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Birth Rate Trends in Madhya Pradesh

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Introduction

Madhya Pradesh is one of those States of India which are known for persistent high birth rate. Although, information available from the sample registration system suggests that the birth rate in the State is declining since last thirty years, yet the State has always ranked amongst the poorest five States of the country in terms of the level of birth rate. The latest estimates based on the Sample Registration System released by the Registrar General of India suggests a birth rate of 30.3 live births per 1000 population for the year 2002 (Government of India, 2003). This birth rate is the fourth highest among the major States of the country. In the rural areas of the State, the birth rate, in the year 2002 was estimated to be 32.2 live births per 1000 population which is the second highest in the country.

The persistent high birth rate in the State is largely responsible for the continued rapid population growth in the State. According to the 2001 population census, the average annual growth rate in the State still continues to be more than 2 per cent per year (Government of India, 2001; Chaurasia, 2001). During the second half of the last century, average annual population growth rate in the State has always been more than 2 per cent per year.

This paper analyses the trend in the birth rate in the State during the period 1985-99. One of the objectives of the analysis is to identify salient features of the birth rate transition path in the State and the factors that appear to be responsible for particular path followed by the birth rate in the State. A second objective of the analysis is to discuss the future prospects of birth rate decline in the State in the light of birth rate transition that has taken place in the past. The analysis carried out in this paper is an extension of an earlier analysis of the birth rate transition in the State for the period 1977 through 1988 (Ranjan, 1994).

Methodology

The key indicator used in this analysis is the rate of change in the birth rate. The birth rate in any population in a particular period is determined by the level of fertility and the age structure of the population. The crude birth rate (CBR) can be represented as

$$CBR = TMFR * (GMFR/TMFR) * (GFR/GMFR) * (CBR/GFR)$$

where TMFR is the total marital fertility rate, GMFR is the general marital fertility rate and GFR is the general fertility rate. It is straightforward to note that the ratio CBR/GFR is nothing but the proportion of females in the reproductive age group in the total population. Similarly, the ratio GFR/GMFR is the proportion of married females among all females in the reproductive age group in any population. On the other hand, the ratio GMFR/TMFR represents the age structure of married females in the reproductive age group. It is well known that the GMFR is affected by the age structure of married females, although the TMFR is not. In fact,

$$GMFR/TMFR = \sum_j f_j * p_j / \sum_j f_j \text{ where } j= 15...49,$$

and f_j is the age-specific marital fertility rate and p_j is the proportion of married females at age j among all married females in the age group 15-49 years. When p_j is same for all ages then it is clear that GMFR=TMFR.

The above multiplicative identity provides a very useful approach of understanding of the factors that determine the level and describe the trend in the crude

birth rate in any population. It shows how the reproductive experience of a married woman measured in terms of total marital fertility rate gets translated into the fertility experience of the population which is measured in terms of the crude birth rate through age structure effects on general marital fertility rate, proportion of married females in the reproductive age group and proportion of females in the reproductive age group in the total population.

Denoting by r the exponential rate of change, it is easy to show that

$$r_b = r_f + r_{ag} + r_m + r_p$$

where f stands for total marital fertility rate, ag for age structure effects on general marital fertility rate, m for the proportion of females married in the reproductive age group and p stands for proportion of females in the reproductive age group in the total population.

The above formulation suggests that the rate of change in the birth rate in any population over a given period of time is the algebraic sum of the rate of change in total marital fertility rate, rate of change in age structure effects on the general marital fertility rate, rate of change in the proportion of married females among all females in the reproductive age group and rate of change in the proportion of females in the reproductive age group to the total population. This means that transition in the birth rate over time can be analysed in terms of transition over time in total marital fertility rate, age structure effects on general marital fertility rate, proportion of married females in the reproductive age group and proportion of females in the reproductive age group to the total population.

One problem in using the above framework for analysing trends in the birth rate is the scale of the ratio GMFR/TMFR. As shown earlier, the ratio GMFR/TMFR represents the age structure of currently married females in the reproductive age group. However, the scale of GMFR is different from the scale of TMFR. GMFR is presented in terms of number of births per year per currently married female in the reproductive age group while the TMFR is presented as the number of children that a currently married woman is expected to have during her entire reproductive life on the basis of the prevailing age specific fertility rates. Obviously, the two indicators are not compatible in terms of scale. As such the scale of the ratio GMFR/TMFR is difficult to specify and hence its interpretation is difficult. This is however not the problem in case of the ratio GFR/GMFR and CBR/GFR in which case, the scale of indicators in the numerator and in the denominator are the same.

There are two options to address this problem. First is to adopt the conventional definitions of GMFR and TMFR and analyse and discuss the trend in this ratio on the basis of the numerical values only. This will create no problem as the main concern here is to analyse the change in the birth rate over time. Alternatively, TMFR may be converted into equivalent general marital fertility rate (to be denoted by EGMFR) by noting the fact that TMFR is nothing but the sum of the age-specific marital fertility rates of different five-year age groups of the reproductive period. In other words, dividing the TMFR by 35, the reproductive age span, gives a GMFR which is equivalent to the prevailing TMFR. This equivalent GMFR (EGMFR) is nothing but the GMFR independent of the age structure of married females in the reproductive age group. Replacing the ratio GMFR/TMFR by the ratio GMFR/EGMFR, the multiplicative identity becomes

$$CBR = EGMFR * (GMFR/EGMFR) * (GFR/GMFR) * (CBR/GFR).$$

With the above formulation, the rate of change in the birth rate over a period of time can be represented as

$$r_b = r_e + r_{ag} + r_m + r_p$$

where r_e is the rate of change in the equivalent general marital fertility rate derived on the basis of prevailing TMFR. It is also clear that the above formulation can also be used for analysing differentials in the birth rate across different population groups as well as across different geographical regions.

Data Source

The analysis is based on the estimates of different indicators of fertility for Madhya Pradesh prepared on the basis of the information available through the sample registration system for the period 1985 through 1999 (Government of India, 1999; 2002). The sample registration system is the only data source which provides estimates of key demographic indicators for the States and Union Territories of the country on an annual basis. The system was launched in 1968 by the Registrar General of India to improve the civil registration system in the country. However, estimates of total marital fertility rate and general marital fertility rate are available through the system for the major States of the country from the year 1985 onwards.

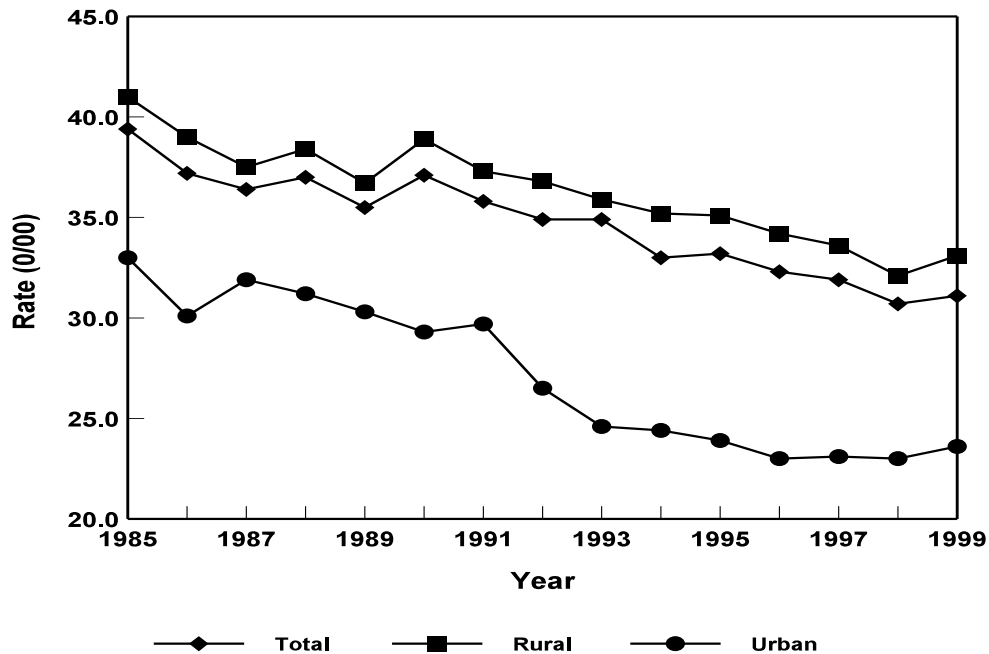
Estimates of different indicators of fertility available from the sample registration system are related to the undivided Madhya Pradesh as it existed before 1 November 2000. On 1 November 2000, the erstwhile State of Madhya Pradesh was divided into the States of Chhattisgarh and Madhya Pradesh by separating the Chhattisgarh region of the erstwhile Madhya Pradesh to constitute the new State of Chhattisgarh. Estimates of various fertility indicators other than the crude birth rate are however not available for the new States of Madhya Pradesh and Chhattisgarh through the sample registration system prior to the year 1998. As such, the analysis of the trend in the birth rate and other indicators of fertility is possible only for the undivided Madhya Pradesh as it existed before 1 November 2000. It is expected that the analysis carried out in this chapter also reflect the situation prevailing in the Madhya Pradesh that exists today to a significant extent.

Estimates available through the sample registration system have been found to be associated with year to year random fluctuations primarily because of a number of administrative and other operational reasons. In order to eliminate these annual random fluctuations, it is customary to use three-year moving averages of instead of annual estimates of various demographic indicators available through the sample registration system. In this chapter, both the annual estimates and three-year moving averages have been used for analysing the trend in the birth rate.

Findings

Table 3.1 presents the basic information about levels of fertility in undivided Madhya Pradesh used in this analysis. According to the sample registration system, the crude birth rate in Madhya Pradesh decreased from 39.4 in 1985 to 31.1 live births per 1000 population in 1999. This implies a decrease of 8.3 absolute points for every 1000 population between 1985 and 1999. In the rural areas of the State, the crude birth rate decreased by 7.9 absolute points for every 1000 population during the same period - from 41.0 live births per 1000 population in 1985 to 33.1 live births per 1000 population

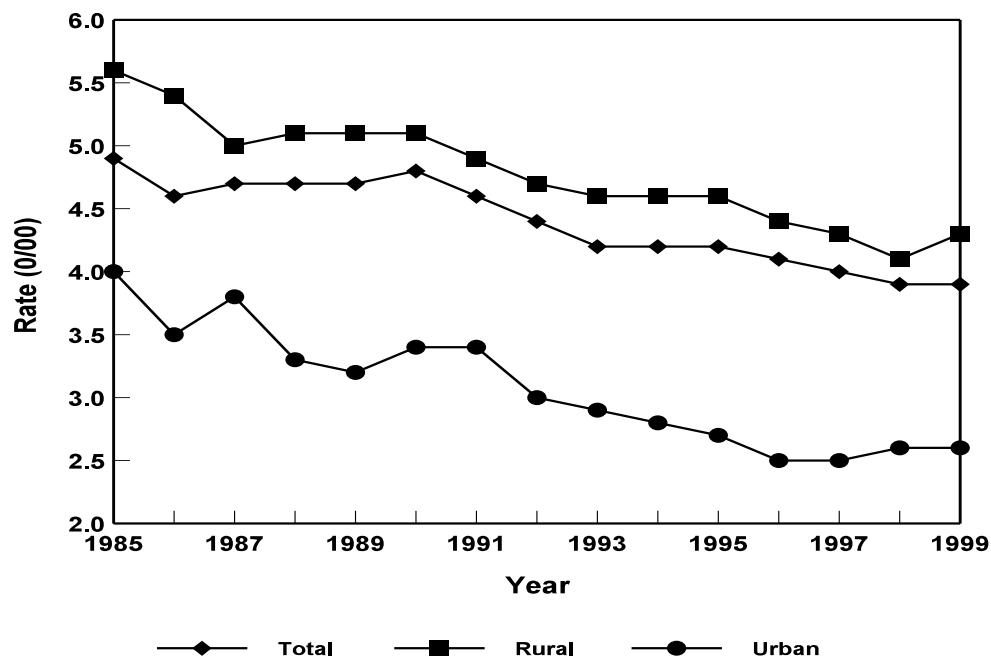
Figure 1
Trends in birth rate
1985-99



in 1999. In the urban areas of the State, on the other hand, the decrease in the crude birth rate was of the order of 9.4 absolute points for every 1000 population. The crude birth rate in the urban areas of the State decreased from 33.0 live births per 1000 population in 1985 to 23.6 live births per 1000 population in 1999 suggesting that the decrease in the crude birth rate had been relatively faster in the urban areas as compared to the rural areas of the undivided Madhya Pradesh. In terms of logarithmic rate of change, this means that average annual rate of change in the crude birth rate between 1985-87 and 1997-99 was about -1.6 per cent per year for Madhya Pradesh as a whole while it was -1.4 per cent per year in the rural areas of the State and -2.6 per cent per year in urban areas.

It may be seen from figure 3.1 that although the trend in the crude birth rate for the undivided Madhya Pradesh closely resembles the trend in its rural areas, the trend in the rural and urban areas of the State had been essentially different during the period under reference. The most notable feature of this differing trend is that during the three-year period 1991-93, there had been a very rapid decline in the urban crude birth rate from 29.7 live births per 1000 population in 1991 to 24.6 live births per 1000 population in 1993 which means that within a short period of just 3 years, the crude birth rate in the urban areas of the State decreased by more than 5 absolute points for every 1000 population. However, no such decrease was found in the rural crude birth rate according to the information available through the sample registration system. Similarly, during the period 1996-98, there has been some rapid decrease in the crude birth rate in the rural areas of the State but in the urban areas, the crude birth rate virtually stagnated during this period.

Figure 2
Trends in total fertility rate
1985-99



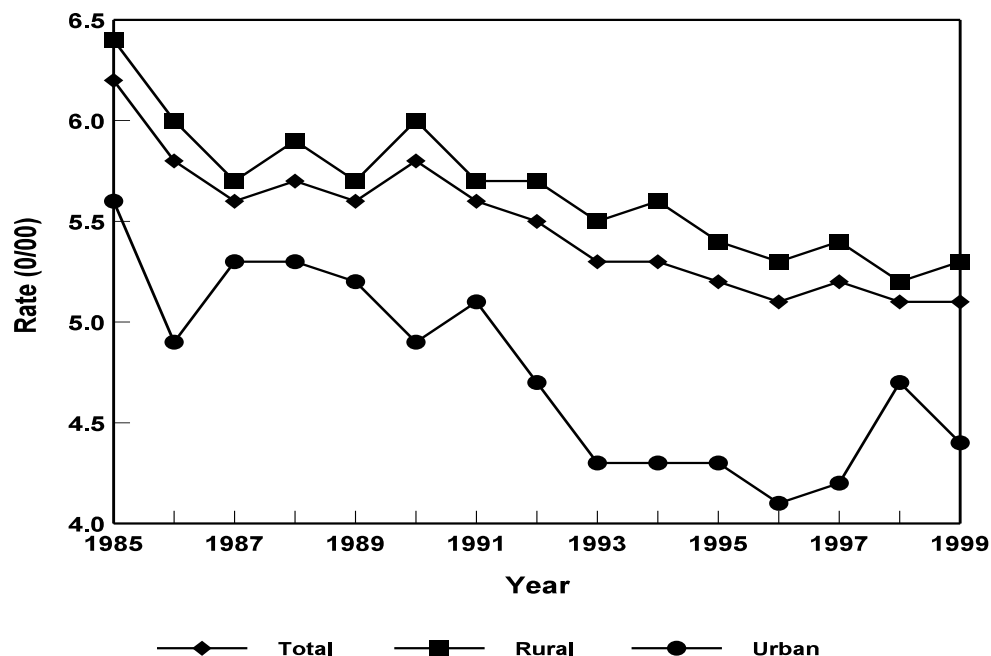
In comparison to the decrease in the crude birth rate, the decrease in total fertility rate in the undivided Madhya Pradesh was marginally slower during the period under reference. The total fertility rate in the undivided Madhya Pradesh decreased from 4.6 children per woman to 3.9 children per woman between 1985 and 1999 - a decrease of 0.7 absolute points during the period under reference. This means that the average annual rate of change in the total fertility rate in the undivided Madhya Pradesh was -1.5 per cent per year during the period under reference.

Among the rural and urban areas of the State, decrease in the total fertility rate, had been more rapid in the urban areas as compared to the rural areas. In the urban areas of the State, the total fertility rate decreased at an average annual rate of -3.2 per cent per year between 1985 and 1999 as compared to a decrease of -1.9 per cent per year in the total fertility rate in the rural areas. In both rural and urban areas, however, the decrease in total fertility rate has been marginally faster than the crude birth rate.

The decrease in total marital fertility rate was even slower than that in total fertility rate in the undivided Madhya Pradesh during the period under reference. For the whole Madhya Pradesh, total marital fertility rate decreased from about 6.2 children per currently married woman in 1985 to about 5.1 children per currently married woman in 1999 - a decrease of 1.1 absolute points. In other words, the total marital fertility rate in the undivided Madhya Pradesh decreased at an average annual rate of -1.140 per cent per year during the period under reference.

The decrease in the total marital fertility rate in the urban areas of the undivided Madhya Pradesh has been found to be marginally faster as compared to the total marital fertility rate in the rural areas. In the urban areas, total marital fertility rate decreased by

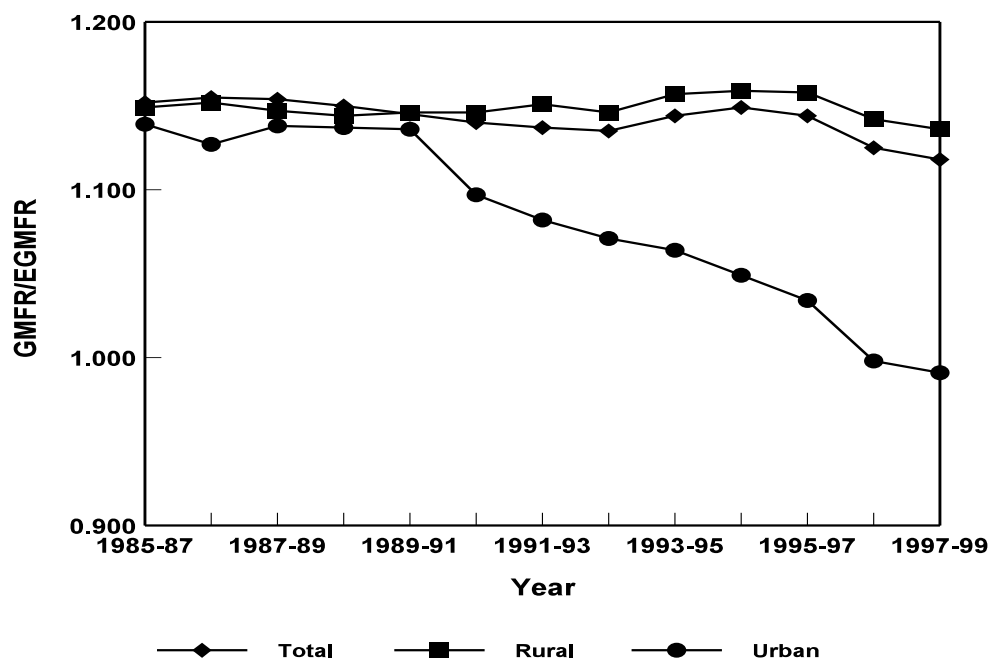
Figure 3
Trends in total marital fertility rate
1985-99



1.2 absolute points between 1985 and 1999 - from 5.6 children per currently married woman in 1985 to 4.4 children in 1999. On the other hand, in the rural areas of the undivided Madhya Pradesh, the total marital fertility rate decreased by 1.1 absolute points during this period - from 6.4 in 1985 to 5.3 children per currently married woman in 1999. In other words, the total marital fertility rate in the urban areas of undivided Madhya Pradesh decreased at an average annual rate of -1.172 per cent per year whereas in the rural areas of the undivided Madhya Pradesh, the total marital fertility rate decreased at an average annual rate of 1.173 per cent per year.

Trends in the ratios GMFR/TMFR or equivalently GMFR/EGMFR, GFR/GMFR and CBR/GFR are given in table 3.2 and presented in figures 4 through 6. As discussed earlier, the ratio GMFR/TMFR or equivalently the ratio GMFR/EGMFR reflects the age structure of currently married women in the reproductive age group. It may be seen from figure 3.4 that this ratio had shown a marginally decreasing trend during the period under reference in the total as well as in the rural population of undivided Madhya Pradesh suggesting that there had been some shift in the age structure of currently married women in the reproductive age group from high fertility ages to low fertility ages in the State. In contrast to the rural population, this shift appears to be very rapid in the urban population of the undivided Madhya Pradesh which is clear from a very rapid decrease in the ratio GMFR/GMFR especially after the period 1989-91. Between 1989-91 and 1997-99, the ratio GMFR/EGMFR decreased from 1.136 to 0.991 in the urban areas of the undivided Madhya Pradesh. In fact, since 1996-98, the observed general marital fertility rate in the urban areas of the undivided Madhya Pradesh has become less than the general marital fertility rate implied by the

Figure 4
Trends in the ratio GMFR/EGMFR
1985-99

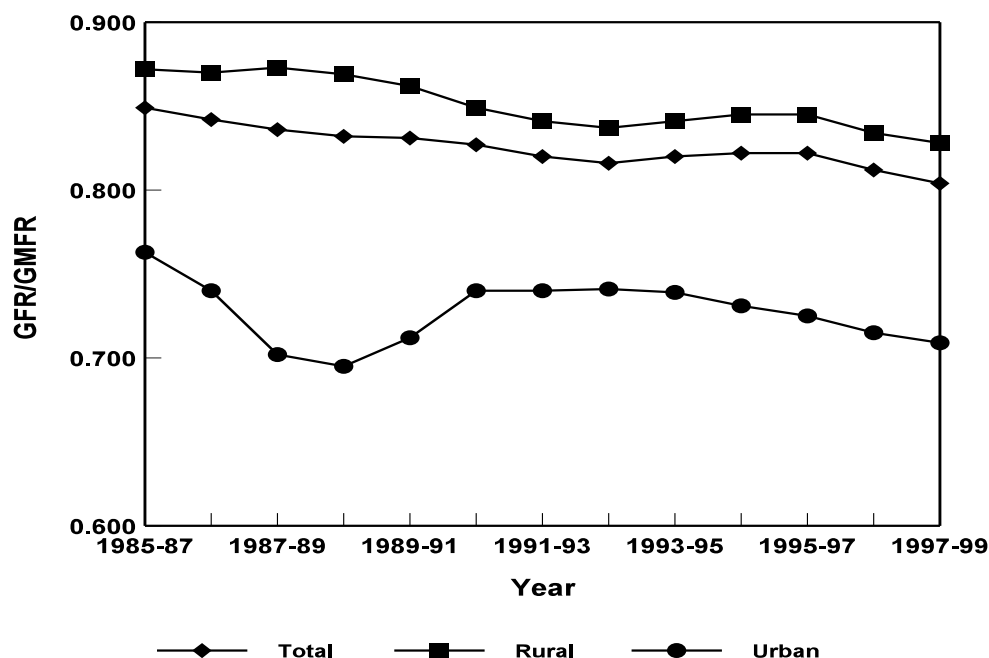


prevailing level of total marital fertility rate. This suggests that age structure of currently married women in the reproductive age group in the urban areas of the undivided Madhya Pradesh is working towards lowering down the fertility of the population for a given level of the fertility of the individual woman because an increasing proportion of currently married women in the urban areas of the State appear to getting more and more concentrated in the low fertility age groups.

The situation, however, is not so rosy in the rural areas of the State as this ratio appears to have actually increased between 1985-87 and 1995-97. There is however some indication that this ratio has started decreasing after 1995-97. This means that the effect of a large cohort of currently married women entering in the reproductive period as the result of high to very high fertility of individual women in the past on the fertility of the population has gradually started waning and the age structure of the currently married females in the reproductive age group is gradually turning more conducive to low birth rate regime. This trend in the composition of the age structure of currently married females is a good sign as far as fertility transition in the State is concerned.

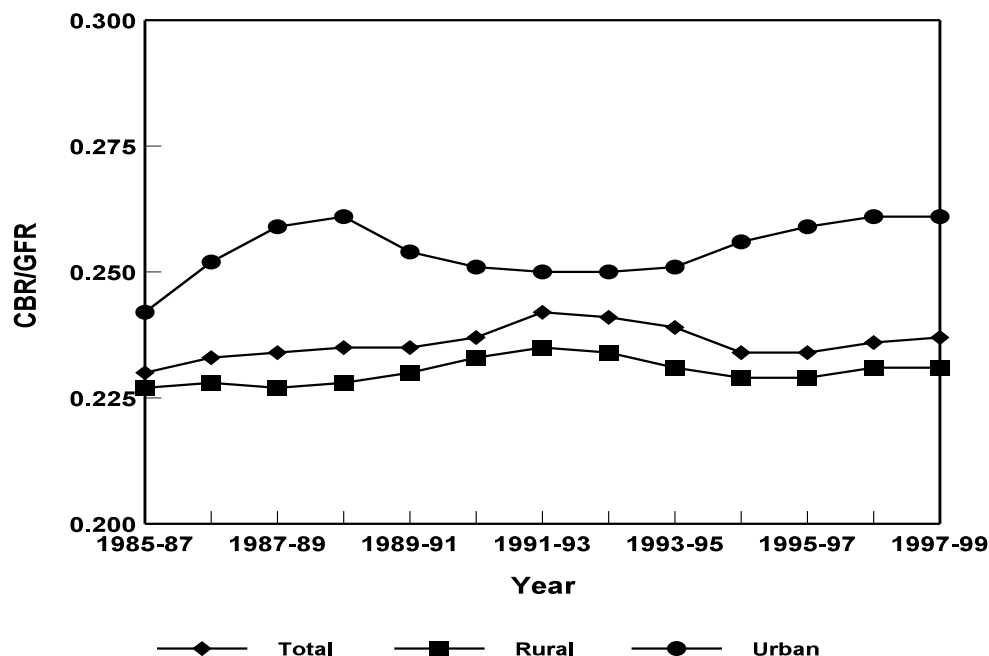
Like the ratio GMFR/EGMFR, the ratio GFR/GMFR has also shown a decreasing trend in the undivided Madhya Pradesh as may be seen from figure 3.5. For the period 1985-87, this ratio was 0.849 which decreased to 0.804 in the period 1997-99. Since, the ratio GFR/GMFR represents the proportion of currently married women to all women in the reproductive age group, a decrease in the ratio GFR/GMFR implies that the proportion of currently married women among the total women in the reproductive age group appears to have decreased from almost 85 per cent around the period 1985-87 to about 80 per cent around the period 1997-99. In the rural areas of the

Figure 5
Trends in the ratio GFR/GMFR
1985-99



undivided Madhya Pradesh, the trend in the ratio GFR/GMFR suggests that the proportion of currently married women to all women in the reproductive age group decreased from about 87 per cent during the period 1985-87 to about 83 per cent during the period 1997-99 whereas in the urban areas, this proportion decreased from about 76.3 per cent during 1985-87 to around 71 per cent during the period 1997-99. This decrease in the proportion of currently married women among the total females in the reproductive age group is a reflection of the fact that the age at marriage of females in the undivided Madhya Pradesh had been increasing during the period under reference, albeit marginally. Once again this is a good sign for fertility transition in the population of the State is concerned. However, the transition in the proportion of currently married females to total females in the reproductive age group in the undivided Madhya Pradesh had been very slow, especially in the rural areas, where, the proportion of currently married women to total women in the reproductive age group decreased by only about 4.4 absolute percentage points during the period under reference. Even in the urban areas of the State, the situation does not appear to be very encouraging as the proportion of currently married women to total women in the reproductive group appears to have decreased by less than 5.5 absolute percentage points between 1985-87 and 1997-99. The trend in the ratio GFR/GMFR suggests that although there has been a lot of rhetoric in the state about increasing the age at marriage of females in both contexts - reducing the levels of fertility and improving the survival and health status of the new born and the mother - under the family welfare programme, yet this issue had received only a residual attention under the population stabilization efforts in the undivided Madhya Pradesh.

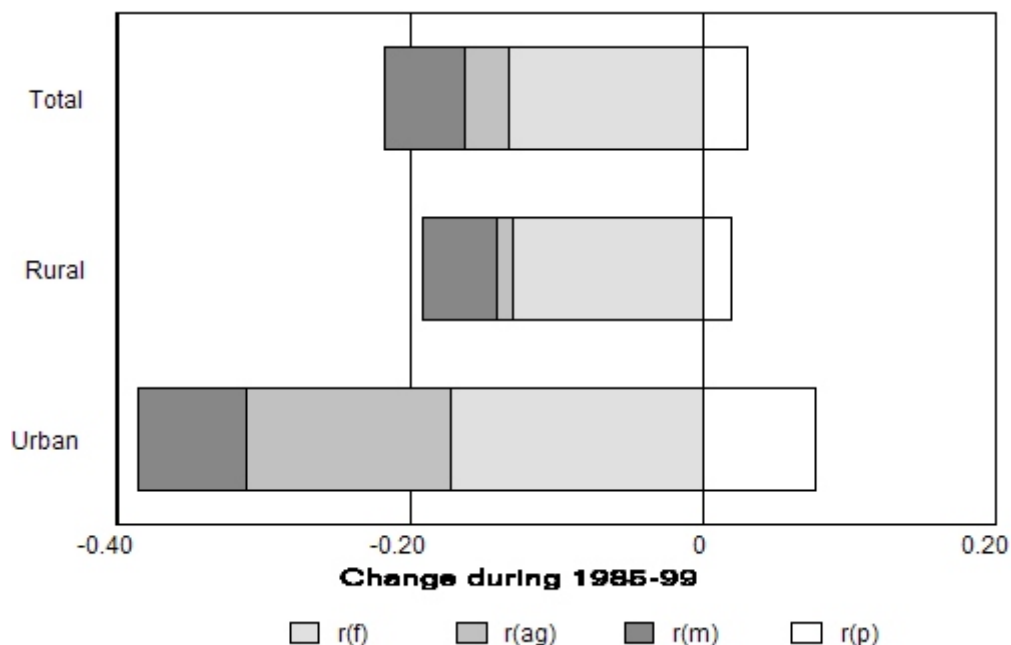
Figure 6
Trends in the ratio CBR/GFR
1985-99



The ratio CBR/GFR, on the other hand, had shown a very marginal increasing trend in the undivided Madhya Pradesh during the period under reference. The ratio CBR/GFR represents the proportion of females in the reproductive age group to the total population. The trend in the ratio CBR/GFR suggests that the proportion of females in the reproductive age group to the total population in the undivided Madhya Pradesh increased from about 23 per cent during the period 1985-87 to about 23.7 per cent during the period 1997-99. In the rural areas, this proportion appears to have increased from 22.7 per cent to 23.1 per cent while in the urban areas, the increase was from 24.2 per cent to 26.1 per cent during the period under reference. This increase in the proportion of females in the reproductive age group to total population appears to have off-set, to some extent, the influence of the decrease in the proportion of currently married women to total women in the reproductive age group and the shift in the age structure of currently married women from high fertility age intervals to the low fertility age intervals in the undivided Madhya Pradesh.

Table 3.3 gives the average annual rate of change in the crude birth rate and its different components for different years of the period 1985-99. The change in the crude birth rate and its components during the period under reference is presented in figure 3.7 for total, rural and urban populations respectively. The change given in the table and presented in the figure are estimated on the basis of three year moving averages rather than reported annual rates to remove the errors of random annual fluctuations in the annual estimates of different indicators of fertility available through the sample registration system.

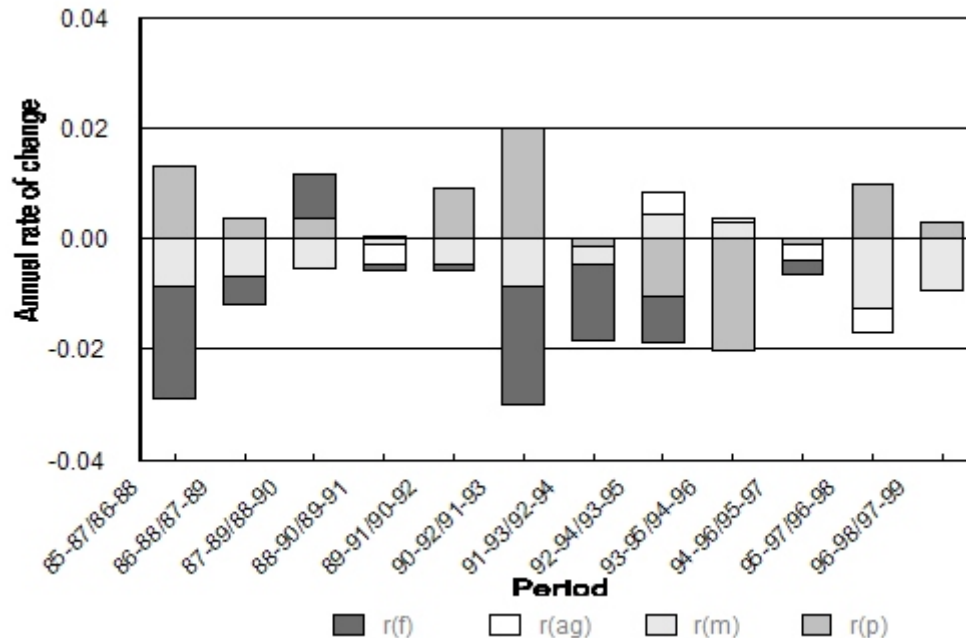
Figure 7
Decomposition of the change in the birth rate in Madhya Pradesh
1985-99



It will be illustrative to decompose the total change in the crude birth rate in the undivided Madhya Pradesh in between 1985 and 1999 into the change in its four components - total marital fertility rate, age structure of currently married females in the reproductive age group, proportion of currently married females among all females of reproductive age group and proportion of females in the reproductive age group in the total population. It may be seen from table 3.3 that for undivided Madhya Pradesh as a whole, the crude birth rate decreased by approximately 18.7 per cent between 1985 and 1999. This decrease in the crude birth rate could be possible because of a decrease of approximately 13.4 per cent in the total marital fertility rate, a decrease of approximately 5.4 per cent in the proportion of currently married women among all women in the reproductive age group and some shift in the age structure of currently married females in the reproductive age group towards low fertility age intervals. In fact, the crude birth rate in the undivided Madhya Pradesh would have decreased slightly faster if the proportion of females in the reproductive age group to the total population would not have increased by about 3 per cent during the period under reference. This increase in the proportion of females in the reproductive age group to the total population had slightly slowed down the decrease in the birth rate.

The pattern of contribution to the decrease in the crude birth rate in the rural and urban areas of undivided Madhya Pradesh is same as that for the total population. The only difference is that the total change had been comparatively slower in the rural areas of the State as compared to its urban areas. In the urban areas, there had been a very sharp decline in the index r_{ag} which indicates some major shift in the age structure of currently married women in the reproductive age group from high fertility age intervals

Figure 8
Trends in the different components
of the rate of change in the birth rate



to low fertility age intervals. By contrast, there is virtually little shift in the age structure currently married women in the reproductive age group in the rural areas of the State.

An important observation of table 3.3 is that the average annual change in the crude birth rate as well as in its four components is not consistent over time. Rather, the average annual change in birth rate and its components fluctuate frequently. Figure 3.8 presents these fluctuations succinctly. For example, the crude birth rate decreased by 2.1 per cent during the period 1985-87/1986-88. Subsequently, the decline in the crude birth rate slowed down and during the period 1987-89/1988-90, it even turned positive. Since then, the rate of decline in the crude birth rate increased every year reaching the highest rate of decline in the year 1991-93/1992-94. Since 1991-93/1992-94, the rate of change in the birth rate has followed a, more or less, unchanging but zig-zag trend. It may be seen from figure 3.8 that the trend in the average annual rate of change in the crude birth rate in the undivided Madhya Pradesh is different in the period prior to 1991-93 as compared to the trend after the period 1992-94. A similar situation exists in case of the four components of the crude birth rate. In fact, the coefficient of variation given in table 3.3 suggests that variations over time is much higher in the four components of the crude birth rate as compared to the variations in the birth rate itself.

On the other hand, average annual change in the ratio CBR/GFR which is the measure of the proportion of females in the reproductive age group to the total population, shows a clear cyclic trend. This ratio increased during the period 1985-87 through 1988-90; decreased during the period 1988-90 through 1992-94 and increased again during 1992-94 through 1997-99. Reasons for the observed cyclic variations in the

proportion of females in the reproductive age group to the total population are not known. They are probably and so obviously result of fluctuations in the levels of fertility and mortality in the population. The sample registration data suggests that the decline in fertility and mortality in the population is not uniform and there are frequent fluctuations which may or may not be random in nature.

Conclusions

The analysis presented in this chapter highlights the role of both programmatic factors and structural factors in deciding birth rate trends in the undivided Madhya Pradesh during the period 1985 through 1999. The analysis explains, in detail, the process of transition through which individual fertility (measured in terms of total marital fertility rate or the average number of children per woman in reproductive age group) is linked to the fertility of the population (measured in terms of crude birth rate or the total number of live births in a population in a given year) and how this process of transition has changed over time.

Programmatic factors that can induce a decline in the crude birth rate are those that help in reducing the total marital fertility rate and the proportion of current married women among all women of reproductive group. The two most important of these factors are the practice of contraception and the age of the female at the time of marriage. The present analysis reveals that while the total marital fertility rate has decreased substantially primarily due to the increase in the practice of contraception in the State, there has been only a marginal decrease in the proportion of currently married females in the reproductive age group. This indicates that increasing the female age at marriage had received only a neglected attention in population stabilization efforts in the State despite the fact that the age of the female at the time of entry into the marital union is one of the most important proximate determinants of fertility.

On the other hand, structural factors like the age structure of currently married women in the reproductive age group and proportion of reproductive age females in the total population cannot be modified through programme interventions like family planning. They are primarily the result of changes in the age structure of the population. These changes in the age structure and composition of the population are the result of medium term trend in the levels of fertility and mortality. The structural changes affecting the change in the birth rate are not influenced by the short term changes in fertility and mortality as the result of such interventions as family planning and preventing some early age marriages. In order to ensure that programmatic interventions like family planning and increase in the age at marriage, etc. have an impact on the structural factors affecting the birth rate, it is essential these interventions are sustained for a sufficiently long time-period. This is possible only when population stabilization related programmes and activities are rooted in the social, cultural and family environment of the people at large. This is possible only when programmes and activities directed towards reducing fertility are given a development orientation rather than a demographic urgency as is the situation at present.

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Table 3.1: Selected fertility indicators for Madhya Pradesh for the period 1985 through 1999.						
Year	Crude Birth Rate	Total Fertility Rate	General Fertility Rate	Total Marital Fertility Rate	General Marital Fertility Rate	Equivalent General Marital Fertility Rate
	<i>CBR</i>	<i>TFR</i>	<i>GFR</i>	<i>TMFR</i>	<i>GMFR</i>	<i>EGMFR</i>
<i>Total Population</i>						
1985	39.4	4.6	173.1	6.2	203.4	177.1
1986	37.2	4.9	161.9	5.8	190.9	165.7
1987	36.4	4.7	156.9	5.6	185.0	160.0
1988	37.0	4.7	156.3	5.7	188.5	162.9
1989	35.5	4.7	152.8	5.6	183.8	160.0
1990	37.1	4.8	158.2	5.8	189.5	165.7
1991	35.8	4.6	151.0	5.6	182.6	160.0
1992	34.9	4.4	146.1	5.5	178.2	157.1
1993	34.9	4.2	140.1	5.3	172.1	151.4
1994	33.0	4.2	140.0	5.3	171.7	151.4
1995	33.2	4.2	143.5	5.2	172.8	148.6
1996	32.3	4.1	137.6	5.1	167.5	145.7
1997	31.9	4.0	135.7	5.2	166.5	148.6
1998	30.7	3.9	128.8	5.1	161.1	145.7
1999	31.1	3.9	131.3	5.1	164.4	145.7
<i>Rural Population</i>						
1985	41.0	5.6	182.6	6.4	208.4	182.9
1986	39.0	5.4	172.0	6.0	197.9	171.4
1987	37.5	5.0	163.6	5.7	188.0	162.9
1988	38.4	5.1	168.3	5.9	193.5	168.6
1989	36.7	5.1	163.3	5.7	185.6	162.9
1990	38.9	5.1	168.5	6.0	196.3	171.4
1991	37.3	4.9	159.3	5.7	187.6	162.9
1992	36.8	4.7	156.2	5.7	185.9	162.9
1993	35.9	4.6	152.2	5.5	182.3	157.1
1994	35.2	4.6	152.1	5.6	181.8	160.0
1995	35.1	4.6	154.7	5.4	181.5	154.3
1996	34.2	4.4	148.9	5.3	176.3	151.4
1997	33.6	4.3	146.4	5.4	175.0	154.3
1998	32.1	4.1	137.5	5.2	167.6	148.6
1999	33.1	4.3	143.5	5.3	173.5	151.4

Table 3.1: Selected fertility indicators for Madhya Pradesh for the period 1985 through 1999.						
Year	Crude Birth Rate	Total Fertility Rate	General Fertility Rate	Total Marital Fertility Rate	General Marital Fertility Rate	Equivalent General Marital Fertility Rate
	<i>CBR</i>	<i>TFR</i>	<i>GFR</i>	<i>TMFR</i>	<i>GMFR</i>	<i>EGMFR</i>
<i>Urban Population</i>						
1985	33.0	4.0	137.4	5.6	181.6	160.0
1986	30.1	3.5	123.8	4.9	161.0	140.0
1987	31.9	3.8	131.0	5.3	171.7	151.4
1988	31.2	3.3	114.5	5.3	166.6	151.4
1989	30.3	3.2	115.3	5.2	175.3	148.6
1990	29.3	3.4	117.9	4.9	158.5	140.0
1991	29.7	3.4	118.0	5.1	159.6	145.7
1992	26.5	3.0	105.3	4.7	142.8	134.3
1993	24.6	2.9	99.3	4.3	133.3	122.9
1994	24.4	2.8	96.8	4.3	130.9	122.9
1995	23.9	2.7	93.8	4.3	128.1	122.9
1996	23.0	2.5	87.9	4.1	121.8	117.1
1997	23.1	2.5	88.3	4.2	122.5	120.0
1998	23.0	2.6	88.7	4.7	126.2	134.3
1999	23.6	2.6	89.7	4.4	127.7	125.7

Table 3.2: Multiplicative components of crude birth rate Madhya Pradesh, 1985-1999.				
Period	GMFR/TMFR	GMFR/EGMFR	GFR/GMFR	CBR/GFR
<i>Total Population</i>				
1985-87	32.91	1.152	0.849	0.230
1986-88	33.01	1.155	0.842	0.233
1987-89	32.98	1.154	0.836	0.234
1988-90	32.85	1.150	0.832	0.235
1989-91	32.70	1.145	0.831	0.235
1990-92	32.56	1.140	0.827	0.237
1991-93	32.49	1.137	0.820	0.242
1992-94	32.42	1.135	0.816	0.241
1993-95	32.70	1.144	0.820	0.239
1994-96	32.82	1.149	0.822	0.234
1995-97	32.70	1.144	0.822	0.234
1996-98	32.15	1.125	0.812	0.236
1997-99	31.95	1.118	0.804	0.237
<i>Rural Population</i>				
1985-87	32.83	1.149	0.872	0.227
1986-88	32.92	1.152	0.870	0.228
1987-89	32.78	1.147	0.873	0.227
1988-90	32.69	1.144	0.869	0.228
1989-91	32.73	1.146	0.862	0.230
1990-92	32.75	1.146	0.849	0.233
1991-93	32.89	1.151	0.841	0.235
1992-94	32.74	1.146	0.837	0.234
1993-95	33.07	1.157	0.841	0.231
1994-96	33.10	1.159	0.845	0.229
1995-97	33.09	1.158	0.845	0.229
1996-98	32.64	1.142	0.834	0.231
1997-99	32.46	1.136	0.828	0.231

Table 3.2: Multiplicative components of crude birth rate Madhya Pradesh, 1985-1999.				
Period	GMFR/TMFR	GMFR/EGMFR	GFR/GMFR	CBR/GFR
<i>Urban Population</i>				
1985-87	32.55	1.139	0.763	0.242
1986-88	32.21	1.127	0.740	0.252
1987-89	32.51	1.138	0.702	0.259
1988-90	32.49	1.137	0.695	0.261
1989-91	32.46	1.136	0.712	0.254
1990-92	31.35	1.097	0.740	0.251
1991-93	30.90	1.082	0.740	0.250
1992-94	30.60	1.071	0.741	0.250
1993-95	30.41	1.064	0.739	0.251
1994-96	29.98	1.049	0.731	0.256
1995-97	29.56	1.034	0.725	0.259
1996-98	28.50	0.998	0.715	0.261
1997-99	28.30	0.991	0.709	0.261

Table 3.3: Average annual rate of change in crude birth rate and its multiplicative constants in Madhya Pradesh.					
Period	r_b	r_f	r_{ag}	r_m	r_p
<i>Total Population</i>					
1985-87/1986-88	-0.021	-0.029	0.003	-0.009	0.013
1986-88/1987-89	-0.015	-0.012	-0.001	-0.007	0.004
1987-89/1988-90	0.006	0.012	-0.004	-0.005	0.004
1988-90/1989-91	-0.011	-0.006	-0.005	-0.001	0.000
1989-91/1990-92	-0.006	-0.006	-0.004	-0.004	0.009
1990-92/1991-93	-0.021	-0.030	-0.002	-0.008	0.020
1991-93/1992-94	-0.027	-0.018	-0.002	-0.005	-0.001
1992-94/1993-95	-0.017	-0.019	0.008	0.004	-0.011
1993-95/1994-96	-0.026	-0.013	0.004	0.003	-0.020
1994-96/1995-97	-0.011	-0.006	-0.004	-0.000	-0.001
1995-97/1996-98	-0.026	-0.006	-0.017	-0.013	0.010
1996-98/1997-99	-0.013	0.000	-0.006	-0.010	0.003
1985-87/1997-99	-0.187	-0.134	-0.030	-0.054	0.030
Coefficient of variation	-0.596	-1.106	-2.385	-1.102	4.050
<i>Rural Population</i>					
1985-87/1986-88	-0.022	-0.028	0.003	-0.003	0.006
1986-88/1987-89	-0.020	-0.017	-0.004	0.004	-0.003
1987-89/1988-90	0.012	0.017	-0.003	-0.005	0.003
1988-90/1989-91	-0.010	-0.011	0.001	-0.008	0.008
1989-91/1990-92	0.001	0.000	0.001	-0.015	0.015
1990-92/1991-93	-0.027	-0.029	0.004	-0.009	0.007
1991-93/1992-94	-0.019	-0.006	-0.005	-0.005	-0.004
1992-94/1993-95	-0.016	-0.018	0.010	0.005	-0.013
1993-95/1994-96	-0.016	-0.012	0.001	0.004	-0.009
1994-96/1995-97	-0.015	-0.012	-0.000	0.000	-0.003
1995-97/1996-98	-0.030	-0.013	-0.014	-0.013	0.009
1996-98/1997-99	-0.011	0.000	-0.005	-0.007	0.001
1985-87/1997-99	-0.173	-0.130	-0.011	-0.052	0.019
Coefficient of variation	-0.773	-1.126	-5.925	-1.459	4.850

Table 3.3: Average annual rate of change in crude birth rate and its multiplicative constants in Madhya Pradesh.					
Period	r_b	r_f	r_{ag}	r_m	r_p
<i>Urban Population</i>					
1985-87/1986-88	-0.019	-0.019	-0.010	-0.031	0.041
1986-88/1987-89	0.002	0.019	0.009	-0.052	0.025
1987-89/1988-90	-0.028	-0.026	-0.000	-0.011	0.009
1988-90/1989-91	-0.017	-0.013	-0.001	0.024	-0.027
1989-91/1990-92	-0.043	-0.033	-0.035	0.039	-0.015
1990-92/1991-93	-0.057	-0.042	-0.015	0.000	-0.000
1991-93/1992-94	-0.068	-0.058	-0.010	0.000	0.000
1992-94/1993-95	-0.035	-0.031	-0.006	-0.002	0.004
1993-95/1994-96	-0.022	-0.016	-0.014	-0.010	0.018
1994-96/1995-97	-0.018	-0.008	-0.014	-0.009	0.013
1995-97/1996-98	-0.013	0.031	-0.036	-0.014	0.006
1996-98/1997-99	0.009	0.023	-0.007	-0.009	0.002
1985-87/1997-99	-0.310	-0.172	-0.140	-0.073	0.076
Coefficient of variation	-0.825	-1.809	-1.076	-3.603	2.654