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FERTILITY ANALYSIS IN ZIMBABWE

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AUTHOR'S NOTE

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Note that all tables and illustrations appear at the back, in the order to which they are referred in the text.

Ingwani L. Zanamwe.

FERTILITY ANALYSIS IN ZIMBABWE

1.0 GENERAL INTRODUCTION

One of the main focus of research in Zimbabwe has been the theme of population and socio-economic development (see Working Paper 504). The debate on population and its effects on social and economic development within Zimbabwe was begun in the early 1970s and has intensified in the post-independence period (after April 18th, 1980) as researchers began to investigate the implications of the development strategies introduced by the new government and how these could be adversely affected by rapid population growth. The debates have highlighted the lack of a population policy in Zimbabwe (Whitsun Foundation 1984:153, Moyo 1986:36-39, Moto 1988:6), though documenting the official support given by government to family planning organisations.

The paper is not directly concerned with the pros and cons of the population and socio-economic development debate in Zimbabwe. Instead, it seeks to investigate one of the main weaknesses which has been highlighted by the debate. This is the lack of statistics that relate fertility or for that matter mortality or migration to socio-economic development. As shall be argued, most of the debate centres on the use of the population growth rate which is derived from the use of crude measures of population change. More refined measures such as will be discussed and derived in this paper might lead to greater clarity on the whole issue, and if the government so wishes, the formation of a better population policy.

The rest of the paper is divided into four sections. Section 2.0 defines how fertility is measured by demographers. It indicates the detail of data required to be able to measure each fertility indicator as well as indicating the levels of vital registration within Zimbabwe. Finally, it considers the data sources used in the investigation for this paper. Section 3.0 examines conventional or direct estimates of fertility in Zimbabwe as a means of investigating past and current fertility levels within the country. The major limitations of present fertility analysis in the country are pointed out. Section 4.0 investigates various ways or methods of estimating fertility at the sub-national level while the final section, Section 5.0, is a comparative overview of the results obtained in the third and fourth sections and indicates their possible application in future fertility discussions.

2.0 THE MEASUREMENT OF FERTILITY

The measurement of fertility can be approached in one of two ways. The first is to view fertility as a period event whilst the second would view it as a cohort event. There is a clear distinction between these two approaches, conceptually and in terms of the data required to fulfill the meaurements.

Period fertility provides a measure of fertility in a cross-section of time. Normally, period fertility measures births occurring during a specified period of time, say one year. In direct contrast, cohort fertility is a longitudinal measure of fertility. The focus is on births occurring to a specific group of women linked by some common event such as birth or marriage in a particular year (Benjamin 1968:62, Woods 1979:96, Yaukey 1985:145-151, Newell 1988:36). This paper will be concerned with the measurement of period fertility as it is the most commonly used approach in studies of population.

Five measures of fertility will be discussed and defined. These will be in the order of their complexity, i.e., in terms of the data required to calculate them. The five measures are; the child-woman ratio, the crude birth rate, the general fertility rate, the age-specific fertility rates and the total fertility rate. It is possible to estimate other more specific measures of fertility but the chapter will ignore these as they do not feature prominently in the debate on population and development and often require more detailed data to estimate or measure.

2.1 The Child-Woman Ratio (CWR)

The child-woman ratio is a very crude measure of fertility that expresses the number of children aged 0-4 years as a ratio of the total female population aged 15-44 or 15-49 years. This can be represented mathematically as:

$$CWR = \frac{\text{Children aged 0-4}}{\text{Women aged 15-44 or 15-49}} \qquad (1)$$

The child-woman ratio is most useful where population data by age and sex only are available, as for instance, from a census. Woods (1979:111) cites Robson as having applied the CWR in research on urban social area analysis. The CWR was applied at that level because this level of spatial analysis did not have any other fertility data except for the age and sex structure of the population. De Vany and Sanchez (1979) found it useful to apply the CWR in their study of the relationship between fertility and socio-economic development in Mexico when other data on fertility were not available. Roughly speaking, if fertility in an area is high then the child to woman ratio is also high and vice versa. Bogue (1969) has argued that the CWR varies in direct proportion with the more refined measures of fertility such as the general fertility rate. Due to this relationship with other more specific measures of fertility, the CWR can be used to estimate such measures in conjuction with other socio-economic data. In Section 4 one such method is applied to the estimation of the general fertility rate.

Newell (1988:36) points out that the CWR is quite sensitive to errors in age data (such as under-reporting of young children) as well as the level of infant and child mortality.

Caution is therefore advised in the use and interpretation of the measure, especially where comparison are being carried out between populations with different infant and child mortality levels or where under-reporting of young children is a known problem. Otherwise, the CWR can be viewed as a useful indicator of fertility in a population in the absence of other data. Its utility is enhanced by the fact that it can be used to estimate finer measures of fertility.

2.2 The Crude Birth Rate (CBR)

Another rough indicator of fertility is the crude birth rate. Woods (1979:106) argues that the use of the term rate is a misnorma. In reality, the crude birth rate is a ratio that expresses the number of births in a given year over the total mid-year population. This can be written as:

$$CBR = \frac{\text{Births in year}}{\text{Total mid-year population}} .1000 \qquad (2)$$

The crude birth rate is viewed as a ratio because the denominator includes the whole population regardless of sex or age. The inclusion of all ages and both sexes and other characteristics of the population affects the CBR measure. As a result, its usefulness in comparative population studies is impaired because populations with different characteristics can not be compared or even the same population over widely differing time periods.

Despite these limitations, the CBR is still a useful and widely used measure because of three features. First, it is very easy to understand and use. Seoncdly, it requires few data (births and total mid-year population) and if therefore very easy to compute. Thirdly, if estimates of the Crude Death Rate are available, then the Crude Natural Increase Rate can be calculated by subtracting the CDR from the CBR. The Crude Natural Increase Rate together with the Crude Net Migration Rate give the overall rate of population growth (Newell 1988:37). Indeed, the debates on population growth often use the population growth rate derived from the crude measures outlined above. However, to overcome the limitations of lack of comparability, it is necessary to look beyond the crude measures of fertility to more specific measures.

2.3 The General Fertility Rate (GFR)

The general fertility rate expresses births in a given period of time to the number of women in the reproductive age span. In as far as it tries to relate the births to the women who are at risk of giving a birth, it is a more specific measure of fertility than the crude birth rate or the child-woman ratio. It can be written thus:

$$GFR = \frac{\text{Births during the year}}{\text{Women aged 15-44 or 15-49 at mid-year}} \qquad (3)$$

The GFR is very sensitive to the denominator used. The denominator must be stated clearly if meaningful comparisons are to be made between different populations. Comparing a 15-44 GFR with a 15-49 GFR can be misleading and can lead to a wrong interpretation of the fertility levels of a given population. Newell (1988:38) illustrates the difference the denominator makes with regards to data from the United States. The 15-44 GFR was found to be 66.1 children per thousand women as opposed to 57.8 children/1000 women when the 15-49 GFR was applied. The difference in the results is of the order of 13 per cent.

Like the CBR, data used in the computation of the GFR can be derived from vital registration systems. This is especially true of the data on births. However, the data on the age of women will come from estimates of mid-year populations, since in most cases the age of women might not be recorded when the births are registered. Indeed, Newell points out that recording of the age of the mother was not carried out in England and Wales until 1937.

Unlike the CBR, the GFR controls for age and sex age structure by relating births to the women at risk of having them. Hwoever, control for age structure is only partial, as they may be substantial differences between populations within the reproductive age ranges. Some populations have say more females in the 15-19 age group than others. Further, births are not spread evenly across the childbearing age ranges, with ages 20-34 having a larger share of the birth than the 15-19 or over 35 years age ranges. Thus, if comparative analysis is the goal, then a more specific measure of fertility, which controls for both age and sex is required.

2.4 Age-Specific Fertility Rates (ASFRs)

The age specific fertility rate expresses the relationship between the number of births and the age of the mother as a function of the fertility experience of a given population (Woods 1979:108). The definition hints at the rigorous data requirements for the computation of the ASFRs. The data required are of births in a given year classfied by the age of mother. The vital registration systems of developed nations can provide such data, as the age of mother is recorded when the child's birth is registered. For developing nations, such vital registration systems are still in the developmental stages and are far from being complete, thus reducing their utility. The ASFRs are derived as:

$$\text{ASFRs} = \frac{\text{Births in year to women aged } x\text{+}n}{\text{Women aged } x\text{+}n \text{ at mid-year}} \qquad (4)$$

where n is the age interval of the age groups (usually 5 years)
x takes the values 15, 20, ...45.

Because there are normally seven ASFRs in all, it is easier to apply an index i instead of x. The i is used to refer to the seven ASFRs associated with the seven age groups of the women in the childbearing years ages (15-19, 20-24, ...45-49), as 1,2,...7 (Pressat 1972:38-42, Woods 1979:108, Yaukey 1985:148, Newell 1988:39-41)

Data obtained from vital registration systems make it possible to calculate ASFRs as single year rates. If such a system is adpoted then 35 ASFRs will be generated. The ASFRs can be expressed as part of a thousand or per thousand. It is also convention to added the births to females below the age of 15 to the 15-19 age group and those to females above the age of 50 to the 45-49 age group. The reason is that there are fewer births at the extreme ends of the reproductive age ranges to warranty separate treatment.

The ASFRs are most useful in terms of modelling as they are free from age structure and sex biases. Further, they are of greater accuracy than the general fertility rate because the population at risk is even more clearly defined. Their disadvantage lies in the fact that they are not a single number indicator like the GFR or the CBR. This makes them more complex and tediuos to apply in comparative analysis (Woods 1979:108, Newell 1988:41). To utilise their age-sex bias free advantage, it is necessary to take them a step and use them to calculate the total fertility rate, which is a single number indicator of fertility.

2.5 The Total Fertility Rate

Known too, as the Period Total Fertility Rate, it is the sum of the age specific fertility rates, adjusted for the width of the age classification of the women. Thus, where n (the width of the age group of women) equals five, it becomes the average of each of the ASFRs, for each of the five years. To adjust the

TFR, it has to be multiplied by 5.

The convention is to express the TFR as the number of children a woman would have if she bore children at the current ASFRs throughout her childberaing life-span. In contrast, the age specific fertility rates are normally expressed as a rate per 1000 women. The TFR can be written as:

$$TFR = \text{Sum of ASFRs} * n \qquad (5)$$

where $n = 5$

The definition above notwithstanding, the TFR can still be expressed per 1000 women. Shyrock and Siegel (1976:287), in their definitive work on demography, define the total fertility rate per 1000 women. In the United States, the official statistics still quote the TFR per 1000 women as opposed to the European convention of using children per woman. The total fertility rate is a measure that is totally free of age and sex biases and is therefore of great use in comparative analysis of different populations as well as in modelling.

2.6 Registration of vital events and the need for estimation

Sub-sections 2.1 to 2.5 have discussed the common measures of fertility and indicated roughly, the data required for their computation. Most measures relate births in a year to the mid-year female population. Most of the births, especially in developed nations are derived from vital registration systems or sample surveys (Woods 1979:19-25, Newell 1988:19-21). Since the measurement of fertility requires data from vital registration systems, one is forced to address the question, what is the extent of vital registration in Zimbabwe?

There is no explicit treatment of vital registration in the literature on Zimbabwe. However, the extent of registration has been estimated by some official sources. The Minstry of Health (MoH, 1985:2,1986:2) has indicated that the analysis of births recorded in the 1982 Census with those in the register show birth registration as being under-estimated by approximately 25%. The Government of Zimbabwe (GoZ) in a joint report with UNICEF (1985:17) argue for extensive variations in the extent of registration across the country. The urban centres have a more complete registration system than the rural areas. Harare's register of vital events is supposed to be complete, as opposed to the rural districts where variation is by margins greater than the national average (GoZ & UNICEF 1985:11-18).

The lack of complete registration requires that at subnational levels some form of estimation be carried out if the whole fertility picture of the country is to be ascertained. It is necessary to utilise some of the available crude measures of fertility such as the child-woman ratio in estimation procedures that can arrive at the more refined measures of fertility such as the general fertility rate. The overall aim of such estimation is to enhance the overall demographic picture of the nation as well as devising means of continuing to update the demographic data of the country's sub-national units.

The data use in the rest of the paper are drawn from two main sources. The first is the 1982 Census held on August 18th. The second source will be the reports on the demographic and socio-economic surveys carried out between 1983 and 1984 in the district council areas of the country. Only data on five provinces was gathered in these surveys though at the time of writing only three of the reports were available. Other minor sources will include the National Reproductive Health Survey carried out by the Zimbabwe National Family Planning Council in 1983/84 and for comparative purposes the 1969 Census (held 29th April).

3. FERTILITY LEVELS IN ZIMBABWE

Woods (1979:156-157) has argued that the apparent homogeneity of national statistics mask some important spatial and at times temporal variations in fertility within a single country or region. The level of fertility displayed at the national scale is by no means uniform at lower levels. The problem faced by researchers working in developing nations is the lack of suitable data at the sub-national level, which make it difficult to examine the variations of fertility at these levels. It is necessary to establish the pattern of fertility at the national level. Once this is accomplished, further investigation should lead to the exploration of possible temporal and spatial variations at the sub-national levels. From this point, one can proceed to provide estimates for other sub-national units which will enable the full examination of the fertility patterns of the nation.

The questions to address are: what are the levels of fertility in Zimbabwe, both current and in the recent past? What are the spatial and temporal variations in fertility, if any? Is it possible to utilise the available statistics to fill in the gaps at the sub-national level? The last question asked points to the need for estimation of certain fertility measures as discussed in Section 2.

The rest of the section discusses past and current fertility levels in Zimbabwe based on the fertility measures discussed in Section 2. Table 1 presents the raw data on women by age group, births by age group of women, and the total population from various sources and for various time periods. Subsequent fertility measures discussed are derived chiefly from these data.

3.1 Levels of Crude Birth Rate and General Fertility Rate

The most commonly available statistic on the fertility of Zimbabwe is the crude birth rate. This is due to its ease of computation and its minimum data requirements. Table 2 gives a summary of the CBR and GFR estimates available for Zimbabwe at different time periods and spatial scales.

The table indicates that fertility as measured by the CBR has been relatively high in Zimbabwe in the recent past (Mzite (1981:36-37, Kay 1976:148-150, CSO 1985b:15, ZNFPC 1985:50-53). Fertility in the country rose after the Second World War right up to the time of the 1969 Census. After the 1969 Census a fertility decline must have started though the precise point of decline can not be pinpointed. However, both the CBR and the GFR show a decline in fertility, at the national level, of between 14% and 16% by 1982 (CSO 1985a:133-136).

The GFR estimate for 1985 seems to be higher than the estimate for both censuses. The reason for this lies in the character of the sample that the ZNFPC used. This was heavily biased in favour of the rural population, where fertility is suspected to be higher than that of the urban population (ZNFPC 1985). Further, the small size of the sample involved means that errors are likely to be of greater magnitude than in the full census count.

Table 3 can be used to compare the CBR and GFR of Zimbabwe to other countries within the East African region. The estimates show that, according to the 1982 census, Zimbabwe had fertility levels that were lower than the Eastern Africa average. Indeed, of the countries in the table, only Mauritius had lower fertility levels than Zimbabwe in 1982. However, it is important to point out that the degree of comparability between the Zimbabwean statistics and those in Table 3 is very limited. The limitation is imposed by the fact that the statistics shown are by products of indirect estimates by the United Nations, based mostly on Censuses taken in the 1960s or the early 1970s. The figure for Zimbabwe shown in the table is based on projections from 1969 and upon the assumption that the countries in Africa were experiencing the smallest decline in their fertility (Woods 1979:153).

The sub-national level affords very little temporal comparison. However, there is plenty of spatial variation as indicated by the figures for Masvingo and Manicaland in Table 2. In terms of the CBR Manicaland operates much closer to the national average than does Masvingo (38.9 versus 24.7). The evidence would seem to indicate that Masvingo has the lowest birth rate in the country. Statistics available from the City of Harare (1987:2) indicate that in 1985 Harare had a CBR of 47 live births per 1000 of population which by 1986 had fallen to 43 live births per 1000 population. These figures coming some three years later are both higher than the 1982 Masvingo CBR figure. However, there is need to take the Masvingo figure with caution for it might be indicating a degree of underenumeration in the population there. It is noted by the CSO (1984:38) that in the Gaza Komanani District Council:

> "there was an army contact with South Africans during the enumeration in Sengwe. It was reported that people fled but later returned when they were enumerated. In such circumstances underenumeration is likely".

In fact, the figures based on the GFR which is a more fine measure of fertility show Masvingo as being quite close to the national average. The CBR might have been affected by the age and sex structure of the population of Masvingo, compounded by a certain degree of underenumeration.

The figures for the district councils refer to two years later and are the result of a demographic and socio-economic sample survey. Even though they come two years after the census, the figures are quite close to the national average for 1982. This confirms the ascertion that fertility is much higher in the district council areas than elsewhere in the country. The average CBR for the five out of eight provinces (Manicaland, Mashonaland Central and East, Midlands and Masvingo) stood at 39 live births per 1000 population (CSO 1985a:132). Of the available data from this survey, Manicaland DCs had CBR figures that were above the average for both the province and the nation in 1982. Indeed only Manicaland can afford a comparison with the 1982 Census. The rest of the figures hint at small spatial variations in the fertility levels within the country.

3.2 <u>Levels of Age Specific Fertility and Total Fertility Rates</u>

Table 4 provides a summary of age specific fertility rates as well as the total fertility rates for various time periods and spatial units within Zimbabwe. The ASFRs show that the most fertile age groups are in the 20-34 age ranges. On average, these age ranges have fertility levels of above 200 live births per 1000 women in each age group. The contribution of the age group 15-19 seems to have diminished since 1953 though the weighting of the population in 1985 makes its contribution bigger than that found in the 1982 Census. The trend of less and less births from the 15-19 age group is in keeping with the long observed fact that where fertility is declining, the age groups at the extremes of the child bearing age ranges reduce their fertility most (Woods 1979:153). Indeed, the contribution of the age groups 40-44 and 45-49 has been declining too. For example, in 1969, the 40-44 age group had an age specific fertility rate of more than 120 live births per 1000 women. By 1982, the age group's rate had fallen down to 93 per 1000. Even the 1985 data which are weighted in favour of the rural population show the group's rate at 91.9 live births per 1000 women. In this regard, the indication of falling fertility is strongly confirmed.

The falls, though, are not reflected uniformly at the sub-national level. For example, both Manicaland and Masvingo had rates of above 100 live births in 1982 in the 40-44 age group. The evidence from the district council areas also show a degree of spatial variation. Manicaland DCs and those of Mashonaland Central show rates that are below 90 live births in contrast to Mashonaland East which had a rate of 103.8 live births per 1000 women. Due to the lack of data from other time periods for use in comparison, all that can be said is that there is evidence for assuming that fertility varies across space and time.

The total fertility rate, also shown in Table 4, strengthens the argument for falling fertility across time as well as variation across space. The TFR show a rise in fertility through to the 1960s. After that a decline is evident which is in keeping with the evidence from the CBR and the GFR. Variations at the sub-national level is also evident. For example, Manicaland's 1982 5.96 children per woman which is close to the average for less developed countries of 5.94 children per woman in the 1970-1975 period (Woods 1979:153) can be contrasted to the average for its own district councils in the 1983-84 period which stood at 6.25. The latter figure is closer to the national average for 1985 from the ZNFPC of 6.52 children per woman. Interestingly enough, Masvingo's TFR or even its ASFRs do not differ greatly from the rest of the sub-national figures. This is probably another illustration of the greater accuracy of fertility measures which are totally free from biases introduced by age and sex structure.

The section has tried to establish the levels and trends of fertility in Zimbabwe. It is evident that the picture at the sub-national level is incomplete. The limited nature of the data also makes full scale comparisons of the patterns of fertility less practical. Thus, to fulfill the aim of trying to provide a full scale picture of demographic development within Zimbabwe at the sub-national level, it is necessary to estimate some of the measures of fertility from the data available. Section 4 below discusses such methods of estimation and attempts to show how they can be applied in the description of fertility at the sub-national levels where data are not available.

4 INDIRECT PROCEDURES FOR ESTIMATING FERTILITY MEASURES

A number of notable demographers have evolved procedures of estimating fertility levels from limited or defective data. The procedures are termed "indirect" because they rely on some aspect of the social or demographic characteristics of the population under study to arrive at an estimate of its fertility. Two such procedures are discussed briefy below and a third, procedure which is more suitable for our purposes, is described in full.

4.1 Brass Procedures and the Bogue-Palmore Methods

The work of William Brass on fertility and mortality estimation from defective data is probably the most widely known and applied, especially on data from developing nations. The Brass type estimation procedures are based on the recognised relationship between the number of children ever borne by women in the child bearing age ranges and those that survive (see Brass 1975:11-29, Mzite 1981:36-39, UN 1983:27-37). From the children ever borne, parity ratios can be calculated which are then compared to the cumulative fertility rates based on births in the year prior to the survey or census. The comparison is based on the knowledge that children who are born alive but die in their infancy, are not reported completely by their mothers. The closer to the time of the survey the event is, the greater the likelihood of parents not wanting to talk about it. Thus, the data on births in the last year is likely to be incomplete because some children borne alive who die later in the year are not likely to be reported. Indeed, the GoZ & UNICEF (1985:17) report that the application of the Brass techniques to the data from the 1982 census revealed that as much as one third of deaths occurring in the first year of life were not reported by parents to census enumerators.

The Brass type procedures can be viewed as being useful for checking the consistency of the census data collected. They do not lend themselves readily to use in situations where one is required to estimate fertility of areas without data on children ever borne or birth in the previous year. For this reason, the method was dropped in search of one that would enable the estimation of fertility at the subnational level.

The Bogue-Palmore regression techniques presented themselves as a possible means of estimating data at the sub-national level. The techniques were based on socio-demographic characteristics of the population which can be derived from any census or survey data. These included such indices as the child woman ratio, discussed above, the median age of marriage, child mortality, the index of fertility age composition and so on (Bogue & Palmore 1964:317,325-326). The indices were regressed based on data from countries in the developed world i.e. those whose data was known to be reliable. Cho (1964:359-374) provided the classifications of countries according to the reliability of their data which were then utilised by Bogue and Palmore in their regressions. The regression equations and coefficients obtained were then applied to estimating fertility measures for countries with very little or defective data. The results obtained from applying the techniques seemed reasonable enough based on the known demographic, social and economic development of the countries with the defective data.

The Bogue-Palmore regression technique seemed to provide a means of estimating fertility at the sub-national data based on the 1982 Census for Zimbabwe. However, not all the data necessary to calculate the indices Bogue and Palmore used were available. Indeed, the available statistic which covered the whole of the country, was the child to woman ratio. It was therefore decided to use the child woman ratio to estimate other fertility measures, especially the general fertility rate.

4.2 Child Woman Ratio and Indirect Estimates of Fertility

A comparison of equations 1 and 3 reveals that the child woman ratio is a special case of the general fertility rate. The difference lies in the enumerators. The general fertility rate enumerator is concerned with births in the year prior to the survey whereas that for the CWR is concerned with the births in the previous five years who have survived as the population in the 0-4 year age group. Bogue (1969:662-663) and Rees (1987) argue that the application of reverse survival techniques can convert the children aged 0 to 4 years to their births in the five years prior to the census. The female population aged 15 to 49 years can also be reverse survived to obtained the women in the child bearing age ranges. If the reverse survival for both the children and the women are done successfully, then estimates of the GFR can be derived and the births implied by the GFR computed for the population or area under consideration. Once, the births are computed, it is also possible to arrive at the estimates of the crude birth rate, if the total population for the areas under consideration are available.

Both Bogue and Rees point out that, for the reverse survival technique to work properly, it is necessary to have an estimate of both child and maternal mortality for the period under observation. Since in most cases such information is not available, it is necessary to utilise life tables in the estimation of child and maternal mortality. If a national life table does not exist then a model life table, which embodes the mortality conditions of the population under study, can be used (Brass 1969:663, Rees 1987).

Life tables exist for both the male and female populations of Zimbabwe based on the 1982 Census (CSO 1985a:178-179). The female population aged 15-49, the children aged 0-4, the child to woman ratios and the total population are presented in Table 5 by districts and provinces within the country. Note that the district is the third rung in the administrative structure of the country before the councils. A step by step discussion of the technique of estimating fertility measures from the child woman ratio through the reverse survival technique follows.

The first step is to estimate the GFR implied by each district or provincial CWR as follows:

$$GFR_1 = CWR/5 \qquad (6)$$

The estimate is not adjusted for the mortality of the children nor the women. It is therefore an underestimate of the actual fertility level as measured by the general fertility rate. The second step is to adjust for mortality conditions. The children are adjusted first. A survival rate is computed using the Zimbabwe male and female life tables for children aged 0-4 years:

$$S_{birth\ 0-4} = \frac{{}_5L_0^{(m)} + {}_5L_0^{(f)}}{5l_0^{(m)} + 5l_0^{(f)}} \qquad (7)$$

where $S_{birth\ 0-4}$ = survival from birth during a 5 year period to being age 0 to 4 years at end of period;
$L_0^{(m\ or\ f)}$ = stationary population between ages 0 and 5 for males and females respectively;
$l_0^{(m\ or\ f)}$ = size of the hypothetical cohort in a life table at birth (age 0) for males and females respectively.

The survival rate is used to derive a reverse survival ratio for the population 0-4 years to the births in the previous five years thus:

$$BSRc_{(t-5)} = P_{0-4}(t)\ 1/S_{birth\ 0-4} \qquad (8)$$

where $BSRc_{(t-5)}$ = the back survival ratio for births in the 5 years prior to the census (August 1977);
$P_{0-4}(t)$ = the population aged 0 to 4 at the time of the survey (August 1982);
$S_{birth\ 0-4}$ = the survival rate worked out in equation 7 above.

The back survival ratio gives the number of children alive today to their births in the five year period. Thus for every child alive aged 0-4 in 1982, there were 1.1008 persons born in the previous five year period. The back survival ratio can be used to adjust the first estimate of the general fertility rate in Equation 6 for child mortality thus:

$$GFR_2 = (CWR/5)BSRc \qquad (9)$$

The second estimate does not represent the true level of the GFR because it has not been adjusted for the mortality of the population at risk of giving the births i.e. the female population of child bearing ages. The fourth step therefore involves adjusting the female population at risk for mortality during the five years prior to the census. This is achieved by calculating a back survival ratio for females in the 15-49 age group in a similar fashion to that of the children shown in Equation 8. The Zimbabwean female life table is used to calculate the survival rate of the women from age 10-44 to 15 to 49 at the time of the census before the calculation of the back survival ratio thus:

$$S_{10-44\ 15-49} = \frac{\sum_{x=15}^{45} {}_5L_x{}^f}{\sum_{x=10}^{40} {}_5L_x{}^f} \qquad (10)$$

where $S_{10-44\ 15-49}$ = survival from age 10 to 44 years during a 5 year period to being aged 15 to 49 years at the end of the period by females (Census 1982);
$L_x{}^f$ = stationary population or life years lived between ages 10 and 45 and ages 15 and 50 by females.

The survival rate from Equation 10 is applied in the same way as in Equation 8 with a slight difference. Normally, the population at risk is taken as the mid-year estimate. In this case, the female population at risk can be taken as the average of the population implied by the back survival ratio (1.023) and those alive (1.0) divided by two. The back survival ratio of the female populaton (BSRf) is applied to the second estimate of the general fertility rate to arrive at an estimate that is adjusted for both child and maternal mortality thus:

$$GFR_3 = GFR_2 \ / \ BSRf \qquad (11)$$

It is necessary to adjust the estimates of fertility at the sub-national level so that they sum up or they are consistent with the national fertility level. This can be achieved by calculating the births implied by the national estimate of the GFR. Because of the existence of total births from the census, it was felt that using them instead of those from the indirect estimate of the Zimbabwe GFR would yield estimates at the sub-national level which were of greater consistency and accuracy. The estimates of births for the provinces based on the third estimate of the GFR were constrained so that they would add up to the Zimbabwean census births thus:

$$\sum_{p=1}^{11} GFR_3{}^p \, P^p{}_{15-49}(f) = B^z{}_c \qquad (12)$$

where $GFR_3{}^p$ = the general fertility rate estimate for province p as derived in Equation 11 above
$P^p{}_{15-49}(f)$ = the female population in each province p aged 15-49 years
$B^z{}_c$ = total births in the 1982 Census of Zimbabwe.

The ratio of provincial births to total births which is required to adjust the GFR estimates is then calculated and used to arrive at the final adjusted GFR thus:

$$GFR_4{}^p = GFR_3{}^p \cdot \frac{B^z{}_c}{\sum_{p=1}^{11} GFR_3{}^p \, P^p{}_{15-49}(f)} \qquad (13)$$

where definitions are similar to Equation 12 above and 4 denotes the final adjusted GFR estimate.

The exercise was then repeated for district general fertility rate estimates to bring them in line with those of the provinces. The final estimate of the GFR is then used to calculate estimates of births for the provinces and districts. The new set of births are then used to arrive at estimates of the crude birth rate for each province and district using the total population in Table 5. The full results of the estimation procedure described so far are shown in Table 6. Discussion of the results will be deferred to Section 5 below.

4.3 Estimation of Total Fertility Rate and Age Specific Fertility Rate from General Fertility Rate

Bogue and Palmore(1964:318-321) have shown that an empirical relationship exists between the various measures of fertility which justify their use in linear regressions. Basing their argument on fifty nations with the most reliable data between 1955 and 1960, they concluded that "the basic measures of fertility are good estimators of one another" (p.318). They show that the total fertility rate can be estimated from the general fertility rate thus:

$$TFR = a + bGFR \qquad (14)$$

However, they stipulate that only the linear regression of measures directly derived from census or survey data is most likely to give satisfactory results when used for estimation in indirect procedures. The use of regressions derived from direct estimation of fertility measures is recommended because it minimises the degree of error involved in each step of estimation. However, even the measures derived from direct estimation are themselves not absolutely free from errors. The most significant of these errors is that associated with the population data itself.

Bearing in mind the weaknesses pointed out by Bogue and Palmore, it was decided to subject the direct measures of fertility presented in Section 3 to linear regression. The purpose was to obtain coefficients which would enable the indirect estimates of the general fertility rate to be converted into estimates of the total and age specific fertility rates. The statistical package MICROTAB (Higginbottoms, 1985) for the BBC micro-computer was used to carry out the regressions.

The results of the regression of the total fertility rate against the general fertility rate were quite good. Bogue and Palmore had suggested a range of coefficients of correlation of between 0.425 and 0.999 (p.318). The coefficient of correlation arrived at was .908 with a R^2 of 82.4%. Other intervening variables exist to help explain the relationship between TFR and GFR but the degree of correlation observed in the present case makes it possible to use the resulting regression equation in the estimation of total fertility rates for the districts and provinces of the country as in Equation 14 above.

The set of TFRs derived for the districts are then used to estimate age specific fertility rates. First, the ASFRs obtained from direct estimation are regressed thus:

$$\begin{aligned} ASFR15\text{-}19 &= a15\text{-}19 + b15\text{-}19TFR \\ &\vdots \\ ASFR45\text{-}49 &= a45\text{-}49 + b45\text{-}49TFR \end{aligned} \qquad (15)$$

The coefficients of correlation in this case were not as good as those of the total fertility rate. They varied from 0.391 in age group 40-44 to .881 for the 35-39 age group, with the age group 45-49 recording a negative coefficient (-0.336). Bogue and Palmore (1964:336) point out that the last age group is extremely difficult to handle because of the small number of births involved at the extreme end of the childbearing years as well as the greater variation in the ASFRs. The degree of correlation overall is disappointingly low and this is reflected in the levels of R^2. These vary from a mere 11.3% for age group 45-49 to a high of 65.7% in age group 35-39. The ASFRs resulting from the application of the regressions shown in Equation 15 need to be treated and interpreted with caution.

The ASFRs need to be adjusted so that they too are consistent with the predicted total fertility rates from Equation 14. To do this, the ASFRs are summed to give their total fertility rates. The ratio of the sum of the total fertility rates to the predicted total fertility rate can be used for this purpose thus:

$$ASFR_2 = ASFR_1 \cdot \frac{\text{TFR predicted}}{\text{TFR found by summing } ASFR_1} \qquad (16)$$

where $ASFR_1$ = unadjusted ASFR from Equation 15
$ASFR_2$ = adjusted ASFR that sums up to the TFR predicted by equation 14 above.

A summary of the results of the estimation are provided in Table 7.

5 DISCUSSION OF RESULTS AND COMMENTS

The paper began by pointing out the need for developing methods for estimating fertility as well as viewing fertility levels in the country which were seen as being relatively high even though on a decline. This section begins by passing a few critical comments on the methods of estimation employed before discussing the results.

5.1 Comments on Techniques

The technique upon which the indirect estimation of fertility measures rests is that based on the ratio of children to women. Two main criticisms can be levelled at the technique. The first lies in the fact that, the technique assumes a stationary population in order to calculate the survival rates which are then employed in calculating the reverse survival ratio for the children aged 0 to 4 years and the women age 15-49 years. The evidence of falling fertility across the country would seem to suggest that the population is far from being stationary. The application of the survival rates and reverse survival ratios based on the national life tables to all populations (provincial and district) might not capture fully the variation of mortality across the country. In certain instances, the children and women derived from the reverse survival ratios are an overestimate whilst in others they are an underestimate. It is assummed that the degree of overestimation is cancelled by that of underestimation. Indeed the use of the Zimbabwe life table instead of a model life table makes the estimates more accurate because at least the Zimbabwe life table embodes all the mortality conditions of the country.

The second criticism to raise is the crudity of the estimation procedure. While it provides an indication of the fertility patterns in the country, it is still a crude approximation, especially when the first criticism is taken into consideration. Bogue and Palmore (1964) strongly recommend the use of other social and demographic characteristic of the population in order to improve accuracy and reliability of the estimates. Such characteristics include age at first marriage, percent married in each child bearing age group and so on. The absence of the data for the provinces and districts makes that level of estimation impossible, in the present study. It is therefore necessary to point out the need for caution when the results are being used or interpreted.

The regression technique have the weakness of having been based on a very small sample of direct fertility measures from Zimbabwe itself. These measures will embode any errors in the population data thus affecting the overall accuracy of the results. This is probably most manifest in the regression of the age specific fertility rates. Both the degree of correlation and the goodness of fit where extremely low, indicating other intervening variables in action. Probably, the inclusion of the social-demographic characteristics mentioned by Bogue and Palmore would improve the degree of correlation and goodness of fit. Further research in this area, outside the scope of the current study, is invisaged as more data becomes available.

Despite these criticisms, the methods show how it is possible to utilise raw population data through models to arrive at better estimates of fertility. Studies in Zimbabwean population have suffered from the lack of such techniques leading to concentration on the national picture to the exclusion of the sub-national one. Future research should take advantage of techniques as discussed in this paper to arrive at estimates that contribute to the overall knowledge of developments at the sub-national level.

5.2 Comments on Results

The results of fertility measures derived from both the direct and indirect techniques would seem to support the contention that fertility levels in Zimbabwe are still relatively high. Direct estimates of the CBR vary from 39.4 to 24.7 in 1982 (see Table 2). Estimates from the district council areas in the 1984/84 period also show high levels as they vary from 37.3 to 40.1. However, these estimates are based on a limited number of provinces. The indirect estimates based on the child to woman ratio for 1982 show CBRs varying between 46.22 in Buhera, close to the UN average for the period 1980-1985, to 32.39 in the metropolis of Harare, which is slightly above the Mauritius average for the same period (cf. Table 3 & 6 and Fig. 1).

The general fertility rate estimates as well as the total fertility rates reflect the same trend. Here, the variation based on the adjusted GFR estimate (GFR4), ranges from 245.6 live births per 1000 women in Makoni, second to Kenya's in the East African region, to Harare's 127.9, with a national average of 176.14 (cf. Table 3 & 6 and Fig. 1). As noted earlier, the estimates based on the Census are lower than those of the United Nations which were based on projections.

The ASFRs also reflect high fertility as well as the method by which they were derived. The peak of the national fertility schedule is in the age group 20-24. However, when it comes to the estimated schedule, the peak is shifted to the 25-29 age group (cf. Table 4 & 7). The 20-34 age group is still the most productive, with birth rates which are generally over 200 and in a few cases over 300 live births per 1000 women. The child bearing span seems also to begin early and last till late in some of the districts (e.g. Burera) with births of over 100 at both the 15-19 and 40-44 age groups. The last age group (45-49) though, generally contributes births that are below 80 live births per 1000 women.

Not suprisingly, the TFRs are also quite high. These vary from Makoni's 7.3 children per women, which is nearer to the average for Zimbabwe in the 1960's to Harare's 4.7 (Table 7). The national average based on indirect estimation is 5.86 which lies between the 1982 Census estimate of 5.69 and the 1985 Zimbabwe Reproductive Health Survey estimate of 6.52 (cf. Table 4 & Table 7). Bogue and Palmore (1964) point out that an important litmus test for the reliability of the estimates based on regression techniques is that they lie close or between two known estimates for a given period. The result above would seem to fulfill this criteria despite the weakness of the regressions in the last age group. Overall, one can conclude that the fertility of the nation as measure by the TFR lies between 5.69 and 6.52 children per women in the 1980-1985 period with wide variations at the sub-national level.

Figure 1 show the variations in total fertility rate country wide. Note the high belt of fertility associated with the western and southern provinces, especially Masvingo. It can be recalled that the census estimate of the CBR for Masvingo was a mere 24.7 (Table 3) for 1982, which was the lowest of the available estimates. This gave the illusion that Masvingo had the lowest fertility pattern in the country, at least at the provincial level. The picture that emerges from the indirect estimation show Masvingo as having the highest levels of fertility in the country both at the provincial and district levels. Indeed, it is the only province were total fertility rate at the district level is above 6.0 children per women giving a provincial average of 6.18 children per woman. The finer measure, shorn of biases introduced by age and sex structure would seem to suggest that Masvingo is after all an area of high fertility. The finding supports the concern of other researchers about over population in this province (e.g. Kay 1976 & 1980).

The paper has been able to describe fertility patterns in Zimbabwe both at the provincial and district level by developing techniques that utilise available data to estimate unavailable measures at the sub-national levels. Wide variations than indicated by data at the national level are found within the country. However, some errors are involved in the estimation and future research should seek more data in order to minimise errors and to improve the reliability and accuracy of the estimates.

Table 1: Female population by age group, births by age group of mother and total population; Zimbabwe 1969-1985, Manicaland and Masvingo 1982, District Councils of Manicaland, Mashonaland Central and East 1983/84

Age Group of Mother	Rhodesia 1969		Zimbabwe 1982		Zimbabwe 1985*		Manicaland 1982	
	F	B	F	B	F	B	F	B
15-19	240,110	28,549	410,929	37,818	505	66	62,073	4,621
20-24	208,460	57,014	362,716	93,598	566	164	49,043	12,723
25-29	174,944	50,506	279,915	70,874	489	146	39,762	10,674
30-34	144,519	36,000	205,918	46,291	359	94	29,989	7,212
35-39	119,914	23,851	169,477	27,915	306	67	24,411	4,436
40-44	85,791	11,058	138,961	12,933	185	17	20,692	2,236
45-49	76,964	4,995	109,856	5,586	163	2	16,066	960
TOTAL	1,050,702	211,973	1,677,856	295,015	2,574	556	242,036	42,862
Popul.	-	-	7,546,071	-	-	-	1,102,104	-

Table 1: contd.

Age Group of Mother	Masvingo 1982		Manicaland** DCs		Mashonaland DCs** Central		Mashonaland DCs** East	
	F	B	F	B	F	B	F	B
15-19	34,608	2,831	40,512	2,563	18,005	945	25,238	1,919
20-24	29,911	7,287	32,402	9,258	13,525	3,576	19,334	4,944
25-29	25,176	6,020	27,773	7,460	11,593	3,412	16,567	4,465
30-34	18,869	4,301	21,996	6,120	10,318	2,425	12,360	2,767
35-39	14,200	2,475	17,597	3,136	8,057	1,398	9,340	1,881
40-44	12,898	1,398	13,657	1,225	7,194	532	7,822	812
45-49	9,753	740	12,012	1,034	5,139	369	8,634	699
TOTAL	145,415	25,052	165,949	30,796	73,831	12,660	99,385	17,487
Popul.	1,028,147	-	768,883	-	339,759	-	466,067	-

Notes: * Reproductive Health Survey 1985
** Household Capability Survey 1983-1984
F. Female population; B. Births; Popul. Total population

Sources: Mzite(1981: Table 3.11:41 & Appendix 4:78)
CSO(1985a: Table VI.4:138 & Census 1982:Table 2A & 33A)
ZNFPC(1985: Table 4.10:57)
PSSU(1985: Table 1:2 & Table 3:3)

Table 2: Crude Birth Rate and General Fertility Rate: Zimbabwe 1948-1985, Manicaland and Masvingo 1982, District Councils of Manicaland and Mashonaland Central and East 1983/84.

Area	Date	CBR / 1000	GFR / 1000
Southern Rhodesia	(1948)	46.6	-
Southern Rhodesia	(1953/55)	44.8	-
Southern Rhodesia	(1962)	48.0	-
Rhodesia	(1969)	52.0	202.0
Zimbabwe	(1982)	39.4	175.8
Zimbabwe	(1985)	-	216.0
Manicaland	(1982)	38.9	177.1
Masvingo	(1982)	24.7	172.2
Five District Counclis	(1983/84)	39.0	178.2
Manicaland DCs	(1983/84)	40.1	185.6
Mashonaland Central DCs	(1983/84)	37.5	176.0
Mashonaland East DCs	(1983/84)	37.3	171.5

Sources: Mzite(1981: Table 3.5:29)
CSO(1985a: Table VI.1:132)
ZNFPC(1985:57)
PSSU(1985: Table 1:2 & Table 3:3)
Census 1982: Table 2A & Table 33A

Table 3: Crude Birth Rate and General Fertility Rate estimated by the United Nations for Eastern African Countries 1980-1985

Region/ Country	CBR	GFR	Country	CBR	GFR
EASTERN AFRICA	47.9	215	Mauritius	26.1	98
Burundi	46.8	198	Mozambique	44.6	196
Comoros	46.0	201	Rwanda	49.4	223
Ethiopia	49.7	218	Somalia	46.3	192
Kenya	53.5	264	Uganda	44.6	199
Madagascar	44.8	196	Zambia	49.0	224
Malawi	50.8	231	Zimbabwe	47.2	215

Source: CSO(1985a: Table VI.2:134)

Table 4: Age Specific Fertility Rates and Total Fertility Rates: Zimbabwe 1953-1985, Manicaland and Masvingo 1982, District Councils of Manicaland and Mashonaland Central and East 1983/84.

Age Group of Women	Southern Rhodesia 1953-55	Rhodesia 1969	Zimbabwe 1982	Zimbabwe 1985	Manicaland 1982
15-19	0.260	0.119	0.092	0.131	0.074
20-24	0.340	0.274	0.258	0.290	0.259
25-29	0.230	0.289	0.253	0.299	0.268
30-34	0.160	0.249	0.225	0.262	0.241
35-39	0.100	0.199	0.165	0.219	0.182
40-44	0.040	0.129	0.093	0.092	0.108
45-49	0.010	0.065	0.051	0.012	0.043
Total	1.140	1.323	1.137	1.304	1.192
TFR	5.700	6.620	5.685	6.520	5.960

Table 4: contd.

Age Group of Women	Masvingo 1982	District Councils of: Manicaland 1983-1983	Mashonaland Central	Mashonaland East
15-19	0.082	0.063	0.053	0.076
20-24	0.244	0.286	0.264	0.256
25-29	0.239	0.269	0.294	0.270
30-34	0.228	0.278	0.235	0.224
35-39	0.174	0.178	0.174	0.200
40-44	0.108	0.090	0.074	0.104
45-49	0.076	0.086	0.072	0.081
Total	1.151	1.250	1.166	1.209
TFR	5.755	6.250	5.830	6.045

Sources: Mzite(1981: Table 3.11:41 & Appendix 4:78)
CSO(1985a: Table VI.4:138)
ZNFPC(1985: Table 4.10:57)

Table 5: Children aged 0-4, Women aged 15-49, Child Women Ratios and Total Population by Province and Ditrict; Zimbabwe 1982.

Province/ District	Children 0-4	Women 15-49	Child Woman Ratio	Total Population
MANICALAND	194,310	228,250	850.6	1,054,890
Buhera	42,160	44,520	947.0	205,660
Chipinge	41,810	52,840	791.3	224,610
Chimanimani	11,930	14,630	815.4	66,150
Mutasa	15,970	19,100	836.1	85,020
Makoni	27,320	25,070	1,089.7	152,840
Mutare	38,730	49,240	786.6	222,700
Nyanga	16,390	23,050	711.1	97,910
MASHONALAND CENTRAL	121,040	150,400	804.8	677,290
Bindura	31,040	40,780	761.2	180,150
Centenary	16,000	19,360	826.4	87,560
Darwin	14,120	17,410	811.0	76,890
Mazowe	22,530	27,540	814.5	125,950
Guruve	11,830	15,560	760.3	69,100
Rushinga	8,750	9,740	879.9	45,570
Shamva	16,950	20,010	847.1	92,070
MASHONALAND EAST	101,770	130,620	779.1	589,870
Marondera	18,430	22,490	819.5	106,720
Mudzi	11,000	13,460	817.2	89,030
Mutoko	16,680	24,140	691.0	67,310
Murewa	28,240	34,300	823.3	165,350
Wedza	7,910	9,400	841.5	45,300
Goromonzi	15,820	20,930	755.9	94,000
Seke	3,690	5,820	634.0	22,160
MASHONALAND WEST	160,230	202,430	791.5	929,010
Chegutu	24,870	32,450	766.4	149,010
Hurungwe	52,510	62,620	838.5	292,680
Kadoma	21,760	29,430	739.4	129,770
Kariba	4,320	5,980	722.4	25,970
Lomagundi	56,770	71,950	789.0	331,580
MATABELELAND NORTH	79,250	95,300	831.6	452,960
Binga	9,310	11,750	792.3	47,670
Bubi	4,890	5,770	847.5	26,650
Lupane	18,370	20,880	879.8	99,180
Hwange	15,890	21,410	742.2	96,820
Nkayi	16,500	19,540	844.4	92,110
Nyamandhlovu	14,290	15,950	895.9	90,530

Table 5 contd.

Province/ District	Children 0-4	Women 15-49	Child Woman Ratio	Total Population
MATABELELAND SOUTH	103,360	124,300	831.5	587,950
Beitbridge	13,290	17,540	757.7	77,070
Bulalima Mangwe	28,550	36,910	773.5	165,720
Gwanda	17,270	21,910	788.2	107,120
Insiza	16,420	16,370	1003.1	84,420
Matobo	14,670	16,100	911.2	78,790
Umzingwane	13,160	15,470	831.5	74,830
MIDLANDS	199,620	244,580	816.2	1,101,700
Charter	24,050	29,670	810.6	141,240
Chilimanzi	8,590	10,080	852.2	49,880
Gokwe	53,230	57,210	930.4	268,130
Gweru	22,980	31,250	735.4	134,290
Kwekwe	32,820	40,490	810.6	183,530
Mberengwa	36,120	49,270	733.1	204,430
Shurugwi	10,570	13,590	777.8	62,860
Zvishavane	11,260	13,020	864.8	57,340
MASVINGO	178,450	210,330	848.4	976,460
Bikita	34,950	38,230	914.2	179,700
Chiredzi	40,130	49,430	811.9	218,340
Ndanga	24,590	28,010	877.9	131,600
Gutu	30,030	36,560	821.4	169,640
Masvingo	19,710	23,750	829.9	110,570
Mwenezi	6,190	7,070	875.5	32,450
Chivi	22,850	27,280	837.6	125,160
HARARE	87,040	153,430	567.3	605,890
BULAWAYO	60,300	106,040	568.7	413,500
CHITUNGWIZA	23,310	29,060	802.1	120,950
ZIMBABWE	1,308,680	1,684,720	776.8	7,510,470

Source: 1982 Census: Ten Percent Sample, Table 2A

Table 6: General Fertility Rate Estimates, Estimates of Births, Crude Birth Rates and Total Fertility Rates by Districts: Zimbabwe 1982.

Province/ District	General Fert. Rate Per 1000 Women 1	2	3	Births a	GFR 4	Births b	CBR Per 1000 Popn	TFR Per Woman
MANICALAND	170.1	187.3	183.1	41,820	191.8	43,806	41.5	6.19
Buhera	189.4	208.5	203.8	9,073	213.5	9,505	46.2	6.64
Chipinge	158.3	174.2	170.3	8,999	178.4	9,426	42.0	5.91
Chimanimani	163.1	180.0	175.6	2,568	183.9	2,690	40.7	6.03
Mutasa	167.2	184.1	179.9	3,437	188.5	3,600	42.3	6.12
Makoni	217.9	240.0	234.5	5,878	245.6	6,157	40.3	7.30
Mutare	157.3	173.2	169.3	8,335	177.3	8,732	39.2	5.89
Nyanga	142.2	156.7	153.1	3,528	160.3	3,696	37.8	5.53
MASH. CENTRAL	161.0	177.2	173.2	26,049	181.4	27,286	40.3	5.97
Bindura	152.2	167.6	163.8	6,681	171.6	6,998	38.9	5.77
Centenary	165.3	181.9	177.9	3,443	186.3	3,607	41.2	6.08
Darwin	162.2	178.6	174.5	3,039	182.8	3,183	41.4	6.00
Mazowe	162.9	179.3	175.3	4,828	183.6	5,057	40.2	6.02
Guruve	152.1	167.4	163.6	2,546	171.4	2,667	38.6	5.77
Rushinga	176.0	193.7	189.4	1,844	198.4	1,932	42.4	6.32
Shamva	169.4	186.5	182.3	3,648	191.0	3,821	41.5	6.17
MASH. EAST	155.8	171.5	167.7	21,904	175.7	22,944	38.9	5.85
Marondera	163.9	180.4	176.4	3,966	184.7	4,154	38.9	6.04
Mudzi	163.4	180.0	175.9	2,367	184.2	2,479	42.2	6.03
Mutoko	138.2	152.1	148.7	3,590	155.7	3,759	36.8	5.44
Murewa	164.7	181.3	177.2	6,077	185.5	6,364	38.5	6.06
Wedza	168.3	185.3	182.0	1,711	190.6	1,791	39.5	6.16
Goromonzi	151.2	166.4	162.7	3,405	170.4	3,566	37.9	5.74
Seke	126.8	139.6	136.4	794	142.8	832	37.6	5.18
MASH. WEST	158.8	174.3	170.3	34,482	178.4	36,119	38.9	5.91
Chegutu	153.3	168.7	164.9	5,352	172.8	5,606	37.6	5.80
Hurungwe	167.7	184.6	180.5	11,300	189.0	11,836	40.4	6.13
Kadoma	147.9	162.8	159.1	4,683	166.7	4,906	37.8	5.67
Kariba	144.5	159.0	155.5	930	162.9	974	37.5	5.59
Lomagundi	157.8	173.7	169.8	12,217	177.9	12,797	38.6	5.90
MAT. NORTH	166.3	183.1	179.0	17,056	187.5	17,866	39.4	6.10
Binga	158.5	174.4	170.5	2,004	178.6	2,099	44.0	5.92
Bubi	169.5	186.6	182.4	1,052	191.1	1,102	41.4	6.17
Lupane	176.0	193.7	189.3	3,953	198.3	4,141	41.8	6.33
Hwange	148.4	163.4	159.7	3,420	167.3	3,582	37.0	5.68
Nkayi	168.9	185.9	181.7	3,551	190.4	3,720	40.4	6.16
Nyamandhlovu	179.2	197.2	192.8	3,075	202.0	3,222	35.6	6.40

Table 6 contd.

Province/ District	General Fert. Rate Per 1000 Women 1	2	3	Births a	GFR 4	Births b	CBR Per 1000 Popn	TFR Per Woman
MAT. SOUTH	166.3	183.1	179.0	22,243	187.5	23,300	39.6	6.10
Beitbridge	151.5	166.8	163.1	2,860	170.8	2,996	38.9	5.76
B. Mangwe	154.7	170.3	166.5	6,144	174.4	6,436	38.8	5.83
Gwanda	157.6	173.5	169.6	3,717	177.7	3,893	36.3	5.90
Insiza	200.6	220.8	215.9	3,534	226.1	3,702	43.9	6.90
Matobo	182.2	200.6	196.1	3,157	205.4	3,308	42.0	6.47
Umzingwane	170.1	187.3	183.1	2,832	191.8	2,967	39.7	6.19
MIDLANDS	163.2	179.7	175.7	42,960	184.0	45,000	40.9	6.03
Charter	162.1	178.5	174.5	5,176	182.8	5,423	38.4	6.00
Chilimanzi	170.4	187.6	183.4	1,849	182.8	1,937	38.8	6.20
Gokwe	186.1	204.8	200.0	11,443	209.6	11,990	44.7	6.56
Gweru	147.1	161.9	158.3	4,946	165.8	5,182	38.6	5.65
Kwekwe	162.1	178.5	174.5	7,063	182.8	7,401	40.3	6.00
Mberengwa	146.6	161.4	157.8	7,774	165.5	8,145	39.8	5.64
Shurugwi	155.6	171.2	167.4	2,275	175.4	2,383	37.9	5.85
Zvishavane	173.0	190.4	183.1	2,423	195.0	2,539	44.3	6.26
MASVINGO	169.7	186.8	182.6	38,402	191.3	40,225	41.2	6.18
Bikita	182.8	201.3	196.8	7,522	206.3	7,886	43.9	6.49
Chiredzi	162.4	178.8	174.7	8,637	183.2	9,056	41.5	6.01
Ndanga	175.6	193.3	188.9	5,292	198.1	5,548	42.2	6.32
Gutu	164.3	180.8	176.8	6,423	185.3	6,776	39.9	6.06
Masvingo	166.0	182.7	178.6	4,242	187.3	4,447	40.2	6.10
Mwenezi	175.1	192.8	188.4	1,332	197.6	1,397	43.1	6.31
Chivi	167.5	184.4	180.3	4,917	189.0	5,156	41.2	6.13
HARARE	113.5	124.9	122.1	18,732	127.9	19,622	32.4	4.87
BULAWAYO	113.7	125.2	122.4	12,978	128.2	13,595	32.9	4.87
CHITUNGWIZA	160.4	176.6	182.6	5,016	180.8	5,255	43.5	5.96
ZIMBABWE	155.4	171.0	175.8	295,015	176.1	295,018	39.3	5.86

Notes: 1. 1st GFR estimate (unadjusted for child & maternal mortality)
2. 2nd GFR estimate (adjusted for child mortality)
3. 3rd GFR estimate (adjusted for both child & maternal mortality)
4. 4th GFR estimate (adjusted so that all district and provincial estimates sum to the national estimate)
a. 1st estimate of births based on 3rd GFR estimate for use in adjustment procedure for summing up tp national estimate
b. final estimate of births based on the final estimate of the GFR (4th GFR)
See Table 5 for explanation of abbreviated names

Table 7: Estimates of age specific fertility rates, adjusted ASFRs and total fertility rates by districts: Zimbabwe 1982.

Province/ District	Age Specific Fertility Rate 15-19	20-24	25-29	30-34	35-39	40-44	45-49	Sum	Total Fertility Rate
MANICALAND	.0915	.2700	.2768	.2467	.1907	.1017	.0604	1.2378	6.1897
Buhera	.1143	.2858	.2942	.2640	.2095	.1100	.0503	1.3279	6.6394
Chipinge	.0755	.2604	.2660	.2362	.1791	.0966	.0667	1.1825	5.9126
Chimanimani	.0833	.2644	.2704	.2405	.1839	.0987	.0641	1.2053	6.0265
Mutasa	.0881	.2677	.2741	.2442	.1879	.1005	.0619	1.2243	6.1216
Makoni	.1479	.3090	.3200	.2894	.2373	.1222	.0353	1.4609	7.3045
Mutare	.0764	.2596	.2652	.2353	.1782	.0962	.0672	1.1778	5.8904
Nyanga	.0586	.2473	.2515	.2219	.1635	.0898	.0751	1.1077	5.5385
MASH. CENT.	.0805	.2625	.2683	.2385	.1816	.0977	.0653	1.1942	5.9722
Bindura	.0704	.2555	.2606	.2308	.1733	.0940	.0698	1.1543	5.7717
Centenary	.0858	.2661	.2724	.2424	.1860	.0996	.0630	1.2152	6.0762
Darwin	.0821	.2636	.2696	.2397	.1830	.0983	.0646	1.2008	6.0041
Mazowe	.0830	.2641	.2702	.2403	.1836	.0986	.0642	1.2038	6.0205
Guruve	.0702	.2553	.2604	.2306	.1731	.0940	.0699	1.1535	5.7674
Rushinga	.0984	.2748	.2821	.2520	.1964	.1042	.0573	1.2652	6.3258
Shamva	.0907	.2695	.2761	.2461	.1900	.1014	.0608	1.2345	6.1727
MASH. EAST	.0745	.2583	.2637	.2339	.1766	.0955	.0680	1.1705	5.8527
Marondera	.0841	.2649	.2711	.2412	.1846	.0990	.0637	1.2085	6.0426
Mutoko	.0538	.2440	.2478	.2182	.1595	.0880	.0773	1.0886	5.4430
Mudzi	.0836	.2645	.2707	.2407	.1841	.0988	.0640	1.2064	6.0321
Murewa	.0850	.2655	.2718	.2418	.1853	.0933	.0633	1.2121	6.0605
Wedza	.0903	.2692	.2758	.2458	.1897	.1012	.0610	1.2330	6.1649
Goromonzi	.0691	.2546	.2596	.2298	.1722	.0936	.0704	1.1492	5.7460
Seke	.0403	.2347	.2375	.2081	.1484	.0833	.0831	1.0354	5.1768
MASH. WEST	.0775	.2604	.2661	.2362	.1792	.0966	.0666	1.1826	5.9132
Chegutu	.0716	.2563	.2615	.2317	.1743	.0945	.0693	1.1592	5.7959
Hurungwe	.0886	.2681	.2746	.2446	.1883	.1007	.0617	1.2265	6.1325
Kadoma	.0653	.2519	.2566	.2269	.1690	.0922	.0721	1.1340	5.6700
Kariba	.0612	.2491	.2535	.2239	.1657	.0907	.0739	1.1181	5.5905
Lomangundi	.0770	.2600	.2656	.2358	.1787	.0964	.0669	1.1803	5.9014
MAT. NORTH	.0870	.2669	.2734	.2433	.1870	.1001	.0624	1.2201	6.1004
Binga	.0777	.2605	.2662	.2364	.1793	.0967	.0665	1.1834	5.9171
Bubi	.0908	.2695	.2762	.2462	.1901	.1014	.0607	1.2350	6.1748
Lupane	.0984	.2748	.2820	.2520	.1964	.1042	.0573	1.2651	6.3256
Hwange	.0659	.2524	.2571	.2274	.1696	.0924	.0718	1.1367	5.6833
Nkayi	.0900	.2690	.2756	.2456	.1895	.1012	.0611	1.2321	6.1603
Nyamandhlovu	.1022	.2774	.2850	.2548	.1995	.1056	.0556	1.2802	6.4010

Province/ District	Age Specific Fertility Rate							Sum	Total Fertility Rate
	15-19	20-24	25-29	30-34	35-39	40-44	45-49		
MAT. SOUTH	.0870	.2669	.2733	.2434	.1870	.1001	.0624	1.2201	6.1004
Beitbridge	.0696	.2599	.2599	.2302	.1726	.1726	.0937	1.1510	5.7551
B. Mangwe	.0733	.2575	.2628	.2330	.1757	.0951	.0685	1.1658	5.8291
Gwanda	.0768	.2599	.2654	.2356	.1785	.0963	.0670	1.1795	5.8976
Insiza	.1275	.2949	.3044	.2740	.2204	.1148	.0443	1.3802	6.9012
Matobo	.1058	.2799	.2877	.2576	.2025	.1069	.0540	1.2944	6.4720
Umzingwane	.0915	.2700	.2768	.2468	.1907	.1017	.0604	1.2379	6.1895
MIDLANDS	.0834	.2644	.2705	.2406	.1840	.0987	.0640	1.2057	6.0284
Charter	.0821	.2635	.2695	.2396	.1829	.0983	.0646	1.2007	6.0033
Chilimanzi	.0919	.2703	.2771	.2471	.1910	.1018	.0602	1.2395	6.1976
Gokwe	.1102	.2829	.2911	.2609	.2061	.1085	.0521	1.3116	6.5582
Gweru	.0643	.2513	.2559	.2262	.1683	.0918	.0725	1.1304	5.6522
Kwekwe	.0821	.2635	.2695	.2396	.1829	.0983	.0646	1.2007	6.0023
Mberengwa	.0640	.2511	.2557	.2260	.1680	.0917	.0727	1.1287	5.6460
Shurugwi	.0744	.2582	.2636	.2338	.1765	.0954	.0681	1.1700	5.8500
Zvishavane	.0949	.2724	.2794	.2493	.1935	.1029	.0589	1.2313	6.2564
MASVINGO	.0912	.2698	.2765	.2465	.1904	.1016	.0606	1.2364	6.1819
Bikita	.1067	.2806	.2884	.2583	.2033	.1072	.0536	1.2981	6.4903
Chiredzi	.0825	.2638	.2966	.2400	.1833	.0984	.0644	1.2024	6.0120
Ndanga	.0981	.2746	.2818	.2518	.1962	.1041	.0575	1.2641	6.3204
Gutu	.0848	.2654	.2716	.2417	.1851	.0933	.0634	1.2113	6.0563
Masvingo	.0868	.2668	.2731	.2432	.1868	.1000	.0325	1.2192	6.0961
Mwenezi	.0976	.2742	.2814	.2513	.1957	.1039	.0577	1.2618	6.3092
Chivi	.0886	.2680	.2745	.2446	.1883	.1006	.0617	1.2264	6.1321
HARARE	.0246	.2238	.2255	.1962	.1354	.0903	.0774	0.9733	4.8618
BULAWAYO	.0249	.2241	.2257	.1964	.1357	.0902	.0775	0.9745	4.8663
CHITUNGWIZA	.0801	.2621	.2680	.2381	.1812	.0975	.0655	1.1925	5.9627
ZIMBABWE	.0748	.2585	.2639	.2341	.1769	.0956	.0679	1.1717	5.8587

Notes: Totals might not add up due to rounding
Mashonaland East excludes Harare and Chitungwiza
Matebeleland North excludes Bulawayo.

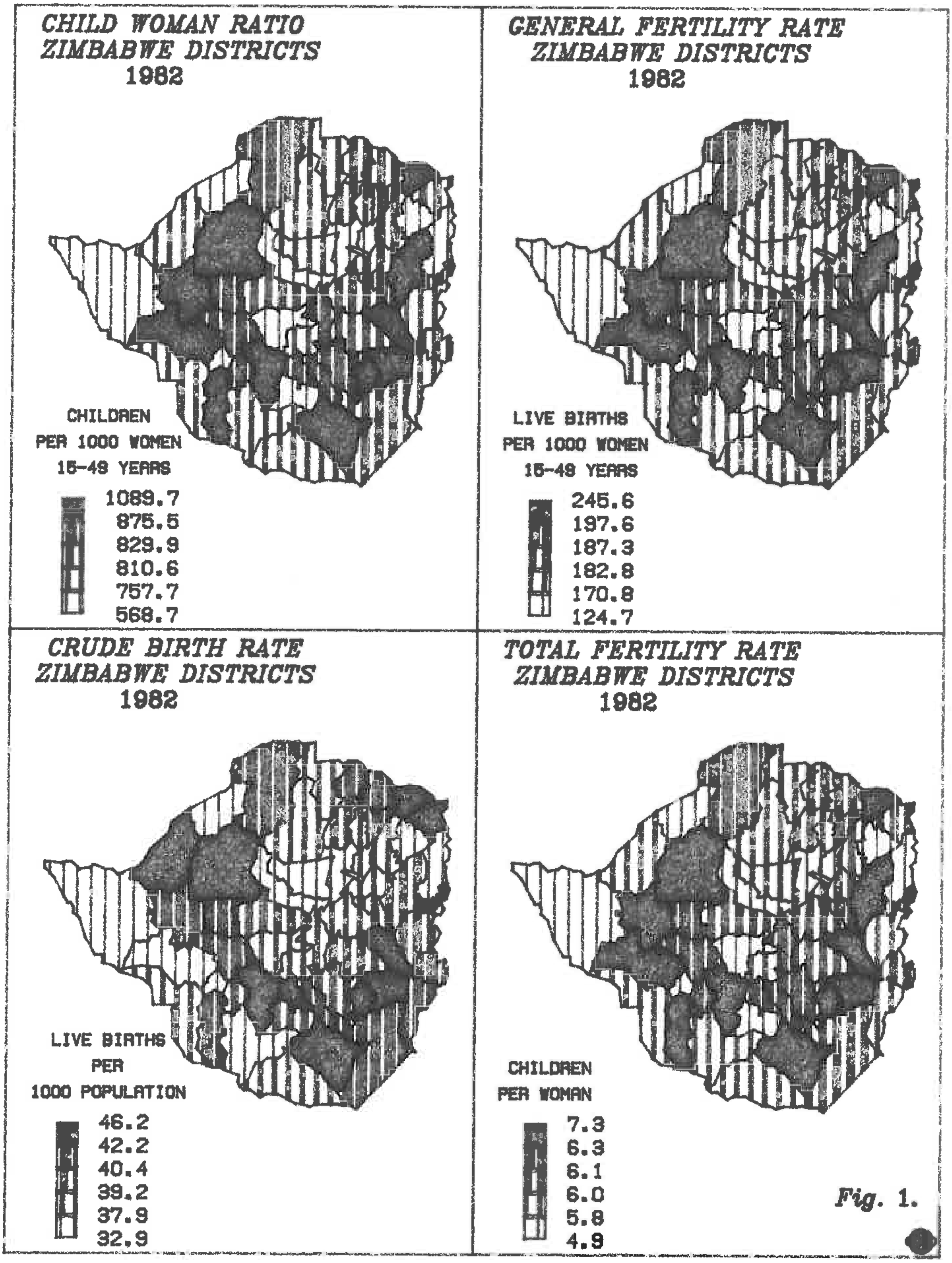
CHILD WOMAN RATIO
ZIMBABWE DISTRICTS
1982
CHILDREN
PER 1000 WOMEN
15-49 YEARS
1089.7
875.5
829.9
810.6
757.7
568.7
GENERAL FERTILITY RATE
ZIMBABWE DISTRICTS
1982
LIVE BIRTHS
PER 1000 WOMEN
15-49 YEARS
245.6
197.6
187.3
182.8
170.8
124.7
CRUDE BIRTH RATE
ZIMBABWE DISTRICTS
1982
LIVE BIRTHS
PER
1000 POPULATION
46.2
42.2
40.4
39.2
37.9
32.9
TOTAL FERTILITY RATE
ZIMBABWE DISTRICTS
1982
CHILDREN
PER WOMAN
7.3
6.3
6.1
6.0
5.8
4.9

Fig. 1.

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