number of children ever born is not stated (UN, 2004). Average parities are expected to gradually increase with the age of the mother. Figure 3 gives the reported average parities according to the 1996, 2001 and 2011 censuses. It is clear that for all years, average parity increases with the age of the mother. On the other hand, analysis of average parities across cohorts from 1996 to 2011 confirms the pattern of average parities in prior years. For example, there is an increase in average parities among women aged 15–19 from 0,21 in 1996 to 0,59 in 2001 when they are aged 20-24, and then in 2011 it was positioned at 1,77 as they progressed to age 25-29. Average parity increased within a cohort as that cohort aged.

Figure 3: Average parities, censuses of 1996, 2001 and 2011



	15-19	20-24	25-29	30-34	35-39	40-44	45-49
1996	0.210	0.836	1.631	2.510	3.178	3.719	4.058
2001	0.123	0.590	1.265	2.028	2.703	3.088	3.305
2011	0.157	0.674	1.237	1.777	2.285	2.690	2.955

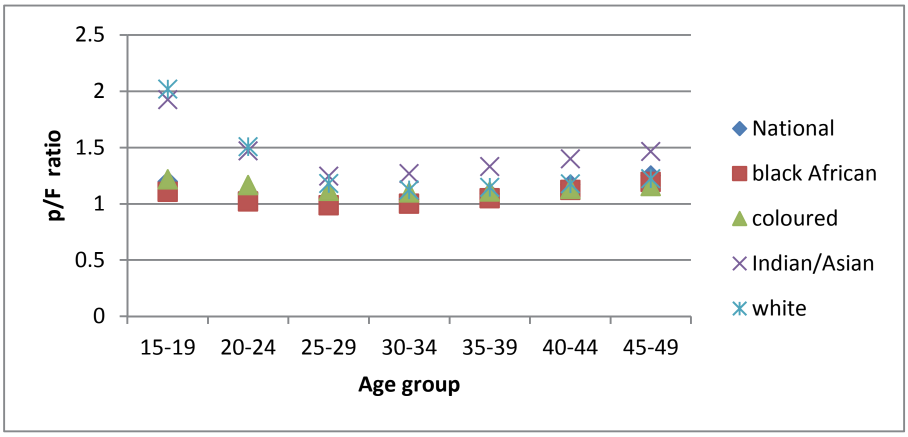
Source: Udjo 2005, Calculated average parities from Census 2001 and Census 2011

2.5.5 Pattern of P/F ratios

Although the Brass 1968 P/F ratio procedure was originally used as a technique to estimate fertility, it has been recommended and thus used, as a diagnostic tool in the evaluation of census fertility data and surveys (Moultrie and Dorrington, 2008; Hobcraft, Goldman and Chidambaram, 1982). The method compares observed average parities P(i) with calculated average parity equivalents F(i) (UN,1983). The P/F ratios by age serve as indicators of the consistency and accuracy of two data sets.

On applying the method, national data in Figure 4 indicate P/F ratios that increase with age, with the exception of the younger age groups 15–19 and 20–24. A similar pattern of P/F ratios across age groups is apparent in all population groups. Apart from the P/F ratios of Western Cape and Gauteng that start to increase at age group 30–34, the same pattern for population groups still holds for all provinces (Appendix Table A1). The P/F ratio pattern could suggest two main issues. Firstly, that fertility has been declining in the recent past, which confirms the scenario in terms of fertility transition in South Africa. Secondly, P/F ratios that are above one signify that current fertility is underreported relative to lifetime fertility. African women aged 25–29 had a P/F ratio that falls below unity, indicating more complete current fertility relative to lifetime fertility. The provincial P/F ratios suggest that only North West reported current fertility more completely in relation to lifetime fertility among women aged 25–29, 30–34 and 35–39 (Appendix Table A1).

Figure 4: P/F ratios by population group and age of the mother



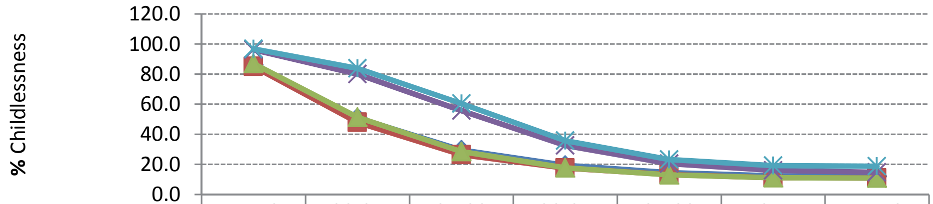
2.5.6 Childlessness

The proportion of women who are childless[2] among women in a population is yet another method used to evaluate the quality of parity data. Parity data are deemed to be reliable if the proportion of women experiencing childlessness decreases with the age of women, and the proportion of women that remained childless at age 45–49 should not exceed 10% in reported data (Moultrie et al., 2013).

Figure 5 shows the proportion of women who were childless by age of women at national level and across population groups. All subpopulations show decreasing childlessness with an increase in age of women. The white and Indian/Asian women have the highest proportion of childlessness among women aged 15–19 and 20–24. The level of childlessness declined significantly among white and Indian/Asian women at ages 25–29, whilst the decline in childlessness occurred far earlier among black African and coloured women at ages 20–24. The results further show the proportion of childless women that exceeds 10% at age group 45–49 across all population groups. However, childlessness at this age group is noticeably higher among white and Indian/Asian population groups. The Indian/Asian and white populations are characterised by low fertility, therefore the populations are likely to have a high proportion of childless women at ages 45–49. With the exception of the proportion of childless women aged 45–49 who are white and Indian/Asian, the pattern suggests that the data could be employed to derive plausible fertility estimates. It is noteworthy that prior to the assumption that the unstated parity is parity zero, the proportion of coloured, black African as well as women nationally, aged 45–49 who were childless, was below 10%, whilst whites and Indians/Asians scored above 10%.

[2] Note that women with unstated parity are included in analysis as they are assumed to be childless. The assumption is based on the findings from the El-Badry correction method (Figure 7)

Figure 5: Proportion of women who were childless by age of women

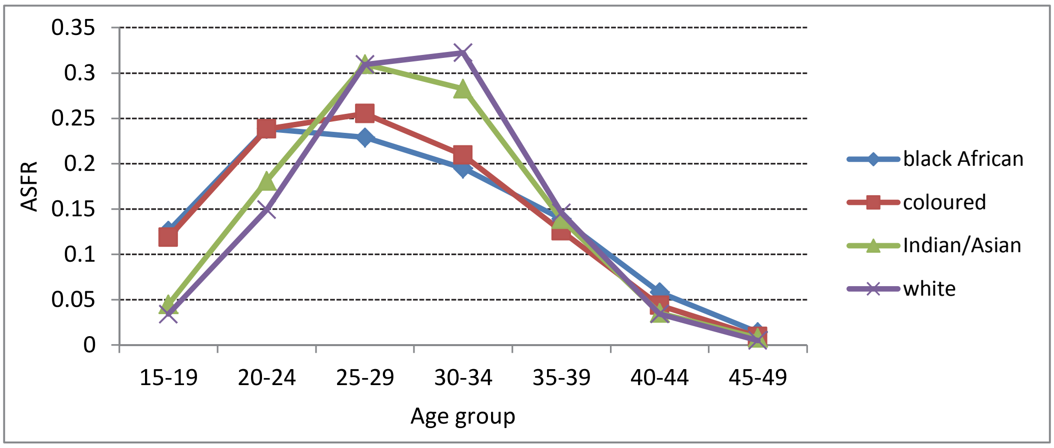


	15-19	20-24	25-29	30-34	35-39	40-44	45-49
National	86.1	50.9	29.5	19.4	14.4	12.2	11.9
black African	85.1	47.8	26.3	17.4	13.2	11.1	10.8
coloured	86.9	51.2	28.4	17.6	12.9	11.0	10.8
Indian/Asian	96.0	79.9	55.6	32.5	20.3	15.9	14.6
white	96.7	83.7	60.4	35.6	23.2	19.1	18.6

2.5.7 Observed age-specific fertility rates

Further assessment of the fertility data was done by comparing the observed age-specific fertility rates of the four population groups of South Africa. The pattern depicted in Figure 6 suggests that the data are reasonable since the fertility schedules are consistent with what has been documented about fertility behaviour of the respective population groups in prior surveys and census data (Stats SA, 2010). The fertility schedules for black African women suggest that childbearing peaks at early ages (20–24) when compared to other population groups. Coloured and Indian/Asian women showed higher ASFRs at ages 25–29, whilst whites peaked at ages 30–34. Though the ASFRs of the Indian/Asian and white population groups are the highest amongst women aged 25–29 and 30–34, the rates dropped significantly as the age of women increases.

Figure 6: Observed relative age-specific fertility rates by population group of the mother, Census 2011



2.5.8 Application of the El-Badry correction method

It is well documented that enumerators often do not record zero parity on the questionnaire to indicate that a woman had never had a child; instead the response is left blank. This is particularly prevalent among younger women. The responses are thus ambiguous, such that it will not be known whether blank is unspecified or represents a childless woman (El-Badry, 1961). If a noticeably large proportion of women are classified under parity not stated, the exclusion of these women will overestimate average parities. Conversely, if these women are included in the denominator, the inclusion will underestimate the average parities.

The El-Badry correction method is employed to rectify such errors. The method apportions the number of women whose parity is recorded as 'missing' between those whose parity is regarded as being truly unknown, and those women who should have been recorded as childless but whose responses were left blank (UN, 1983).

The method is applied when the proportion of "not stated" at each age group is higher than 2%. However, there should be strong linearity between the unstated parity and parity zero. If a linear relationship cannot be identified, it is assumed that all women of unstated parity are childless. The figures in Table 12 show that in all age groups, the proportion of women with parity unstated exceeds 2%. This is an indication that the El-Badry correction method should be applied to establish if the unstated parity are "true missing" or are in fact parity zero.

Table 12: Distribution of parity by age of women

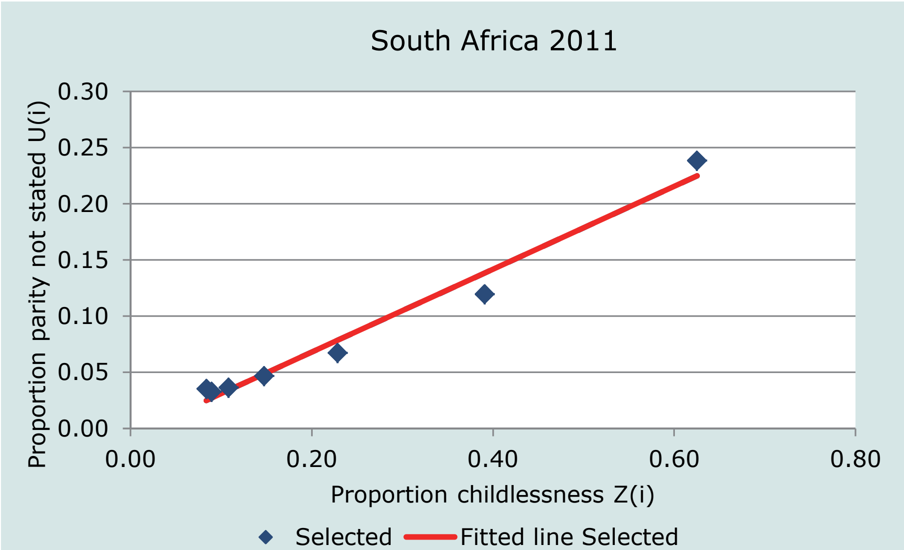
	Age group						
Parity	**15–19**	**20–24**	**25–29**	**30–34**	**35–39**	**40–44**	**45–49**
0	1 527 716	1 017 578	566 391	290 751	188 325	137 200	118 294
1	291 576	898 301	846 408	492 473	300 345	206 532	170 264
2	34 802	296 807	600 123	588 898	498 577	389 005	313 890
3	6 197	59 514	208 317	312 162	359 106	325 900	287 990
4	1 025	14 840	60 334	121 759	182 705	201 407	198 588
5	0	4 284	15 771	41 096	79 329	105 206	117 067
6	0	1 583	7 044	16 581	37 209	56 220	69 561
7	0	0	3 728	6 289	15 229	27 314	37 390
8	0	0	1 312	3 955	8 321	14 838	21 537
9	0	0	0	2 205	3 998	7 537	10 881
10	0	0	0	898	2 328	4 425	6 667
11	0	0	0	211	1 252	2 314	3 296
12	0	0	0	0	687	1 651	2 416
13	0	0	0	0	127	936	1 428
14	0	0	0	0	0	587	969
15	0	0	0	0	0	195	628
16	0	0	0	0	0	0	422
95	582 689	311 077	166 272	91 585	63 123	49 734	49 657
97	6 553	8 798	6 725	3 407	2 061	1 073	686
Total	**2 450 558**	**2 612 782**	**2 482 425**	**1 972 270**	**1 742 722**	**1 532 074**	**1 411 631**
% parity unstated	**23,78**	**11,91**	**6,7**	**4,64**	**3,62**	**3,25**	**3,52**
% childless	**62,3**	**38,9**	**22,8**	**14,7**	**10,8**	**9,0**	**8,4**

2.5.9 Fitting of El-Badry correction method, Census 2011

The proportions of parity unstated above suggest that the El-Badry technique for estimating true non-response be applied. However, the requirement of linearity between parity unstated and missing values should be observed, or else, women of unstated parity should be included in the female population denominator when calculating average parity (UN, 1983).

Figure 7 presents the results of fitting the El-Badry correction method. The method suggests that if there is linearity between the unstated parity and parity zero, i.e. if all the values lie on the fitted line, then all points could be included in the application of the El-Badry correction method. The divergence of the proportion childlessness Z(i) and proportion with parity not stated U(i) from the fitted line is a suggestive that there is no linear relationship between childlessness and unstated parity, hence missing parity is assumed to be parity zero.

Figure 7: Series of selected points from the El-Badry correction, Census 2011



Chapter 3: Average parities and parity progression ratios

3.1 Introduction

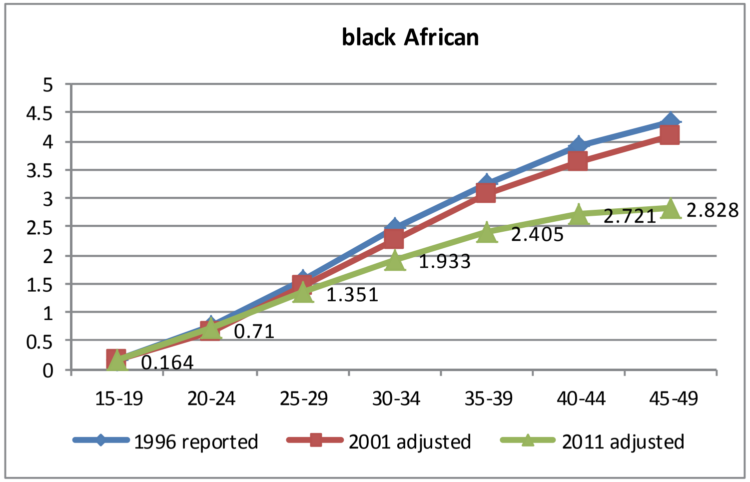
Average parties ascertain whether cohorts of women report the number of children ever born consistently. It has already been established in the previous section on assessment of data that the pattern of average parities derived from parity data is credible and can be used as input data when deriving fertility estimates. This section investigates average parities over time within population groups and provinces. Further; it examines the fertility behaviour of women by analysing the parity progression ratios.

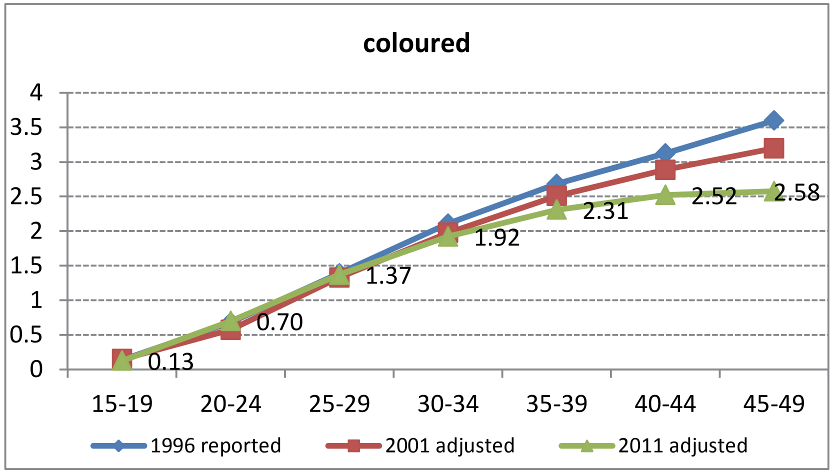
3.2 Pattern and trends of average parities

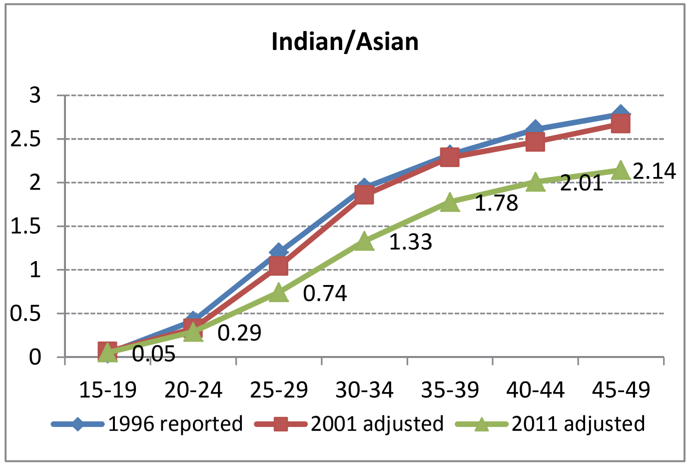
Figure 8 indicates that for all population groups there was a decline in average parities over time, with average parities in 2011 lower than those reported in Census 1996 and Census 2001. However, the level of and decline in average parities differ across population groups. It is apparent that black African and coloured population groups characterised by high fertility rates exhibit higher average parities relative to other population groups

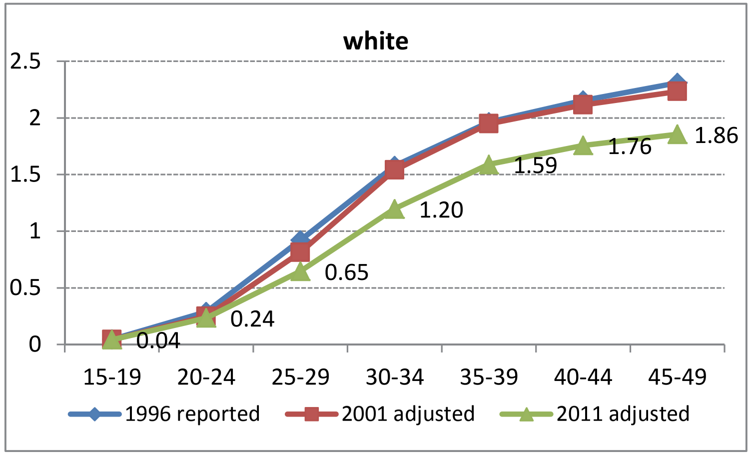
Table 13 presents the average parities of all the provinces in South Africa, i.e. Western Cape (WC), Eastern Cape (EC), Northern Cape (NC), Free State (FS), KwaZulu-Natal (KZN), North West (NW), Gauteng (GP), Mpumalanga (MP), and Limpopo (LP). The table shows that between 1996 and 2011, average parities for all the provinces decreased. The levels of average parities for each province correspond to the total fertility rates (TFRs) observed in the provinces. The provinces of Limpopo, Eastern Cape, North West, Mpumalanga and KwaZulu-Natal had higher average parities and higher TFRs compared to rest of the country.

Figure 8: Average parities by population group, censuses of 1996, 2001 and 2011









Source:Moultry and Dorrington (2004), Calculated average parities from Census 2011

Table 13: Average parities by province, censuses of 1996, 2001 and 2011

Age group	WC 1996 reported	WC 2001 adjusted	WC 2011 adjusted	EC 1996 reported	EC 2001 adjusted	EC 2011 adjusted	NC 1996 reported	NC 2001 adjusted	NC 2011 adjusted
15–19	0,15	0,16	0,14	0,15	0,15	0,16	0,17	0,18	0,16
20–24	0,64	0,57	0,58	0,77	0,65	0,71	0,73	0,67	0,78
25–29	1,36	1,27	1,1	1,72	1,6	1,37	1,52	1,39	1,46
30–34	2,19	1,99	1,62	2,78	2,58	1,97	2,3	2,16	2,03
35–39	2,88	2,71	2,06	3,69	3,5	2,45	3,06	2,81	2,45
40–44	3,58	3,2	2,31	4,34	4,16	2,77	3,64	3,38	2,69
45–49	3,97	3,71	2,44	4,68	4,54	2,88	4,12	3,77	2,76

Age group	FS 1996 reported	FS 2001 adjusted	FS 2011 adjusted	KZN 1996 reported	KZN 2001 adjusted	KZN 2011 adjusted	NW 1996 reported	NW 2001 adjusted	NW 2011 adjusted
15–19	0,13	0,15	0,14	0,18	0,2	0,17	0,15	0,16	0,16
20–24	0,64	0,57	0,67	0,75	0,71	0,72	0,72	0,63	0,74
25–29	1,44	1,32	1,29	1,58	1,49	1,36	1,49	1,4	1,41
30–34	2,29	2,08	1,82	2,58	2,32	1,92	2,29	2,15	2,00
35–39	3,01	2,78	2,23	3,4	3,2	2,36	3,03	2,81	2,46
40–44	3,75	3,31	2,47	4,11	3,79	2,65	3,75	3,36	2,75
45–49	4,3	3,87	2,54	4,54	4,3	2,74	4,26	3,88	2,83

Age group	GP 1996 reported	GP 2001 adjusted	GP 2011 adjusted	MP 1996 reported	MP 2001 adjusted	MP 2011 adjusted	LP 1996 reported	LP 2001 adjusted	LP 2011 adjusted
15–19	0,14	0,16	0,13	0,19	0,21	0,18	0,18	0,2	0,15
20–24	0,66	0,58	0,57	0,81	0,75	0,76	0,83	0,78	0,74
25–29	1,32	1,25	1,09	1,69	1,56	1,42	1,72	1,67	1,48
30–34	2,05	1,91	1,59	2,65	2,41	2	2,9	2,54	2,17
35–39	2,6	2,51	2,02	3,48	3,24	2,48	3,73	3,56	2,74
40–44	3,04	2,88	2,33	4,2	3,85	2,8	4,43	4,17	3,12
45–49	3,33	3,17	2,5	4,66	4,36	2,91	4,69	4,61	3,25

Source: Moultry and Dorrington (2004), Calculated average parities from Census 2011

3.3 Parity progression ratios in South Africa

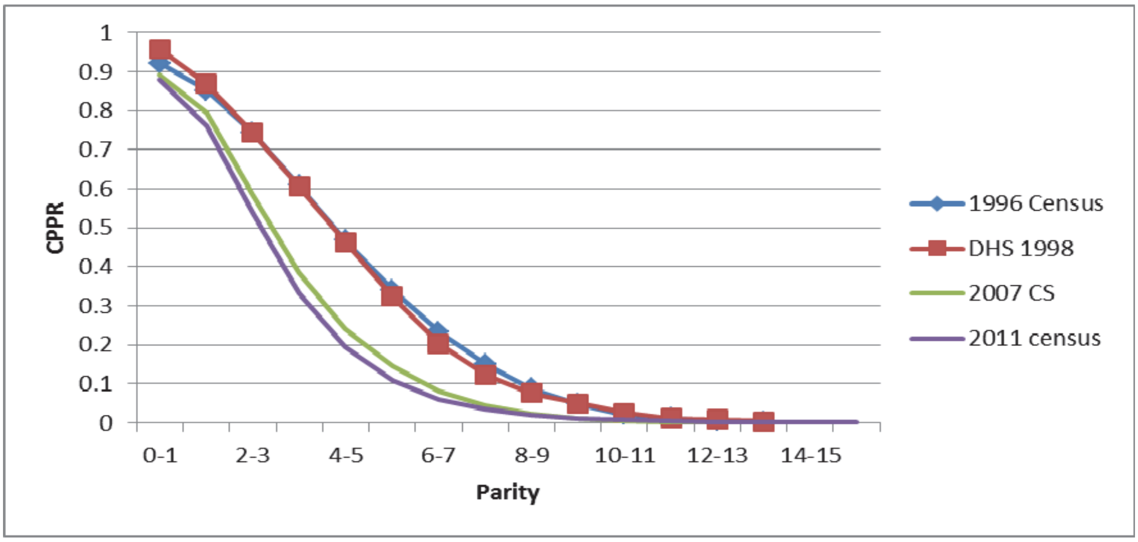
When measuring and investigating the pattern of fertility, it is important to consider birth orders, particularly higher birth orders, i.e. the proportion of women having a third or subsequent birth, as this greatly influences the TFR within a population (Kippen, 2004). Information on the proportion of women having another child describes a pattern of fertility, and is useful in better understanding the family formations and the factors influencing fertility transition in South Africa. This section attempts to use the parity progression ratios (PPR) over time to better understand factors influencing fertility in South Africa, particularly the preference in the number of children desired in South Africa.

Using parity information collected in Census 1996, DHS 1998 and Census 2011, the change in the pattern of fertility over time is clearly depicted (Figure 9). Figure 9 shows the cumulative parity progression ratios among women aged 45–49 over time. The cohort of women aged 45–49 have completed their childbearing and thus provide the most reliable measure of parity progression. Parity among women in younger cohorts may be considered misleading, as these women may progress to having more births in the future.

3.3.1 Cumulative parity progression ratios

The cumulative parity progression ratio (CPPR) between 1996 and 2011 in Figure 9, reflects the proportion of women aged 45–49 attaining parity one or higher. The DHS CPPRs confirm the findings of Census 1996, given the similarity in results over the 2 year period. According to the figure, the proportion of women attaining higher birth orders is higher among women in 1996 and 1998 when compared to women in 2011. Also, the proportion of women who have had one or more births is lower in 2011 than in previous years. By 2011, 76% of women aged 45–49 have had at least two births as opposed to 86% in 1996 and 1998. By 2011, 53% of women have had three or more births, which is far lower than what it was in 1996 and 1998 (74%). Between CS 2007 and Census 2011, there is a 4-year interval. The CPPRs for the 2007 CS show a similar pattern and level to that of the 2011 Census CPPRs. However, the CPPRs of 2011 are consistently lower, though marginally, than those of 2007.

Figure 9: Cumulative parity progression ratios for women aged 45–49, Census 1996, DHS 1998 and Census 2011

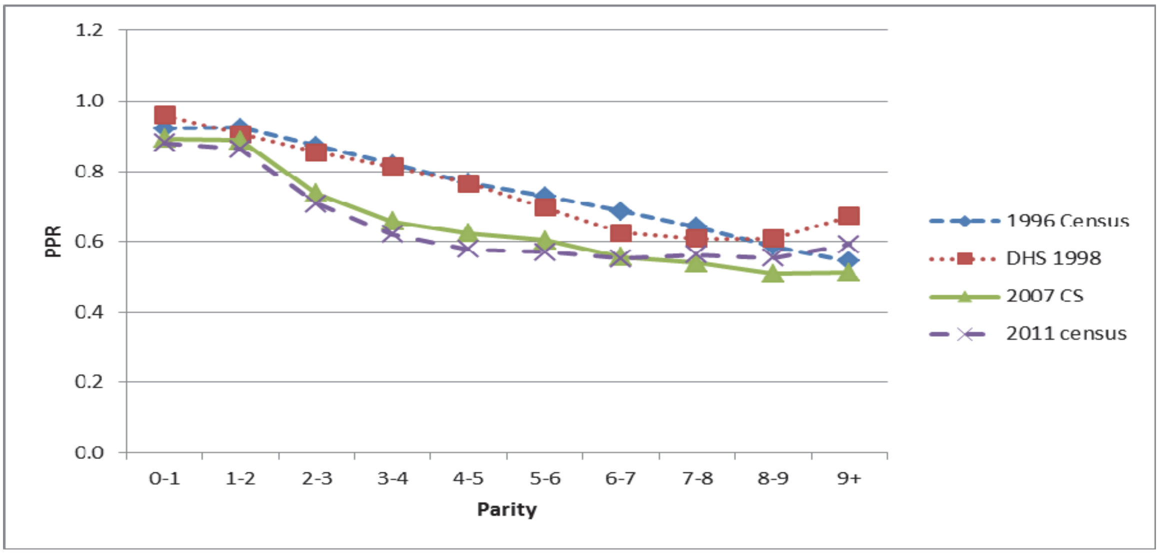


3.3.2 Parity progression ratios

Whilst the cumulative parity progression ratio (CPPR) indicates the proportion of women who have completed a particular parity, the PPR shows the probability of having one more child – given the fact that a woman already has had a certain number of births. The PPRs in Figure 10 show that in general, the probability of progressing to a higher birth order declines with an increase in parity. The differing parity progression ratios in 1996 and 2011 show that the proportion of women aged 45–49, progressing to higher birth orders has declined significantly over time. The decline in TFR over time is characteristic of the decline of PPR at higher birth orders by 2011. According to Appendix Table A5, the probability of progressing from childlessness to first birth (although declining) remained fairly high in 2011. By 2011, around 88% of women aged 45–49 had had at least one child, whilst in 1996, almost 92% of women had had at least one child. As shown in the table, the proportion of women having another birth over time is dropping not only at high birth orders, but also for women of lower parity. The proportion of women aged 45–49, who have had two children and progressed to have a third birth, has dropped significantly. In 1996, 87% of women aged 45–49, who had had two children went on to have a third child. In 2007, this figure dropped significantly to 73%, and in 2011, even fewer women in this age group (70%) who had had two children went on to have a third birth. The 'step' in parity 2 among women aged 45–49 as early as 2007 is a clear indication of a parity preference that has developed over the past 34 years. The decline in PPRs among women aged 45–49 between 1996 and 2011 as well as the fertility preference of two children, confirms the decline in TFR over time. Massive strides in contraceptive innovation, access and use, as well as improvement in female socio-economic status have occurred within this period. More direct indicators such as age at first birth, mean children ever born (CEB) and optimum family size desire have shown a decline in this period. The change in the pattern of parity progression is indicative of increasing fertility control via contraceptive use for limiting and spacing births, and subsequently the choice in deciding the ideal number of children by women and/or couples in South Africa (DoH, 1998).

The increase in PPRs from parity 9 and upwards is partly due to the small number of cases at extremely high birth orders. It is also important to consider that there is an element of self-selection for women at high parities, as it is common for women who have already borne five children, to go on to produce six children. This results in a bias in PPRs at significantly high birth orders.

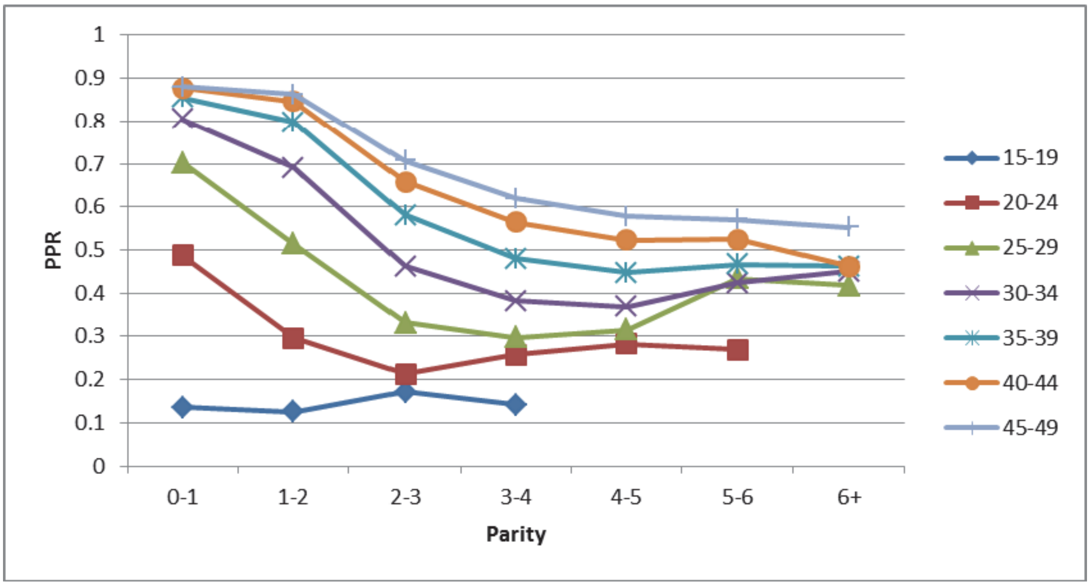
Figure 10: Parity progression ratios for women aged 45–49, Census 1996, DHS 1998, CS 2007 and Census 2011



3.3.3 Incomplete parity progression ratios

The PPRs for 2011 by 5-year age cohorts are presented in Figure 11. These ratios are also referred to as 'incomplete parity progression ratios' as they are for women who are still of childbearing age and who may therefore still have children. However, the figure shows a 'step' at parity 2 for women currently aged 30–34, 35–39 and 45–49 years. This indicates that fertility preference for two children seems to have been continuing for the past 15 years, as women as young as 30 years of age who began their reproductive cycle at age 15 show a preference in 2011 for two children . However, as alluded to earlier, the PPRs of women at younger cohorts should be interpreted with caution.

Figure 11: Incomplete parity progression ratios, Census 2011



3.4 Parity progression ratio differentials

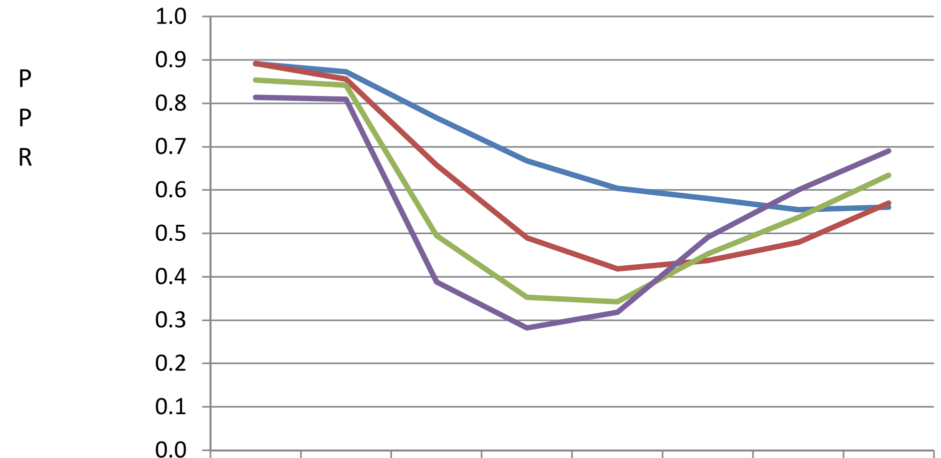
Over a woman's lifetime, her own assessment of the ideal number of children she would like to have will be subject to changes in social and cultural prescripts and ideals as well as her own experiences. The PPRs by population group, educational attainment, marital status and geographical location (urban/non-urban and province), provide us with an indication of the influence of these factors on parity progression and subsequently on fertility behaviour among women in South Africa. Analysis of the PPRs of the cohort, women aged 45–49, is useful as they are at the end of their reproductive lifespan and have in most instances completed their fertility.

3.4.1 Parity progression ratios by population group

Figure 12 below captures the proportion of women with a given number of children who "progress" to having another child. A general pattern of declining PPRs with an increase in parity is evident for all population groups. However, the PPRs for white, Indian/Asian and coloured women show a pattern of increased PPRs at parity 5 and 6. This may be related to the small number of women in the white, Indian/Asian and coloured population groups that report parities greater than 4. The larger number of black African women having higher birth orders relative to other population groups is evident in the PPRs of these women progressing to a high of parity 7.

A lower proportion of white women progressed from parity 0 to 1 when compared to black African, coloured as well as Indian/Asian women, indicating higher levels of childlessness among white women relative to all other population groups. Similar to the national PPR, there is an obvious "step" in the PPR at parity 2, with a sudden decline in the proportion of women with parity 2 progressing to a third birth, leading to the conclusion that there is a socially sanctioned optimum number of two children across all population groups. The gradual decline in PPR by parity among black African women, even after parity 2, indicates that a higher proportion of black African women progress to have another birth, when compared to all other population groups. A higher proportion of black African women progress to having a third or fourth birth (77% and 67% respectively) when compared to coloureds (66% and 49% respectively) as well as Indian/Asian women (50% and 35% respectively) (see Figure 12). Fewer than 28% of white women who have had a third birth progress to having a fourth birth, while almost two-thirds of black African women who have had a third child progress to having a fourth birth. The vastly differing TFR schedules by population group coincide with the pattern of parity progression by population group.

Figure 12: Parity progression ratios for women aged 45–49 by population group, Census 2011



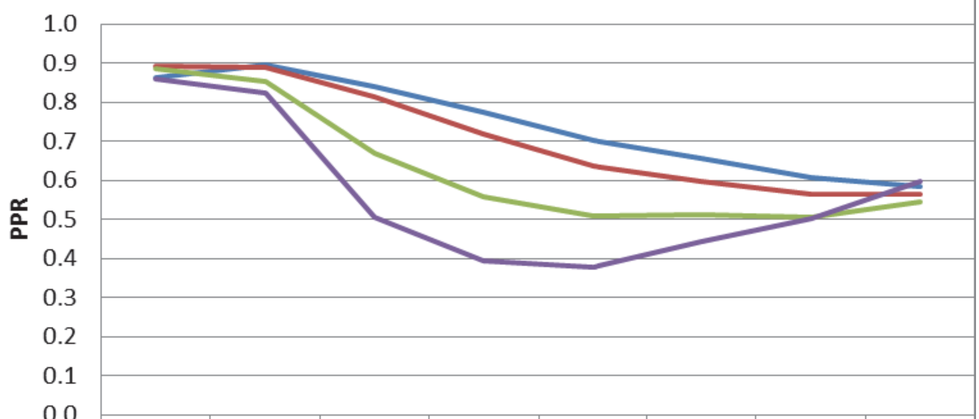
	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7+
black African	0.891	0.873	0.767	0.667	0.604	0.581	0.555	0.561
coloured	0.892	0.856	0.658	0.490	0.418	0.437	0.479	0.570
Indian/Asian	0.853	0.842	0.495	0.353	0.343	0.453	0.537	0.634
white	0.814	0.809	0.388	0.282	0.318	0.491	0.600	0.690

3.4.2 Parity progression ratios by educational attainment

Figure 13 shows the PPR of women by educational attainment. The results confirm the literature regarding education and fertility, indicating that the PPR is highest amongst women with no education and lowest among women with higher levels of educational attainment. When progressing from childlessness to having at least one child, there is marginal difference between women of differing educational attainment, indicating that there is a low level of childlessness among women aged 45–49 in South Africa regardless of educational attainment. Among women progressing from parity 1 to 2, the PPR is higher among women with no education and primary education (89%) relative to women with secondary (85%) and higher education (82%). Though the PPRs among women with no education are similar to those of women with primary education, at parity 4 and beyond, the PPRs are slightly higher among women with no education. The proportion of women with no education and primary education progressing to have their third child (84% and 81% respectively) and a fourth child (77% and 71% respectively) is significantly higher than the proportion of women with higher education progressing to having a third (50%) or a fourth (39%). Overall, a smaller proportion of women with higher educational attainment, i.e. higher or secondary, progress to having higher birth orders when compared to women with primary education or less.

The increase in PPRs from parity 7 and upwards are partly due to the small number of cases at extremely high birth orders among women aged 45–49 with higher and secondary levels of education. Due to the relatively small proportion of women with higher education who go on to have a sixth birth or higher, the PPRs are not reliable and thus not comparable.

Figure 13: Parity progression ratios for women aged 45–49 by educational attainment, Census 2011

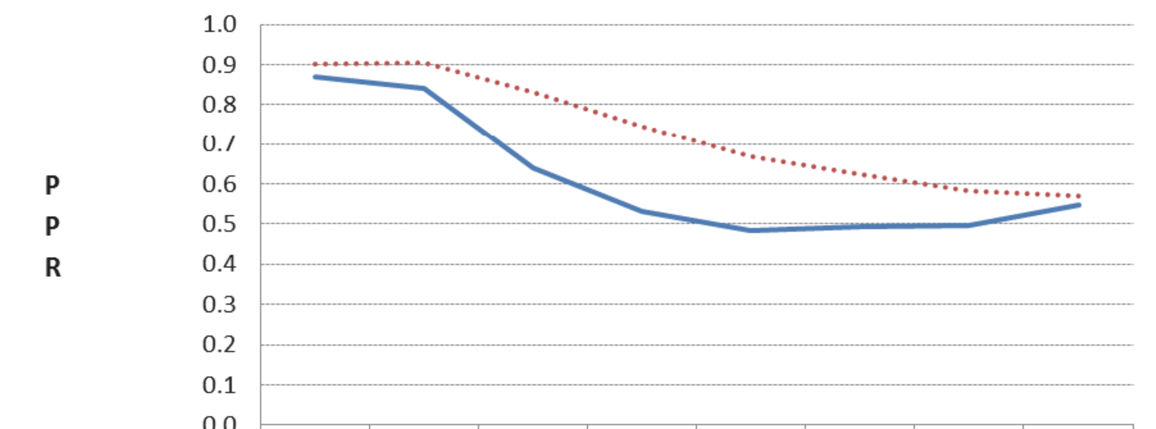


	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7+
None	0.863	0.894	0.840	0.773	0.702	0.655	0.607	0.585
Primary	0.891	0.889	0.814	0.718	0.637	0.597	0.565	0.563
Secondary	0.884	0.853	0.670	0.557	0.509	0.511	0.504	0.544
Higher	0.859	0.824	0.504	0.394	0.377	0.443	0.504	0.596

3.4.3 Parity progression ratios by geography

According to Figure 14, the PPRs of women residing in urban areas are lower than those of women in non-urban settings, confirming literature that suggests higher birth orders occur in non-urban settings. Similar to the national profile of parity progression, childlessness is relatively low and there is a preference of having an optimum of two children in both urban and non-urban settings. The proportion of urban women progressing to having a third birth (64%) is far lower than the proportion of non-urban women opting to have the third birth (83%). However, there is a gradual decline in the proportion of non-urban women opting for higher birth orders. The proportion of women residing in non-urban areas progressing from a fourth to fifth birth remained much higher (67%) than among urban women (48%). This pattern of parity progression indicates higher TFR among non-urban women relative to urban women. The increase in parity progression ratios from parity 7 and upwards is partly due to the small number of cases at extremely high birth orders among women aged 45–49 in urban settlements.

Figure 14: Parity progression ratios for women aged 45–49 by geography, Census 2011



	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7+
Urban	0.870	0.842	0.640	0.530	0.485	0.495	0.496	0.548
Non- Urban	0.901	0.903	0.830	0.747	0.670	0.624	0.582	0.571

3.4.4 Parity progression ratios by province

In South Africa, provincial differences in fertility, mortality and migration are common. Similarly, the PPRs illustrated in Table 14 show variations by province. Relative to all other provinces, Limpopo has the lowest proportion of childlessness (8%), as well as higher PPRs across parity 1 through to 5, indicating a higher level of fertility compared to all other provinces. However, the proportion of women progressing from parity 5 to 6 and 6 to 7 is noticeably higher in Mpumalanga (60% and 57%), KwaZulu-Natal (62% and 60%) and Eastern Cape (63% and 60%). Interestingly, the PPRs of KwaZulu-Natal and Mpumalanga are very similar. Factors influencing higher fertility within these four provinces may be related to a lower level of socio-economic status of women as well as lower levels of education, and limited access to contraceptives and employment opportunities.

Childlessness among women aged 45–49 is highest in Gauteng (14%). Despite lower PPRs in Gauteng, the province of the Western Cape has the lowest proportion of women progressing from parity 2 upwards. The increase in PPRs from parity 6 and upwards is partly due to the small number of cases at extremely high birth orders among women aged 45–49 in most provinces, with the exception of KwaZulu-Natal, Eastern Cape, Limpopo and Mpumalanga, where the PPRs continued to decline even at higher parities, which may be attributed to the higher proportion of higher order births in these provinces relative to the other five provinces. For all provinces, there exists an optimum parity of 2.

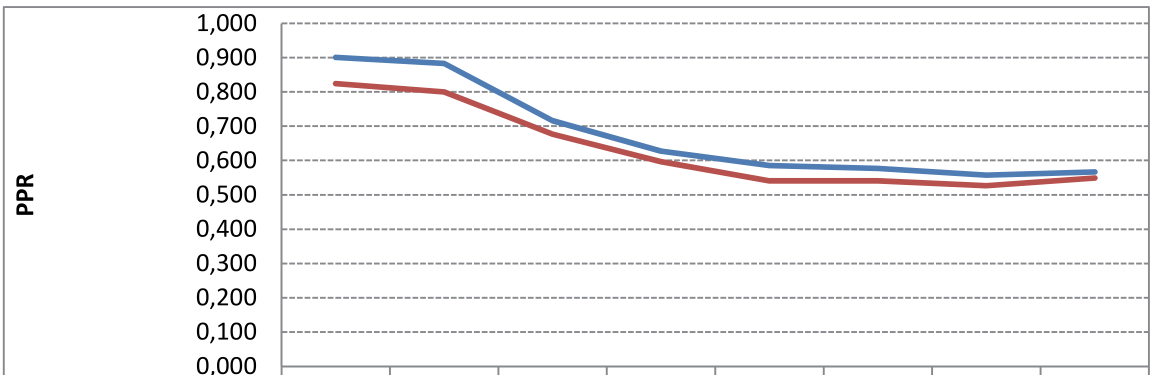
Table 14: Parity progression ratios for women aged 45–49 by province, Census 2011

	Province								
Parity	WC	EC	NC	FS	KZN	NW	GP	MP	LP
0–1	0,87	0,88	0,89	0,90	0,87	0,90	0,86	0,89	0,92
1–2	0,84	0,87	0,86	0,85	0,87	0,87	0,84	0,88	0,91
2–3	0,61	0,75	0,72	0,68	0,74	0,73	0,63	0,76	0,84
3–4	0,47	0,68	0,58	0,56	0,68	0,61	0,53	0,69	0,74
4–5	0,42	0,64	0,50	0,50	0,64	0,55	0,48	0,64	0,64
5–6	0,44	0,63	0,49	0,48	0,62	0,53	0,49	0,60	0,58
6–7	0,48	0,60	0,49	0,47	0,60	0,52	0,49	0,57	0,52
7+	0,57	0,60	0,52	0,52	0,59	0,53	0,54	0,56	0,52

3.4.5 Parity progression ratios by marital status

According to Figure 15, childlessness is higher among women aged 45–49 who have never been married (17%) when compared to the same cohort of women who have been married (10%). This is to be expected given the influence of "marriage" as a form of union that serves as a precursor to childbearing for many women. A similar pattern in the proportion of women who progress to a second birth exists between ever married (88%) and never married women (80%). There is, however, a sharper decline in the proportion of married women progressing to a third birth after having had a second birth (72%) when compared to never married women (68%). The sharper decline among married women points to a higher level of fertility control and subsequently the limitation of birth to an optimum number of two children among women who are married than among women who have never married by age 45–49. Beyond parity 2 however, we find that the difference in PPRs between ever married and never married women is marginal, indicating that marriage has relatively little influence on higher birth orders for women aged 45–49.

Figure 15: Parity progression ratios for women aged 45–49 by marital status, Census 2011



	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7+
Ever Married	0,900	0,884	0,716	0,627	0,586	0,577	0,558	0,566
Never Married	0,825	0,800	0,677	0,597	0,541	0,541	0,526	0,549

Chapter 4: Estimation of fertility

4.1 Introduction

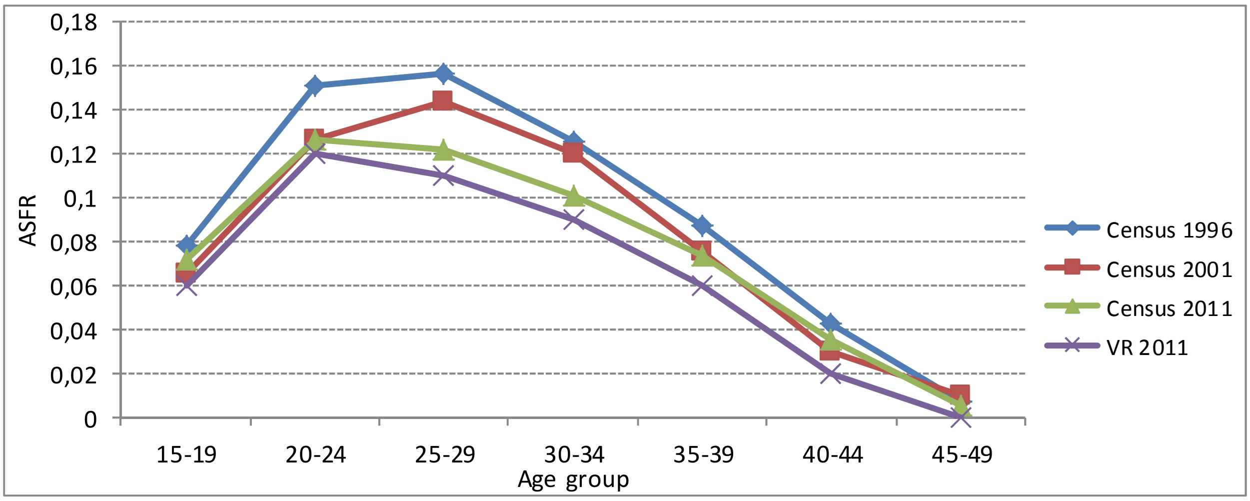
Levels of fertility in South Africa have been declining. Hence, the trends and patterns of ASFRs should be consistent with what is known about the fertility behaviours of women nationally and across provinces as well as the districts, and by population group. Methods of estimating fertility rates are dependent on the levels of age-specific fertility rates (ASFRs) and the kinds of errors observed in the rates. This chapter therefore, examines ASFRs over time and derives fertility estimates.

4.2 Patterns of age-specific fertility rates

The age-specific fertility rates derived from censuses highlight a trend that suggests that fertility has gradually declined over time (Figure 16). Vital registration (VR) data have not been adjusted for completeness, thus the ASFRs from vital registration data, as indicated in Figure 16, are lower than those of Census 2011. However, the pattern across age groups and level of ASFRs in both sources of data is similar. As expected, the ASFRs are highest in 1996 for all ages and lowest in 2011 across all ages, indicating a decline in current fertility over time. In 1996 and 2001, the ASFRs increased with age, peaking among women aged 25–29. However, the ASFRs in 2011 according to census and vital registration, increased with age of the mother, peaking among women aged 20–24.

The shape of ASFRs observed in Table 15 across population groups reveals a similar pattern of decreasing ASFRs, except for the coloured population. The ASFRs of the coloured population show an increasing pattern from 2001 to 2011 among women aged 15–19 and 20–24 respectively. This increase of ASFRs is expected, since the TFRs of coloureds increased from 2,41 in 2001 to 2,57 in 2011. The provincial ASFRs in Table 16 reveal a pattern that concurs with 2011 national and population group TFRs. The levels of ASFRs in Limpopo, Eastern Cape, KwaZulu-Natal, Northern Cape and Mpumalanga reflect the TFRs observed in these provinces (see Figure 19).

Figure 16: Age-specific fertility rates, censuses of 1996, 2001, 2011 and Vital Registration 2011



Source:Moultrie and Dorrington (2004), Calculated ASFR from Vital Registration and Census 2011

Table 15: Age-specific fertility rates by population group, Censuses of 1996, 2001, 2011

	Population group											
	black African			coloured			Indian/Asian			white		
Age group	Census 1996	Census 2001	Census 2011	Census 1996	Census 2001	Census 2011	Census 1996	Census 2001	Census 2011	Census 1996	Census 2001	Census 2011
15–19	0,086	0,071	0,076	0,068	0,06	0,071	0,024	0,022	0,02	0,019	0,014	0,014
20–24	0,159	0,132	0,128	0,144	0,121	0,137	0,12	0,097	0,074	0,089	0,07	0,057
25–29	0,159	0,145	0,125	0,133	0,129	0,125	0,185	0,144	0,117	0,151	0,134	0,108
30–34	0,135	0,125	0,106	0,097	0,1	0,094	0,085	0,089	0,1	0,088	0,103	0,106
35–39	0,102	0,085	0,081	0,06	0,052	0,061	0,045	0,034	0,047	0,031	0,034	0,045
40–44	0,05	0,037	0,042	0,023	0,016	0,024	0,023	0,007	0,011	0,016	0,007	0,01
45–49	0,007	0,012	0,006	0,002	0,004	0,003	0,008	0,002	0,002	0,01	0,002	0,001

Source:Moultrie and Dorrington (2004), Calculated ASFR from Census 2011

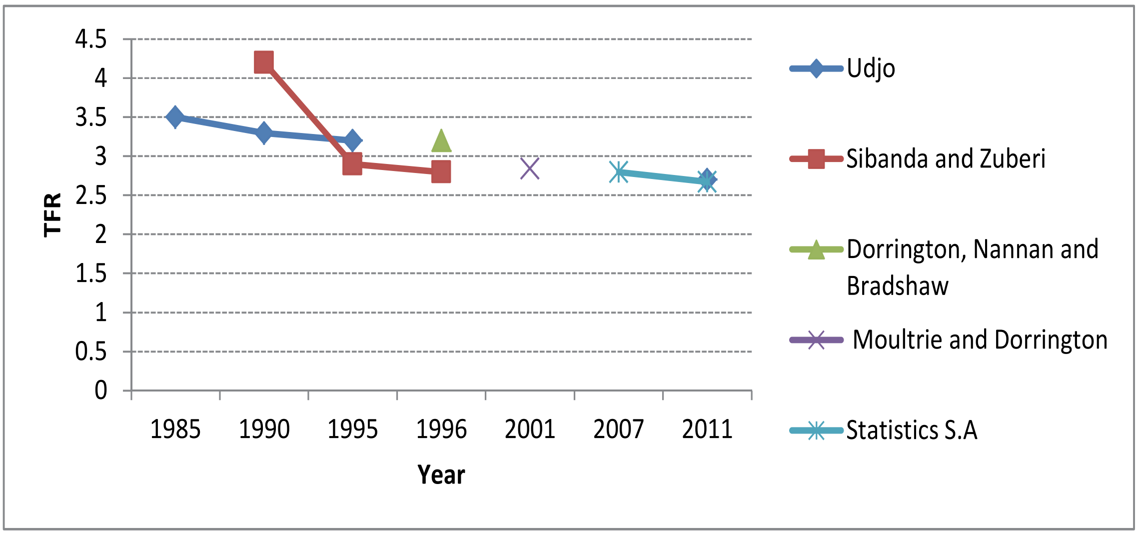
Table 16: Age-specific fertility rates by province, Census 2011

	Province								
Age group	WC	EC	NC	FS	KZN	NW	GP	MP	LP
15–19	0,06	0,08	0,08	0,07	0,08	0,08	0,06	0,08	0,08
20–24	0,10	0,13	0,14	0,13	0,13	0,14	0,11	0,13	0,14
25–29	0,11	0,13	0,13	0,12	0,12	0,13	0,11	0,13	0,15
30–34	0,10	0,11	0,10	0,09	0,10	0,11	0,10	0,11	0,13
35–39	0,06	0,08	0,07	0,07	0,07	0,08	0,06	0,08	0,10
40–44	0,02	0,04	0,03	0,03	0,04	0,04	0,02	0,04	0,05
45–49	0,00	0,01	0,00	0,00	0,01	0,00	0,00	0,01	0,01

4.3 Trends in total fertility rates

Figure 17 presents trends in fertility from 1985 to 2011. The 2011 results add to the existing literature about fertility decline in South Africa. According to the figure, the TFR declined from 2,84 children per woman in 2001 to almost 2,67 children per woman in 2011. What is striking is the level of decline of the TFR from 1996 to 2011. This pattern could suggest that the country is experiencing fertility stalling. Moultrie et al. (2008) argue that fertility decline might have stalled since the 1990s.

Figure 17: Trends in total fertility rates, 1985–2011

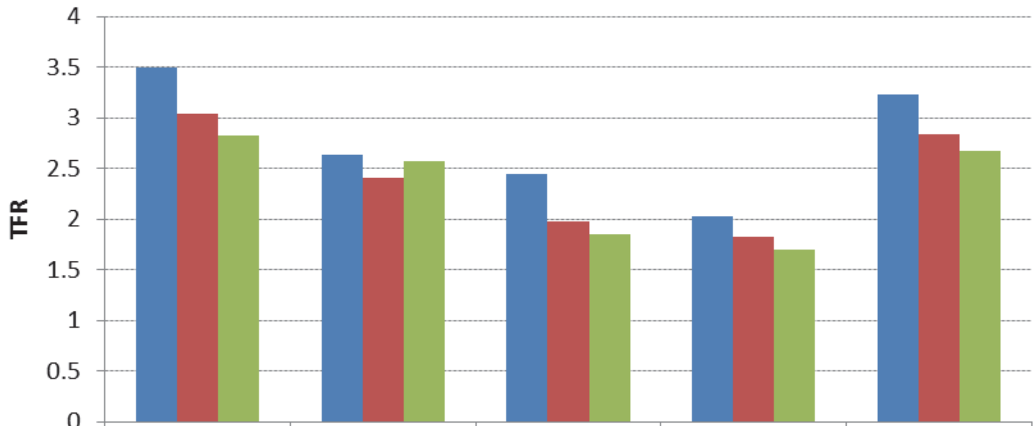


Source: Udjo (1997, 1998); Dorrington et al. (1999); Moultrie and Dorrington (2004); Udjo, (2014); Sibanda and Zuberi, (1999); Stats SA; (2010) and Calculated estimates from Census 2011

4.3.1 Trends in and levels of total fertility rates by population group

As seen in Figure 18, the national TFR according to the censuses, indicates a decline in fertility from 3,23 children per woman in 1996 to 2,67 children per woman in 2011. Although there are variations in fertility among the four population groups, the level of fertility in 2011 among black African women (2,82) and coloured women (2,57) has remained highest, whilst white and Indian/Asian women have a below replacement rate with a TFR of 1,70 and 1,85 respectively. For all population groups there is a decline in TFR over time. However, the TFR for coloureds increased from 2,41 in 2001 to 2,57 in 2011. The accelerated decline in TFR from 2001 to 2011 seems highest among black African women.

Figure 18: Total fertility rates by population group, 1996–2011



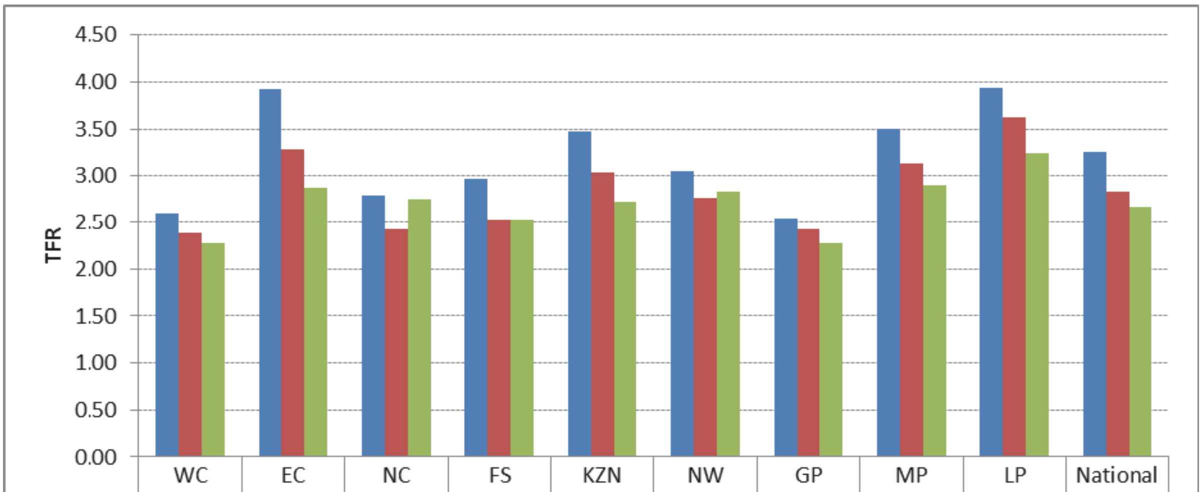
	black African	coloured	Indian/Asian	white	National
1996	3.49	2.64	2.45	2.02	3.23
2001	3.04	2.41	1.98	1.82	2.84
2011	2.82	2.57	1.85	1.7	2.67

Source: Moultrie and Dorrington (2004), Calculated estimates from census 2011

4.3.2 Trends and levels of total fertility rates by province

The diversity in TFRs is apparent geographically, as indicated in Figure 19. The TFRs for 2011 suggest that fertility is highest in Limpopo (3,25), Mpumalanga (2,90), Eastern Cape (2,87) and KwaZulu-Natal (2,73), and the lowest in Western Cape (2,28) and Gauteng (2,27) (see Figure 19). The fertility level for Northern Cape reveals a marked increase in the TFR from 2,43 in 2001 to 2,75 in 2011. Given the increase in TFR among coloured women between 2001 and 2011, this may have contributed to the sudden peak of TFR in Northern Cape in 2011, as over two-thirds of the population in the province is coloured. A slight increase of TFR occurred in North West from 2,77 in 2001 to 2,83 in 2011. The province has a positive net migration rate which may have contributed to the sudden gradual increase of TFR (Stats SA, 2012). Overall, the trends, levels and rate of change in provincial fertility reflect not only the composition of each province by population group but also the differences in the level of socio-economic development across provinces.

Figure 19: Total fertility rates by province, 1996–2011



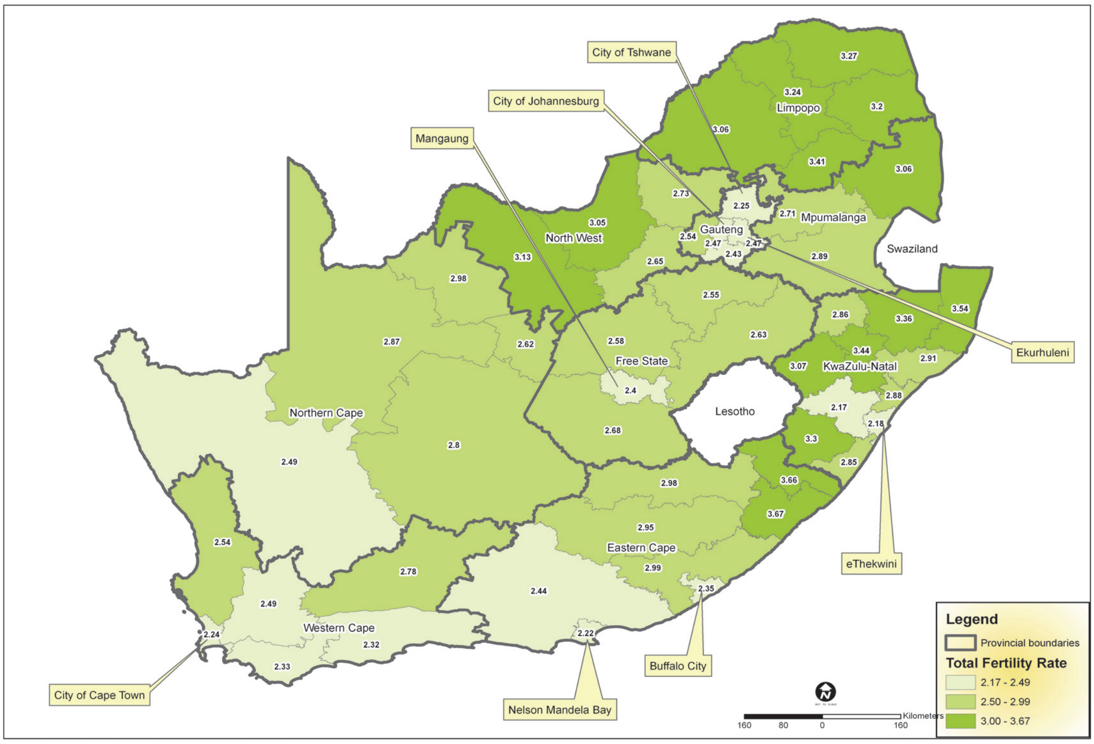
	WC	EC	NC	FS	KZN	NW	GP	MP	LP	National
1996	2.60	3.93	2.80	2.97	3.48	3.05	2.55	3.50	3.94	3.26
2001	2.39	3.28	2.43	2.53	3.04	2.77	2.43	3.13	3.62	2.84
2011	2.28	2.87	2.75	2.54	2.73	2.83	2.27	2.90	3.25	2.67

Source: Moultrie and Dorrington (2004), Calculated estimates from census 2011

4.3.3 Trends in and levels of total fertility rates by district

Further analysis of TFRs across the districts indicates a pattern that corresponds with the estimates of fertility levels nationally, by population group and by province, with the majority of districts having TFRs of three children or less per woman (Appendix Table A2). Virtually, all the districts that fall within Limpopo, Eastern Cape, Mpumalanga, North West and KwaZulu-Natal (these provinces recorded the highest fertility estimates) had TFRs of three children or more per woman, while the majority of those in the provinces with low fertility rates (Gauteng and Western Cape) had fertility rates between 2,2 and 2,25. Surprisingly, Central Karoo (TFR = 2,78) and West Rand (TFR = 2,54) districts in Western Cape and Gauteng respectively, had the highest TFRs. UMgungundlovu district, amongst all the districts in KwaZulu-Natal, had the lowest total fertility rate (TFR = 2,17).

Figure 20: Total fertility rates by district council, Census 2011



Data presented in Figure 20 suggest that all eight metropolitan municipalities of South Africa (City of Johannesburg, City of Cape Town, Nelson Mandela Bay, Mangaung, eThekwini, City of Tshwane, Ekurhuleni and Buffalo City) had low fertility rates relative to the rest of the country.

4.4 Fitting the relational Gompertz model on children ever born and births in the last 12 months

The majority of estimates were derived using the relational Gompertz model. Moultrie et al. (2013) noted that common issues shown by the relational Gompertz diagnostic plot indicate omission of births and exaggeration of age by elderly women, omission of lifetime fertility by elderly women and a suggestive of recent decline in fertility. Findings from diagnostic plots (Appendix Figures A1–A10) indicate that, in all population groups and provincial figures, the F points lie above the P points, and the pattern suggests fertility that is declining. When the P points curve upward towards elderly women, the shape implies under-reporting of children ever born. Contrary, the figures indicate P points that are curving down at elderly ages. This is indicative of some degree of overstatement of children ever born by elderly women. According to Udjo, (2014), these children may be "adopted" children, and not biological ones.

Chapter 5: Age at first birth

5.1 Introduction

Giving birth is considered a significant occurrence within a woman's life cycle. Not only does it signify biological changes in a woman, but also determines future roles and responsibilities a woman is likely to encounter after giving birth. Thus, the age at which a woman first gives birth has far-reaching consequences as far as the socio-economic development of women and society at large is concerned.

Age at first birth has a direct effect on fertility. Early initiation of childbearing lengthens the reproductive period and subsequently increases the fertility level of a woman (Rabbi and Kabir, 2013). Numerous studies show that women who begin reproduction at an early age are likely not only to have more children but are also more likely to experience a higher level of unwanted births later in their reproductive life (Presser, 1971). In contrast, women in developed countries such as Switzerland and the United Kingdom (UK), report a significantly higher median age at first birth (30), with a subsequently low level of fertility.

The age of women at first birth is an important indicator of subsequent fertility at individual and community levels, thereby impacting on the size, composition and future growth of the population. An understanding of the age at first birth within a population provides policymakers and planners with an indication of subsequent fertility patterns and their policy implications. Studies in sub-Saharan Africa (SSA) indicate early childbearing is often related to high levels of adolescent fertility (Gyepi-Garbrah, 1985).

There are a number of social, economic and cultural factors that influence the age at which women give birth to their first child. Increased contraceptive use, educational attainment and labour force participation have been argued to be significant contributors to delaying the age at which women first give birth (Bianchi & Spain, 1986). Further studies point to the effect of wealth, population group and residence, i.e. urban or rural, on age at first birth (Dodoo et al., 2007; Zulu et al., 2002). Within specific contexts, marriage signifies the beginning of the reproductive cycle of women, and various studies point to the high correlation between age at first marriage and age at first birth (Kumchulesi et al., 2011). This holds true in contexts where premarital sex is relatively uncommon among women (Bongaarts, 1983; Da Silva, 2000). However, women may conceive irrespective of marital status, as is the case in many developing countries, including South Africa (Jones, 2007).

A number of studies suggest that family well-being is conditioned by how soon childbearing starts and how rapidly it proceeds. Early childbearing may adversely affect the health of the mother and infant, the economic well-being of families, and marital stability (Hobcraft, 1992). Premarital sex and childbearing are fairly high among young women in South Africa (Chimere-Dan, 1999). In contrast, though some women may marry, they may choose not to conceive immediately after marriage. With the advent of contraceptive methods as well as increased knowledge and access to contraception, women and couples are able to delay fertility within marriage. Thus the age at first marriage may no longer hold sufficient value in determining fertility among women in South Africa (Ringheim and Gribble, 2010).

Bumpass et al. (1978), in a study on age and marital status at first birth in the United States of America (USA), concluded that both a young age at first birth and premarital first conception might be associated with rapid subsequent fertility. However, in South Africa, this is not the case. Due to cultural practices, once a woman has proven her fertility, and has developed an understanding of the health-care system, there is often a lag after the first pregnancy for both adults and adolescents (Meekers, 1994).

It is important to note that the age at first birth is also an indicator of future prospects with regard to education, employment and overall socio-economic status. A study by Harrison and Rossiter (1985) suggests that childbearing at an early age can severely damage a girl's reproductive and general health, causing such problems as obstructed labour, sometimes bleeding to death, and vision-vaginal fistula, leading to social ostracism. Studies have also pointed to the positive effect on the spacing of subsequent children and on completed family size (Card and Wise, 1978; Trussell, 1976; Bumpass et al., 1978; Coombs and Freedman, 1966, 1970; Koo et al., 1978; Menken, 1972; and Presser, 1971). The conditions under which a first birth occurs at an early age, i.e. lower levels of socio-economic and educational empowerment, affect the environment in which children are raised, the kinds of opportunities available to them, and their intellectual development (Zajonc, 1976).

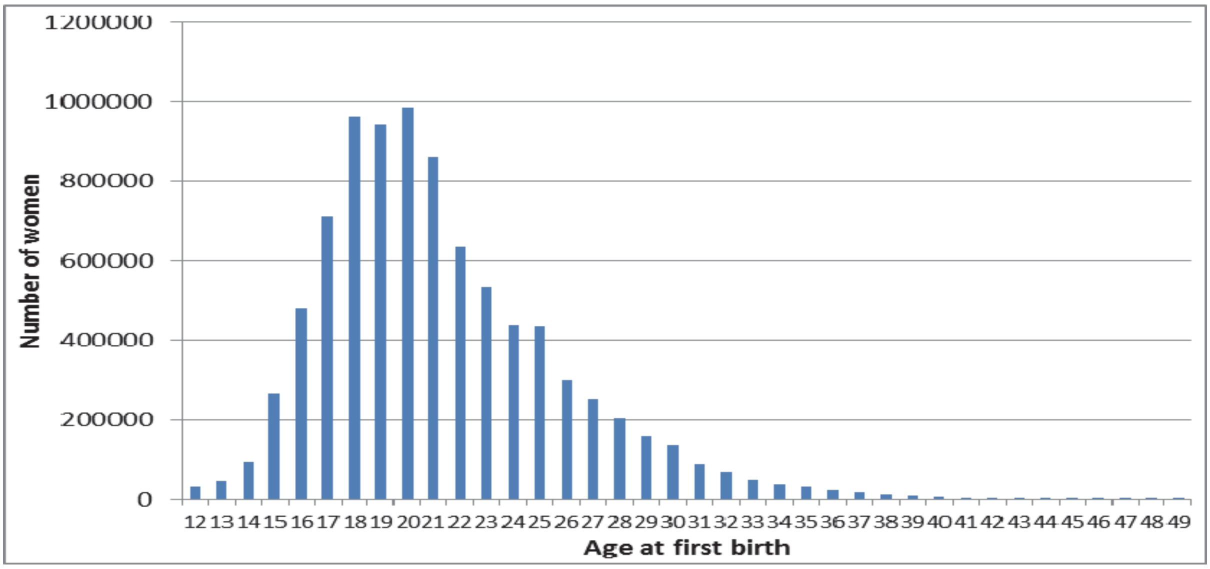
The purpose of this chapter is three-fold. Firstly, it examines the trends and differentials of age at first birth in South Africa across population groups, provinces, and educational groups. Secondly, it provides an understanding as to how these characteristics influence age at first birth, and finally, the impact of age at first birth on fertility in South Africa.

Using Census 2011 data, questions related to fertility included a question on age at first birth. Though all women aged 12–50 were asked about the age at which they first gave birth, the data were limited to women aged 15–49 at the time of the census. In contrast to the previous 1996 census that phrased the question, "When was your first child born?", Census 2011 phrased the question, "At what age did you first give birth?". According to the Demographic Health Survey (DHS) for South Africa, the mean age at first birth was reported to be 20,9 in 1998 and 22,5 in 2003 (DHS, 1998 and 2003), which is an indication that age at first birth is increasing.

5.2 Age at first birth

According to Figure 21, the earliest reported age at first birth was 12 years of age and the oldest age was 49. The majority of first births occurred when the women were aged between 18 and 20 years. Less than 5% of all first births occurred after age 30. It is important to note that the measure of age at first birth is crude, as it is the reported age at first birth, and a bias may exist in the reported age, because a mother may report having completed her birth date at the time of the first birth, whilst this may not be the case, and vice versa. Though the age at first birth tends to be more accurately reported than the age at other birth orders, there is a tendency for older women to report having given birth at a later age than at which it actually occurred. There may exist an upward bias for age at first birth among the older cohorts.

Figure 21: Distribution of women aged 15–49 years by age at first birth in single years, Census 2011



5.2.1 Age at first birth by current age

Current age is an important variable in demographic analysis, particularly in fertility (Shryock and Siegel, 1976). Analysis of age at first birth by current age categories provides a picture of the cohort experience of age at first birth, improving our understanding of the trends in age at first birth over time. Thus, the median age at first birth is categorised by 5-year age cohorts. Estimation of the trend of age at first birth across cohorts is hampered by the incompleteness of the first birth experience of the younger cohorts by the interview date. As noted in Table 17, many women in the younger cohorts will not have started their childbearing phase and those that have, will inevitably have had their children at a young age. The older cohorts will, however, be approaching the end of their reproductive lifespan when surveyed and will include women who had their children later in their life.

Table 18 shows that within the younger cohorts of mothers, i.e. 15–19 and 20–24, the majority of women gave birth for the first time between the ages of 15 to 19 (92,1% and 55,1% respectively). Though the proportion of women giving birth at later ages increases with current age, among women currently aged 25–29, 30–34, 35–39, 40–44 and 45–49, the majority of women had their first birth between the ages of 20–24.

Table 17: Number of women by age at first birth and current age, Census 2011

	Current age							
Age at first birth	**15–19**	**20–24**	**25–29**	**30–34**	**35–39**	**40–44**	**45–49**	**Total**
12–14	24 278	25 673	26 844	29 093	24 427	20 976	19 235	**170 526**
15–19	284 686	685 335	586 264	491 848	488 364	424 772	389 147	**3 350 416**
20–24	0	531 988	818 225	589 624	526 557	512 241	472 123	**3 450 758**
25–29	0	0	278 374	354 326	274 471	226 707	211 881	**1 345 759**
30–34	0	0	0	93 476	119 372	88 121	78 454	**379 423**
35–39	0	0	0	0	29 576	35 156	27 669	**92 401**
40–44	0	0	0	0	0	6 593	7 943	**14 536**
45–49	0	0	0	0	0	0	1 827	**1 827**
Total	**308 964**	**1242 996**	**1 709 707**	**1 558 367**	**1 462 767**	**1 314 566**	**1 208 279**	**8 805 646**

Table 18: Percentage of all mothers by age at first birth and current age, Census 2011

	Current age							
Age at first birth	15–19	20–24	25–29	30–34	35–39	40–44	45–49	Total
12–14	7,9	2,1	1,6	1,9	1,7	1,6	1,6	**1,9**
15–19	92,1	55,1	34,3	31,6	33,4	32,3	32,2	**38,0**
20–24	0,0	42,8	47,9	37,8	36,0	39,0	39,1	**39,2**
25–29	0,0	0,0	16,3	22,7	18,8	17,2	17,5	**15,3**
30–34	0,0	0,0	0,0	6,0	8,2	6,7	6,5	**4,3**
35–39	0,0	0,0	0,0	0,0	2,0	2,7	2,3	**1,0**
40–44	0,0	0,0	0,0	0,0	0,0	0,5	0,7	**0,2**
45–49	0,0	0,0	0,0	0,0	0,0	0,0	0,2	**0,0**
Total	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**

5.2.2 Age at first birth by population group.

Tables 19, 20, 21 and 22 present the percentages of mothers by age at first birth and current age. The majority of black African, coloured and Indian/Asian mothers currently aged 25–29, 30–34, 35–39, 40–44 and 45–49 reported having their first birth between the ages of 20–24, whilst the majority of white mothers aged 25–29, reported having their first birth between the ages of 20–24 (46%). White mothers in the cohorts 30–34 and 35–39 reported having their first births between the ages of 25 to 29. Among the older white cohorts 40–44 and 45–49, the majority of women had first given birth between the ages of 20–24. The higher median ages for younger cohorts reflect a recent increase in age at first birth among white women.

Table 19: Percentage of black African mothers by age at first birth and current age, Census 2011

	Current age							
Age at first birth	15–19	20–24	25–29	30–34	35–39	40–44	45–49	Total
12–14	7,9	2,1	1,7	2,1	1,9	1,9	2,0	**2,2**
15–19	92,1	55,5	35,2	33,7	37,0	36,4	35,9	**40,8**
20–24		42,4	47,8	38,0	36,0	38,8	38,6	**39,1**
25–29			15,3	21,2	16,9	14,9	15,3	**13,6**
30–34				5,0	6,5	5,3	5,5	**3,4**
35–39					1,7	2,2	2,0	**0,8**
40–44						0,4	0,6	**0,1**
45–49							0,2	**0,0**
Total	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**

*Unspecified age at first birth has been removed

Table 20: Percentage of coloured mothers by age at first birth and current age, Census 2011

	Current age							
Age at first birth	**15–19**	**20–24**	**25–29**	**30–34**	**35–39**	**40–44**	**45–49**	**Total**
12–14	7,3	1,8	1,2	1,2	1,0	1,0	0,9	**1,3**
15–19	92,7	56,9	36,4	32,1	31,0	29,4	29,8	**36,6**
20–24		41,3	48,6	42,1	41,3	43,3	42,8	**42,0**
25–29			13,9	19,7	17,9	17,2	17,8	**14,6**
30–34				5,0	7,1	6,3	5,9	**4,1**
35–39					1,7	2,4	2,1	**1,1**
40–44						0,4	0,6	**0,2**
45–49							0,1	**0,0**
Total	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**

*Unspecified age at first birth has been removed

Table 21: Percentage Indian/Asian mothers by age at first birth and current age, Census 2011

	Current age							
Age at first birth	**15–19**	**20–24**	**25–29**	**30–34**	**35–39**	**40–44**	**45–49**	**Total**
12–14	10,5	2,0	0,7	0,6	0,6	0,6	0,5	**0,7**
15–19	89,5	40,0	17,4	13,9	15,3	17,3	20,1	**18,5**
20–24		58,0	51,1	37,5	38,7	44,6	44,8	**43,3**
25–29			30,7	36,2	28,5	24,3	23,8	**26,7**
30–34				11,8	13,8	9,2	7,6	**8,6**
35–39					3,1	3,5	2,5	**1,9**
40–44						0,5	0,6	**0,2**
45–49							0,1	**0,0**
Total	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**

*Unspecified age at first birth has been removed

Table 22: Percentage of white mothers by age at first birth and current age, Census 2011

	Current age							
Age at first birth	**15–19**	**20–24**	**25–29**	**30–34**	**35–39**	**40–44**	**45–49**	**Total**
12–14	9,3	1,4	0,5	0,4	0,3	0,2	0,2	**0,4**
15–19	90,7	40,5	15,2	10,5	10,5	11,4	13,6	**13,5**
20–24		58,1	46,0	30,2	29,5	33,8	37,0	**35,0**
25–29			38,2	41,5	33,0	31,3	30,5	**32,6**
30–34				17,4	21,6	16,3	13,30	**14,5**
35–39					5,0	6,1	4,40	**3,5**
40–44						0,9	1,00	**0,4**
45–49							0,10	**0,0**
Total	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**

*Unspecified age at first birth has been removed

5.3 Mean age at first birth and median age at first birth, Census 2011

The measures of mean and median age at first birth provide valuable information about the timing of first birth in South Africa. The mean age at first birth refers to the average age of mothers at the birth of their first child, whilst the median age at first birth gives an indication of the age at which half the women who ever gave birth, gave birth to their first born. Table 23 above shows that the mean and median age at first birth among South African women has remained relatively stable. Using the median age allows us to compensate for the spread of women who may have given birth at older ages, by providing an index of the age at which half of all mothers aged 15– 49 in 2011 had given birth to their first child.

Table 23: Distribution of women aged 15–49 by ever/never given birth, mean age at first birth and median age at first birth, Census 2011

Current age	Number of women	% of women who have ever given birth	% women who have never given birth	Mean age at first birth	Median age at first birth
15–19	2 450 559	13,9	86,1	Na*	Na*
20–24	2 612 782	49,1	50,8	Na*	Na*
25–29	2 482 424	70,5	29,5	20,9	21
30–34	1 972 271	80,6	19,3	21,9	21
35–39	1 742 720	85,6	14,4	22,1	21
40–44	1 532 074	87,8	12,3	22,1	21
45–49	1 411 629	88,1	11,9	22,2	21
Total	**14 204 459**	**63,7**	**36,3**	**21,8**	**21***

*Women under 25 years of age were not included in the analysis of median age at first birth as more than half have not given birth

5.4 Median age at first birth by socio-demographic characteristics

As mentioned earlier, the analysis of the median age of mothers at first birth focused on those aged 25 years and above. The results by age cohorts show that median age at first birth was 21 years for all age cohorts (Table 24).

Table 24: Median age at first birth across age cohorts by socio-demographic characteristics, Census 2011

	Age group						
Independent variables	**25–29**	**30–34**	**35–39**	**40–44**	**45–49**	**25–49**	**%**
All women	21	21	21	21	21	21	100,0
Population group							
black African	21	21	21	20	20	+ 21	81,6
coloured	21	21	21	21	21	21	9,4
Indian/Asian	23	24	24	23	22	23	2,1
white	23	26	26	25	24	25	6,8
Language							
Afrikaans	21	22	22	22	22	22	13,1
English	22	24	24	24	24	24	8,3
Ndebele	21	21	21	21	21	21	2,2
Xhosa	21	22	21	21	21	21	16,4
IsiZulu	20	21	20	20	20	20	23,1
Sepedi	21	21	20	20	20	20	9,6
Sesotho	21	21	21	21	21	21	8,4
Setswana	21	21	21	21	21	21	8,5
SiSwati	20	20	19	20	20	20	2,8
Tshivenda	20	20	20	20	20	20	2,6
Tsonga	20	20	20	20	20	20	4,9
Province							
Western Cape	21	22	22	22	22	22	11,4
Eastern Cape	21	22	21	21	21	21	11,5
Northern Cape	20	21	21	21	21	21	2,3
Free State	21	22	21	21	21	21	5,4
KwaZulu-Natal	20	21	21	21	21	21	19,0
North West	21	21	21	21	21	21	6,8
Gauteng	21	22	22	21	21	21	24,9
Mpumalanga	20	20	20	20	20	20	8,1
Limpopo	21	20	20	20	20	20	10,7
Education							
None	20	20	20	20	20	20	4,5
Primary	19	19	19	20	20	20	13,5
Secondary	21	21	21	21	21	21	70,6
Higher	23	25	25	25	25	24	11,3
Residence							
Urban	21	22	22	21	21	21	64,9
Non-urban	20	20	20	20	20	20	35,1

5.4.1 Population group

Table 24 suggests that white women had the highest median age at first birth when compared to all other population groups, followed by the Indian/Asian population group, whilst the black African and coloured population groups had the lowest median age at first birth across all age cohorts. The increase in median age at first birth among younger cohorts compared to older cohorts is an indication of an increase in median age at first birth over time among the white and Indian/Asian population groups, particularly among those aged 30–39 years.

5.4.2 Language spoken at home

In Census 2011, individuals were asked to report their spoken first language. Language is a proxy indicator of the different ethnic groups that reside in South Africa. However, this variable is limited, as the spoken first language may not be a reflection of a person's ethnicity/culture or tradition but merely the language most conveniently used in everyday life. Though a number of factors influence the age at which a woman may experience her first birth, first language can be used to determine the difference in age at birth within the various language groups in South Africa. Focusing on women who have reached the final age of reproduction (i.e. 45–49) as shown in Table 24, the highest median age at first birth existed among English speaking women (24), and second highest among Afrikaans speaking women (22). The lowest median age at first birth was found among Xhosa, Zulu, SiSwati, Tshivenda and Tsonga speaking women aged 45–49. Zulu speaking women constituted more than 20% of all women who have ever given birth, and have a low median age at first birth among all women aged 45–49 years of age.

5.4.3 Province

Results in Table 24 further reveal that median age at first birth by province does not vary significantly. However, within the Western Cape, among all women currently aged 45–49 years of age, median age at first birth was 22, whilst the provinces of Mpumalanga and Limpopo depicted median age at first birth as being 20.

5.4.4 Educational attainment

Table 24 shows that for all age cohorts, median age at first birth is highest among women with "higher" educational attainment and lowest among those with "no schooling". Gaisie (1984) also found that the median age at first birth for women with secondary or tertiary education was 25 years compared to 19 years for the middle and primary school-leavers. Similar studies in Kenya by Konogolo (1985) confirmed that "post-primary schooling (especially of 9 or more years) has a strong effect on postponing the onset of fertility – often by 3 to 4 years".

5.4.5 Residence

Individuals were classified geographically into three categories, i.e. urban, traditional and farms. For the purpose of this analysis, traditional areas and farms constitute non-urban areas and comprise 35,1% of all women aged 25–49 who have ever given birth. According to Table 24, women from non-urban areas who have ever given birth did so at an earlier age than women from urban areas (20 and 21 years respectively).

5.5 Age at first birth and children ever born

As alluded to earlier, the age at which a woman first gives birth can and often does influence the number of children a woman will conceive in her lifetime (Bumpass et al., 1978). Table 25 below presents the mean number of children ever born, and the percentage distribution of all children ever born by age of women at first birth.

According to Table 25, there is an inverse relationship between age at first birth and completed fertility in South Africa. Women who give birth at an early age experience a higher number of births in their childbearing lifespan, than women who have their first birth later in life. With an increase in age at first birth there is a decline in the mean number of children ever born (CEB). Women who had first given birth at an age younger than 15 years, experienced a mean CEB of 4,18, whilst women who had first given birth at age 25 and over, experienced a mean CEB of 2,55. The proportion of women aged 45–49, who have seven or more children was highest among women who experienced their first birth at an age younger than 15 (15,3%), whilst the proportion of women having just one child is highest among women who had first given birth at age 25 and above.

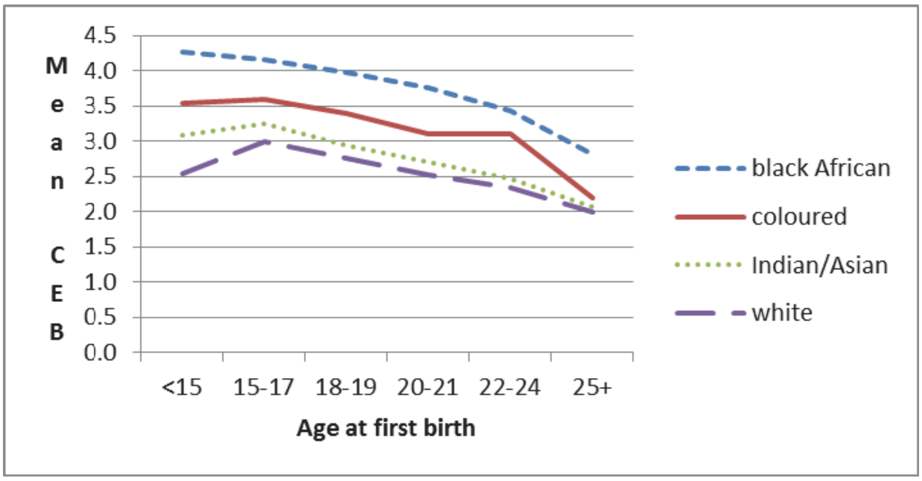
Table 25: Percentage distribution of women aged 45–49 by the number of children ever born and means CEB by age at first birth, Census 2011

	Parity distribution								
Age at first birth	**1**	**2**	**3**	**4**	**5**	**6**	**7+**	**Total %**	**Mean CEB**
<15	12,0	15,0	17,1	17,1	13,4	10,2	15,3	**100,0**	4,18
15–17	9,3	15,4	20,9	19,6	13,7	8,8	12,2	**100,0**	4,04
18–19	8,3	17,8	24,1	20,1	12,8	7,7	9,2	**100,0**	3,83
20–21	9,4	22,3	25,8	18,5	10,6	6,3	7,1	**100,0**	3,55
22–24	11,8	29,3	26,4	15,4	8,0	4,3	4,7	**100,0**	3,16
25+	25,3	35,8	19,7	9,4	4,4	2,4	2,9	**100,0**	2,55

5.5.1 Children ever born by population group

It is observed in all population groups (Figure 22) that there is a decline in the mean number of children ever born in a woman's lifetime with an increase in age at first birth. By implication, women who gave birth for the first time at later ages gave birth to fewer children over their reproductive lifespan. Interestingly, Indian/Asian and white women who experienced their first birth at age group 15–17, have a higher mean CEB than their counterparts who had first given birth younger than 15 years of age, suggesting a decline in lifetime CEB due to early adolescent pregnancy. The mean CEB is highest among black African women when compared to all other population groups. Black African women who had their first birth at an age younger than 15 years have a significantly higher (4,04) mean CEB over their lifetime when compared to coloured (3,5), Indian/Asian (3,1) and white (2,5) women. The mean CEB for black African women declined with an increase in age at first birth, and drastically so, such that black African women who delayed their first birth to age 25 and older, had on average 2,8 children over their reproductive lifespan. The average CEB of black African women who had given birth at age 20 and over were higher than that of the national average, indicating that coloured, Indian/Asian and white women constituted the majority of women who gave birth at age 25 and above.

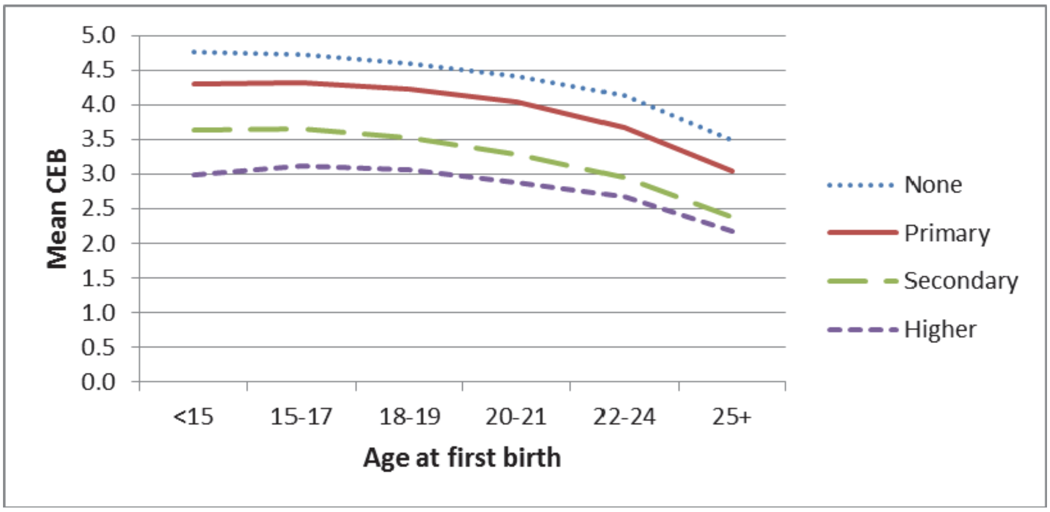
Figure 22: Average number of children ever born by population group among women aged 45–49, Census 2011



5.5.2 Children ever born by education

According to Figure 23, higher educational attainments coincide with a lower average number of children ever born over a lifetime, irrespective of when the first birth occurred. The average number of children born to women who had given birth below 15 years of age, was highest among women who currently have no education (4,4) and lowest among women with higher education (2,9). Despite giving birth at a young age, women with higher or secondary education gave birth to fewer children on average over their lifetime when compared to women with no education or primary education. Among women who have given birth at age 25, women with secondary and higher education achieved similar lower lifetime fertility, i.e. a mean CEB of 2,4 and 2,2 respectively. Women with no education and primary education have a relatively higher mean CEB of 3,4 and 3,0 respectively.

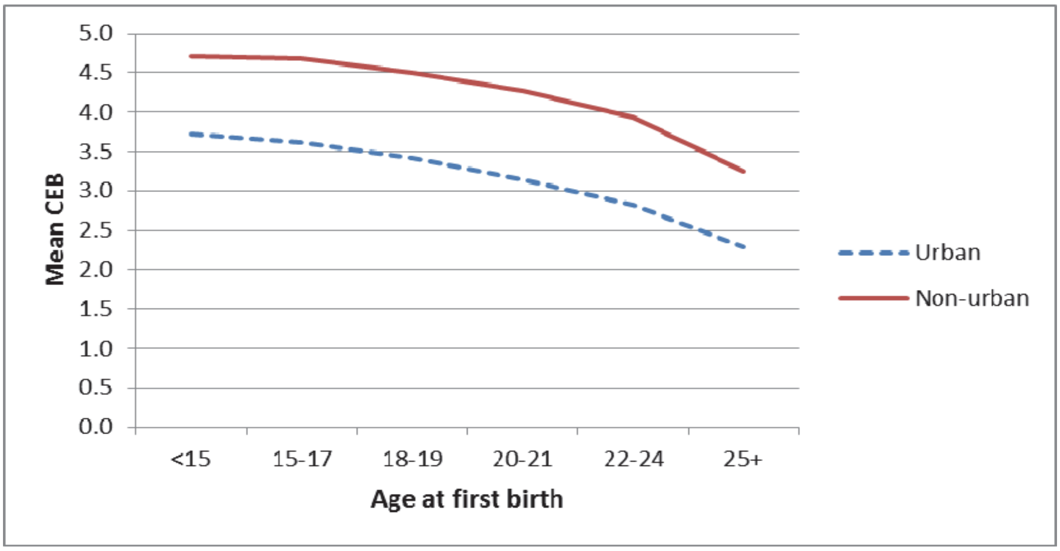
Figure 23: Average number of children ever born by current educational status among women aged 45–49, Census 2011



5.5.3 Children ever born by residence

Figure 24 suggests that women in non-urban settings had a higher average number of children over their reproductive lifespan when compared to those residing in urban settings. Women in both non-urban and urban settings showed a decline in the mean CEB as their age at first birth increases. At ages 15 and below, women in non-urban areas had the highest mean CEB (4,6), compared to women in urban areas who had a mean CEB of 3,6. Women in non-urban settings showed a sharp decline in mean CEB at ages 15–17 and another large decline at ages 22–24, while the urban mean CEB continued to decline at the same rate.

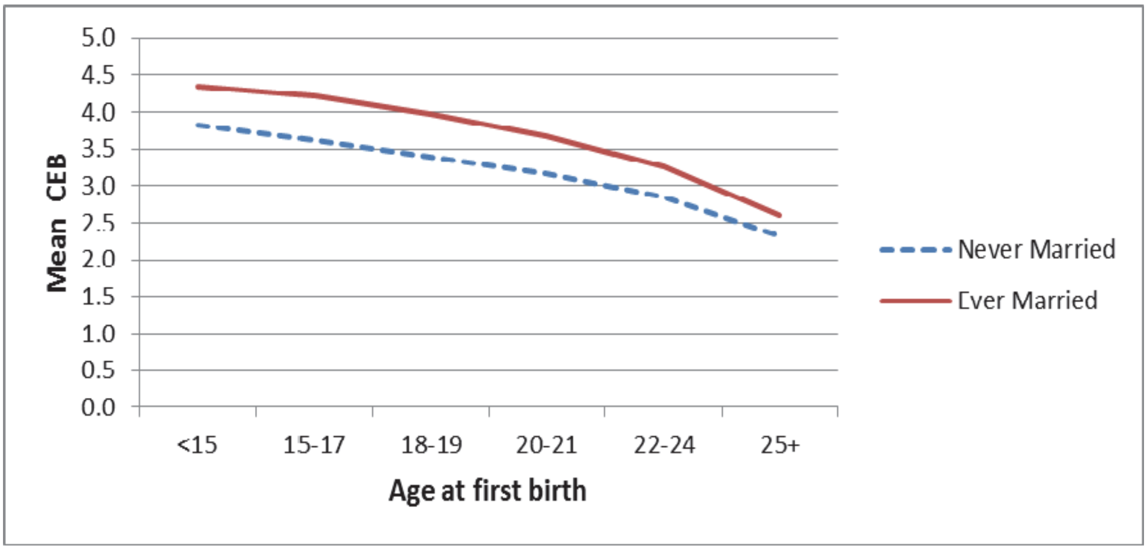
Figure 24: Average number of children ever born by residence among women aged 45–49, Census 2011



5.5.4 Children ever born by marital status

According to Figure 25, ever married women achieved a higher average number of children over their reproductive lifespan than women who had never married. This would suggest that childbearing occurs more often among married women regardless of age at first birth. However, both groups of women (never married and ever married) demonstrated a slight decline in the mean CEB as the age at first birth increases. At ages 15 and below, never married women had an average CEB of 4,8, whereas ever married women had an average CEB of 3,8. However, for higher age groups (25 and above) at first birth, both categories showed a narrow difference in their average CEB with never married at 2,6 while ever married was at 2,3.

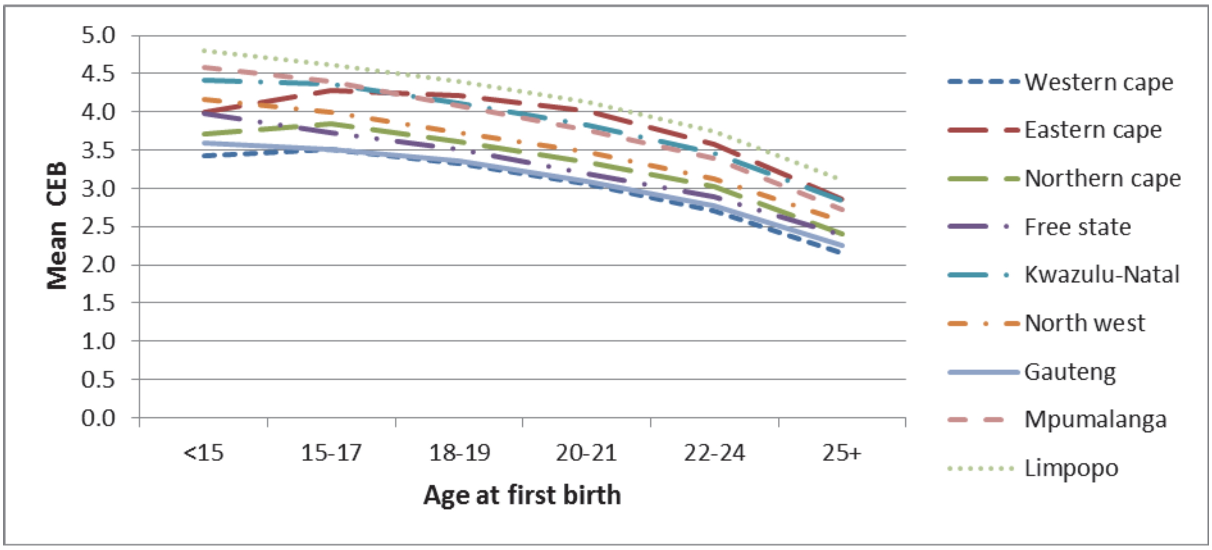
Figure 25: Average number of children ever born by marital status among women aged 45–49, Census 2011



5.5.5 Children ever born by province

Findings from Figure 26 indicate that women in Limpopo province have a higher average number of children over their reproductive lifespan when compared to women in all other provinces, whilst Western Cape had the lowest average number of children. Most of the provinces show a decline in the average number of children ever born from the youngest age at first birth to the oldest. However, Eastern Cape and Northern Cape showed an increase in mean CEB for women giving birth between the ages of 15 and 17, when compared to women who had given birth when they were less than 15 years of age.

Figure 26: Average number of children ever born by province among women aged 45–49, Census 2011



Chapter 6: Conclusion and discussion

Notwithstanding the challenges of errors and deficiencies observed in fertility data, the current level of fertility in 2011 was estimated. It is clear from the array of evidence presented that fertility continues to decline in South Africa. Over a 15-year period, fertility in South Africa declined from 3,23 to 2,67. The decline in fertility has been attributed to a long list of contributing factors. These factors include past population policies (Moultrie and Timaeus, 2003; Chimera-Dan, 1993; Caldwell and Caldwell, 1993), changing social norms and institutions (Kaufman, 1997; Moultrie and Timaeus, 2001), higher educational attainment (DoH, 1998), and increased contraceptive use (Palamuleni et al., 2007). HIV prevalence among South Africans have increased from 10,6% in 2008 to 12,2% in 2012 (HSRC, 2014). There are mixed feelings about the effect of HIV/AIDS on fertility in South Africa. Garenne et al. (2007) argue that the epidemic has assisted in the fertility decline while some argue that it may have boosted fertility (Kalemli-Ozcan, 2006). Evidence suggests that HIV-positive women have lower fertility as a result of secondary sterility and foetal loss brought on by the disease and its associated opportunistic diseases (Zaba and Gregson, 1998).

There were vast variations in fertility amongst the population groups. The levels of fertility in 2011 among black African women (2,82) and coloured women (2,57) have remained highest, whilst white and Indian/Asian women have a below replacement rate with a TFR of 1,7 and 1,85 respectively. Provincially, fertility is lowest in Gauteng and Western Cape and highest in the provinces of Limpopo, Mpumalanga, Eastern Cape and North West. Nonetheless, the level of fertility in Northern Cape has somewhat increased between 2001 and 2011, whilst the TFRs in North West and Free State have remained consistent over time.

The estimated rates of fertility, calculated parity progression ratios and the mean age at first birth, corroborate the findings revealed among them. The PPR is an important indicator of the pattern of fertility in a country. Between 1996 and 2011, there is a clear indication of change in the pattern of fertility in South Africa. The presence of a fertility preference of two children in South Africa was indicated among women aged 45–49 by 2011, across all population groups, education level, residence and marital status. The analysis of PPR by socio-demographics determinants further suggests that the propensity to progress to higher birth orders is higher amongst specific subgroups of women, i.e. black African women, women with no education, non-urban women or married women.

This is consistent with the various studies that evaluate the effect of indirect determinants on TFR, age at first birth and parity.

The implications of early childbearing range from poor maternal and infant health outcomes, to lower levels of female empowerment due to low educational attainment and employment opportunities. Age at first birth thus has the potential to influence a number of demographic occurrences such as fertility, infant and child mortality, maternal mortality and population growth. Educated women have an awareness of the benefits of delayed childbearing, as well as knowledge of and access to family planning. Other factors such as spousal communication, contraceptive prevalence, promotion of small family norms and prevention of adolescent pregnancies have all been associated with an increased level of education. The results indicate that improved education leads to delayed childbearing, irrespective of residence, population and province. In South Africa, black African and coloured mothers experienced their first birth earlier than white mothers irrespective of province, residence and education. Socio-economic and cultural factors may also influence the age at first birth between population groups. The results confirm that there is a relationship between age at first birth and fertility. Giving birth at a younger age has a direct influence on the completed fertility of the mother, with a higher mean number of children ever born prevalent among women who experienced their first birth at a younger age, whilst mothers who delayed childbearing have a lower average number of children in their reproductive lifespan. Policies and programmes that are designed to reduce early childbearing may be targeted to particular communities to assist in the development of women and female empowerment.

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8. Appendix

Table A1: P/F ratios by province and age of the mother

	Provinces								
Age group	**WC**	**EC**	**NC**	**FS**	**KZN**	**NW**	**GP**	**MP**	**LP**
15-19	1.27	1.14	1.12	1.14	1.20	1.15	1.30	1.20	1.13
20-24	1.15	1.04	1.08	1.07	1.15	1.06	1.15	1.11	1.04
25-29	1.08	0.99	1.01	1.03	1.10	0.99	1.07	1.06	1.00
30-34	1.06	1.02	1.00	1.00	1.11	0.97	1.05	1.07	1.02
35-39	1.08	1.10	1.03	1.02	1.18	1.00	1.08	1.13	1.07
40-44	1.12	1.20	1.06	1.08	1.32	1.05	1.13	1.24	1.17
45-49	1.15	1.28	1.09	1.16	1.43	1.10	1.19	1.33	1.28

Table A2: Estimates of TFR (observed and adjusted) and P/F ratio at MAC by district

District	P/F RATIO at MAC	Observed TFR	Adjusted TFR
National	1.04	2.37	2.67
Population group			
African	0.99	2.49	2.82
Coloured	1.12	2.26	2.57
White	1.18	1.52	1.7
Indian	1.27	1.46	1.85
Province			
Western Cape	1.07	2.11	2.28
Eastern Cape	0.99	2.57	2.87
Northern Cape	1.01	2.62	2.75
Free State	1.03	2.39	2.54
Kwa-Zulu Natal	1.10	2.24	2.73
North West	0.99	2.74	2.83
Gauteng	1.07	2.11	2.27
Mpumalanga	1.07	2.49	2.9
Limpopo	1.00	2.93	3.25
District			
Western Cape			
West Coast	1.03	2.39	2.54
Cape Winelands	1.13	2.12	2.49
Overberg	1.15	2.03	2.33
Eden	1.12	2.06	2.32
Central Karoo	1.14	2.53	2.78
City of Cape Town	1.07	2.09	2.24
Eastern Cape			
Cacadu	1.02	2.37	2.44
Amathole	0.94	2.70	2.99
Chris Hani	0.99	2.61	2.95
Ukhahlamba	1.02	2.62	2.98
O.R.Tambo	1.02	2.99	3.67
Alfred Nzo	1.02	3.15	3.66
Buffalo City	1.00	2.12	2.35
Nelson Mandela Bay	1.12	1.99	2.22
Northern Cape			
Namakwa	1.03	2.20	2.49
Pixley ka Seme	1.00	2.75	2.8
Siyanda	1.12	2.50	2.87
Frances Baard	1.05	2.44	2.62
John Taolo Gaetsewe	0.88	3.16	2.98
Free State			
Xhariep	1.02	2.54	2.68
Lejweleputswa	1.00	2.46	2.58
Thabo Mofutsanyane	1.01	2.23	2.63
Fezile Dabi	1.03	2.41	2.55
Mangaung	1.09	2.17	2.4

Table A2: Estimates of TFR (observed and adjusted) and P/F ratio at MAC by district (concluded)

Kwa-Zulu Natal			
Ugu	1.08	2.33	2.85
UMgungundlovu	1.08	2.01	2.17
Uthukela	1.09	2.62	3.07
Umzinyathi	1.07	2.95	3.44
Umkhanyakude	1.15	2.63	3.54
Uthungulu	1.15	2.17	2.91
Sisonke	1.10	2.85	3.3
Amajuba	1.09	2.42	2.86
Zululand	1.09	2.69	3.36
iLembe	1.07	2.44	2.88
eThekwini Metropolitan	1.17	1.87	2.18
North West			
Bojanala	0.99	2.62	2.73
Ngaka Modiri Molema	0.99	2.97	3.05
Dr Ruth Segomotsi Mompa	0.96	3.12	3.13
Dr Kenneth Kaunda	1.07	2.46	2.65
Gauteng			
Sedibeng	1.09	2.18	2.43
West Rand	1.05	2.29	2.54
Ekurhuleni	1.05	2.24	2.47
City of Johannesburg	1.37	2.16	2.47
City of Tshwane	1.10	2.04	2.25
Mpumalanga			
Gert Sibande	1.06	2.52	2.89
Nkangala	0.99	2.97	2.71
Ehlanzeni	1.07	2.53	3.06
Limpopo			
Mopani	0.98	2.90	3.2
Vhembe	1.03	2.90	3.27
Capricorn	1.00	2.88	3.24
Waterberg	0.96	2.89	3.06
Greater Sekhukhune	0.99	3.0799	3.41

Table A3: Trends in district total fertility rates, CS 2007 and Census 2011

District	Adjusted TFR 2007	Adjusted TFR 2011
Western Cape		
West Coast	2.60	2.54
Cape Winelands	2.60	2.39
Overberg	2.30	2.33
Eden	2.40	2.32
Central Karoo	2.70	2.78
City of Cape Town	2.20	2.24
Eastern Cape		
Cacadu	2.50	2.44
Amathole	2.70	2.99
Chris Hani	3.30	2.95
Ukhahlamba	2.90	2.98
O.R.Tambo	4.10	3.67
Alfred Nzo	3.60	3.66
Buffalo City	**	2.35
Nelson Mandela Bay	2.10	2.22
Northern Cape		
Namakwa	2.50	2.49
Pixley ka Seme	3.00	2.80
Siyanda	2.90	2.87
Frances Baard	2.70	2.62
John Taolo Gaetsewe	3.30	2.98
Free State		
Xhariep	3.10	2.68
Lejweleputswa	2.50	2.58
Thabo Mofutsanyane	2.80	2.63
Fezile Dabi	2.80	2.55
Mangaung	2.70	2.40

Table A3: Trends in district total fertility rates, CS 2007 and Census 2011 (concluded)

Kwa-Zulu Natal		
Ugu	2.70	2.85
UMgungundlovu	2.20	2.17
Uthukela	3.60	3.07
Umzinyathi	3.40	3.44
Umkhanyakude	3.10	3.54
Uthungulu	3.60	2.91
Sisonke	3.60	3.30
Amajuba	3.20	2.86
Zululand	3.00	3.36
iLembe	3.20	2.88
eThekwini Metropolitan	2.50	2.18
North West		
Bojanala	2.70	2.73
Ngaka Modiri Molema	3.30	3.05
Dr Ruth Segomotsi Momp	3.30	3.13
Dr Kenneth Kaunda	2.90	2.65
Gauteng		
Sedibeng	2.20	2.43
West Rand	2.70	2.54
Ekurhuleni	2.60	2.47
City of Johannesburg	2.30	2.47
City of Tshwane	2.30	2.25
Mpumalanga		
Gert Sibande	3.00	2.89
Nkangala	2.70	2.71
Ehlanzeni	3.30	3.06
Limpopo		
Mopani	3.30	3.20
Vhembe	3.60	3.27
Capricorn	3.50	3.24
Waterberg	3.20	3.06
Greater Sekhukhune	3.70	3.41

** Buffalo City district was demarcated post 2007

Table A:4 Adjusted district births, Census 2011

Western Cape		Eastern Cape		Northern Cape		Free State		Kwa-Zulu Natal	
District	**Birth**	**District**	**Birth**	**District**	**Birth**	**District**	**Birth**	**District**	**Birth**
West Coast	7766	Cacadu	8616	Namakwa	2042	Xhariep	3108	Ugu	16836
Cape Winelands	16553	Amathole	17689	Pixley ka Seme	3948	Lejweleputswa	13326	UMgungundlovu	20186
Overberg	5033	Chris Hani	16149	Siyanda	5591	Thabo Mofutsanyane	16566	Uthukela	17161
Eden	10588	Ukhahlamba	7796	Frances Baard	8538	Fezile Dabi	9959	Umzinyathi	14020
Central Karoo	1470	O.R.Tambo	38237	John Taolo Gaetsewe	5523	Mangaung	15861	Umkhanyakude	18561
City of Cape Town	75648	Alfred Nzo	21723					Uthungulu	23038
		Buffalo City	15211					Sisonke	12487
		Nelson Mandela Bay	21876					Amajuba	12248
								Zululand	21850
								iLembe	15317
								eThekwini Metropolitan	72514
Total	**117058**		**147298**		**25643**		**58820**		**244218**

North West		Gauteng		Mpumalanga		Limpopo	
District	**Birth**	**District**	**Birth**	**District**	**Birth**	**District**	**Birth**
Bojanala	33753	Sedibeng	19498	Gert Sibande	23449	Mopani	30206
Ngaka Modiri Molema	19951	West Rand	18283	Nkangala	29577	Vhembe	35779
Dr Ruth Segomotsi Mompati	11050	Ekurhuleni	73475	Ehlanzeni	46574	Capricorn	32726
Dr Kenneth Kaunda	15394	City of Johannesburg	114146			Waterberg	16600
		City of Tshwane	62450			Greater Sekhukhune	29226
Total	**80148**		**287851**		**99600**		**144537**

Figure A1 – Figure A10: Fitting the relational Gompertz model to current births (F) and children ever born (P) by population group and province

Figure A.1: RSA

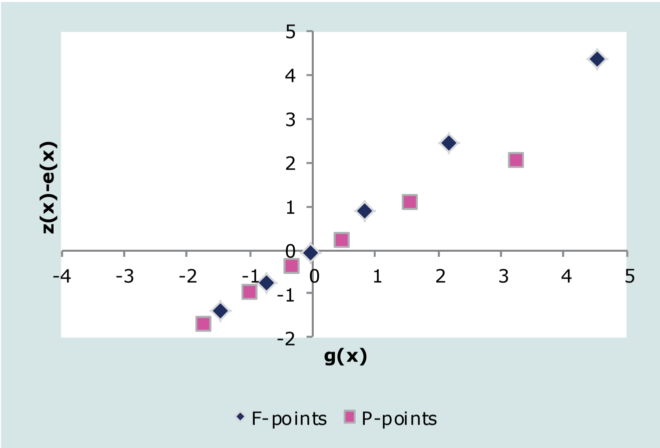

Figure A.2: black African

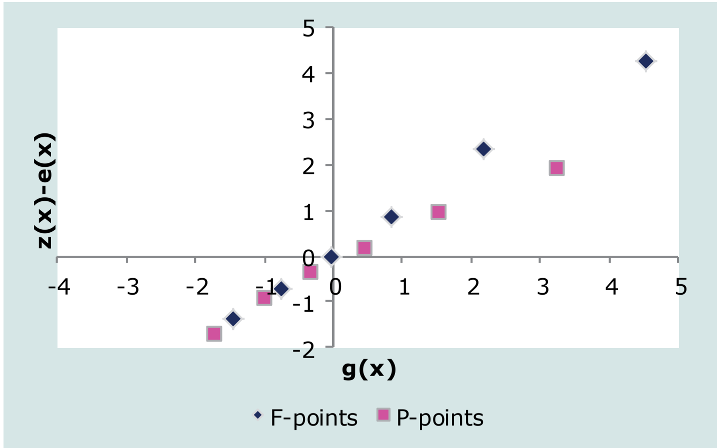

Figure A.3: coloured

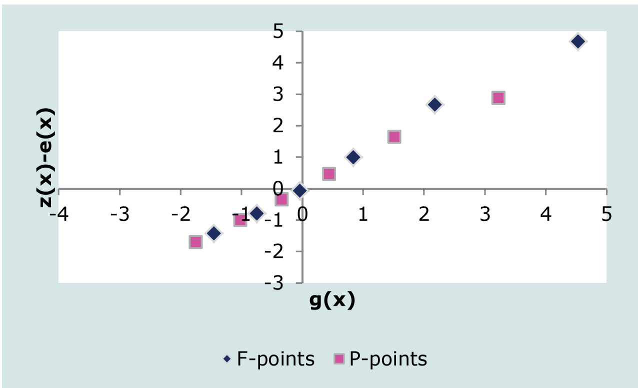

Figure A.4: Eastern Cape

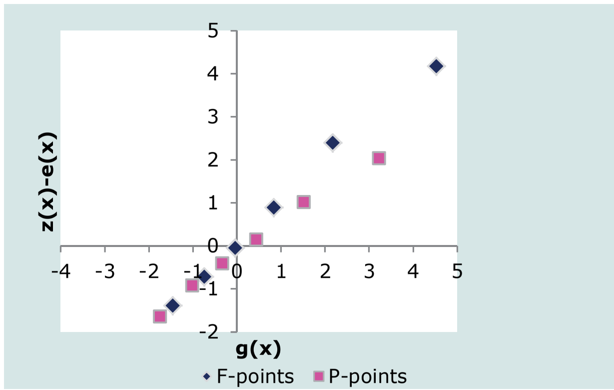

Figure A.5: Northern Cape

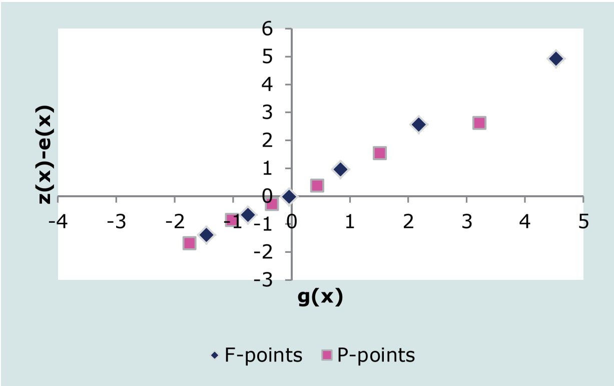

Figure A.6: Free State

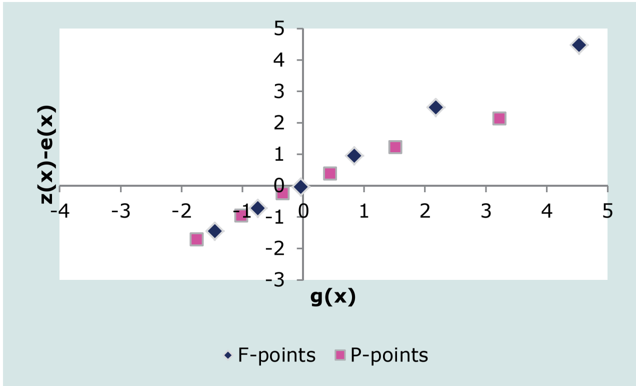

Figure A.7: KwaZulu-Natal

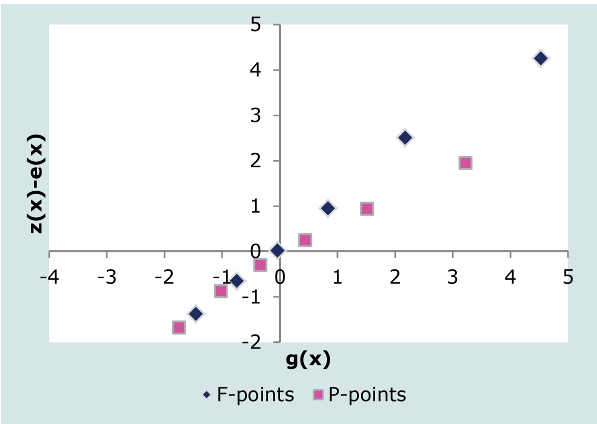

Figure A.8: North West

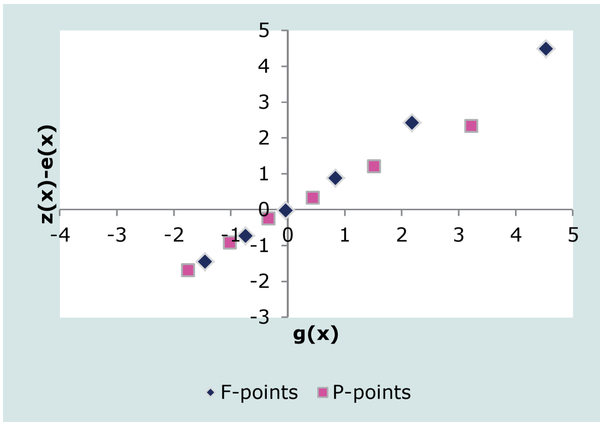

Figure A.9: Mpumalanga

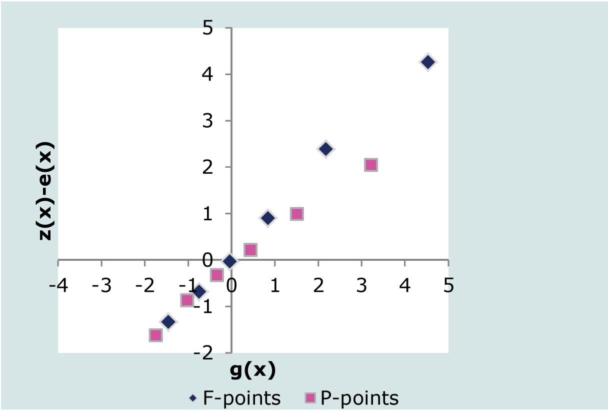

Figure A.10: Limpopo

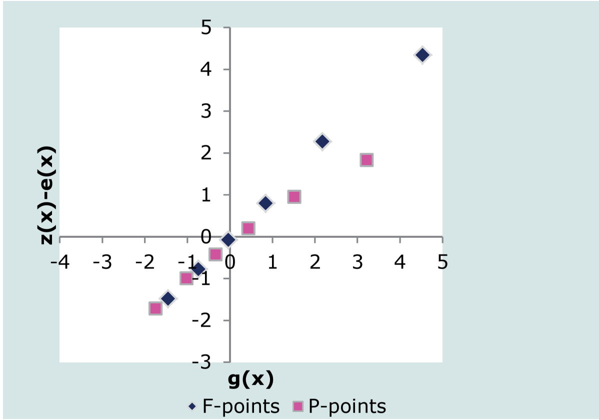

Table A5: Parity progression ratios for women aged 45–49, Census 1996, DHS 1998, CS 2007 and Census 2011

Parity	Census 1996	DHS 1998	CS 2007	Census 2011
0-1	0,922	0,959	0,893	0,881
1-2	0,924	0,906	0,888	0,863
2-3	0,872	0,855	0,736	0,707
3-4	0,820	0,813	0,657	0,620
4-5	0,767	0,766	0,623	0,578
5-6	0,729	0,697	0,604	0,570
6-7	0,687	0,626	0,556	0,552
7-8	0,642	0,608	0,541	0,563
8-9	0,588	0,609	0,509	0,554
9-10	0,545	0,672	0,513	0,593
10-11	0,478	0,501	0,429	0,579
11-12	0,525	0,430	0,416	0,640
12-13	0,483	0,325	0,394	0,588
13-14	0,509	0,338	0,526	0,586
14-15	0,551	-	0,240	0,520
15-16	-	-	0,137	0,402