Human Development and Population in Madhya Pradesh, India

Aalok Ranjan Chaurasia
Professor

'Shyam' Institute
82, Aradhana Nagar
Bhopal, MP-462003
India
www.shyaminstitute.in

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'Shyam' Institute
Mudian Ka Kuan,
Datia, MP-475661, India
91-752-2234522

www.shyaminstitute.in

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In the Memory of

Amma and Daddy

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Contents

PROLOGUE

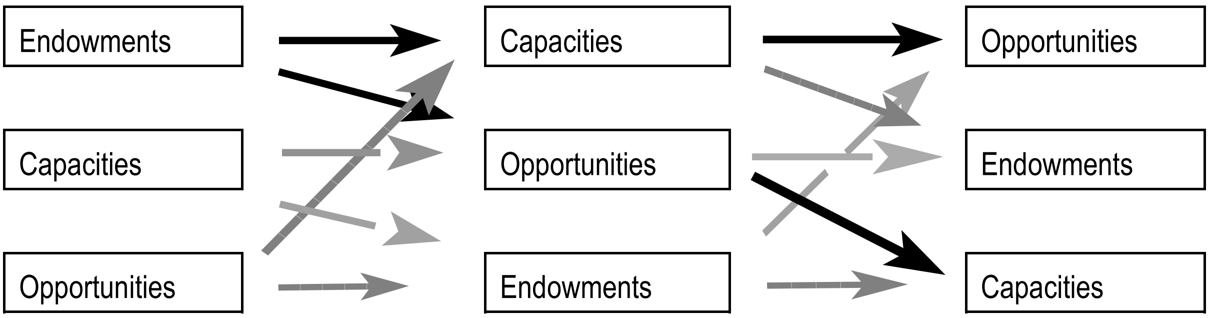
Human development is all about expanding the real freedoms that people enjoy (Sen, 1999). It contrasts with the traditional narrow view of development such as identifying development with the growth of per capita income. The focus of human development is on the removal of major forces of unfreedom, the most important of which are poverty, systematic social deprivation and neglect of public services. Freedoms that people enjoy are not only the primary ends of development, they are also among its principal means. Human, development, therefore, is the central objective of all human activity.

Theoretical underpinnings of human development are located in the capability approach first propounded by Sen (1985). The capability approach helps in understanding development outcomes as they are concerned with what people are capable of doing and being (functionings). Functionings are ends of human life. They can also be means to human life. Functionings are parts of a person's state of being or doing in leading a good life. Capability gives the combinations of functionings achievable by an individual. It is a set of functionings that reflects the freedom of an individual to make choices of possible livings desired by the individual. Dimensions of capabilities include endowment, individual capacity and social opportunity. The three dimensions are complementary and reinforce each other. Endowments may be individual, household and societal, capacity is always individual level and opportunities are societal. The economic, social, cultural and institutional environment plays a key role in the development of these capabilities. They may impact upon personal capacities and can influence opportunities. This new paradigm of development has three core values: 1) sustenance - the ability to keep the individual alive; 2) self-esteem; and 3) freedom from servitude and poverty.

In the context of the capabilities approach, the process of human development is related to: 1) formation or expansion of human capabilities or functionings; and 2) creating opportunities so that people can use the capabilities that they already have or freedoms (United Nations, 1990). The multi-dimensional nature of capability can be captured through the concept of capability space which . A capability space comprises of many dimensions of capability which can broadly be grouped into three sub-spaces - the endowment sub-space; the capacity sub-space; and the opportunity sub-space. Each of the three sub-spaces can comprise of many dimensions of capability having some common element. The importance and relevance of these dimensions may vary from individual to individual depending upon a host of endogenous and exogenous factors and the local context of capability.

Figure 1.1

Pathways of Poverty Reduction in the Three Dimensional Poverty Space.



Conceptualising capability through the concept of capability space leads to six pathways through which capability can be expanded in a multi-dimensional context (Figure 1.1). Each pathway is an ordered linking of the three sub-spaces of the capability space. For example, one path to capability expansion may start with creating opportunities that may lead to expanding capacities and may contribute to increasing endowments. Alternatively, creating opportunities may lead to an increase in endowments which may then lead to expanding capacities. Other pathways to capabilities expansion may also be identified in a similar manner as shown in Figure 1.1.

It may be emphasised here that both capability approach and human development are directed towards the people. This means that the population stock (the size and structure of the population) has a relevance to the human development processes and the human development processes have implications to the population stock. The structure of the population by age and sex has direct relevance to human development process via capabilities expansion because the capability set varies by the age and sex structure of the individual. In the context of human development and capabilities expansion, population may be divided into six groups comprising of three broad age groups - child population, adult or working age population, and old population - and two sexes - male and female. It is obvious that the capability set for each of the six population groups so obtained is different. At the same time, the size of different sub-groups of the population determines the priorities of capabilities expansion or the human development process. For example, in a population with predominantly young age structure, the process of human development should focus on the expansion of those capabilities that contribute to the functionings of the young population. On the other hand, in a predominantly old population, the focus of human development should be on expanding those capabilities that contribute to functionings of the old population. Since the population stock is always in transition, it is obvious that human development processes are essentially dynamic in nature. In fact, human development processes have implications for demographic transition. At the same time, transition in the population stock sets the priorities for human development.

Table 1.1
Population groups and capability sets

Population sub-group	Capability sub-space		
	Endowment	Capacity	Opportunity
Young	Survival Protection	Growth Development	Elementary education
Adult	Higher education Productive skills	Occupational health Reproductive health	Productive employment
Old	Social security	Health Rehabilitation	Productive utilisation

Table 1.1 illustrates how the capability set varies for different population sub-groups. For the young population, the capability space may be defined in terms of survival and protection, growth and development, and elementary education. In contrast, the capability space of the old population may be characterised in terms of social security, health and rehabilitation, and productive utilisation of the old people. Finally, the capability set for the adult, working age, population, may be characterised in terms of higher education and productive skills, occupational and reproductive health, and productive employment.

Given the transient nature of human development and population relationship, it is obvious that this relationship cannot be analysed and understood through a normative, theoretical perspective.

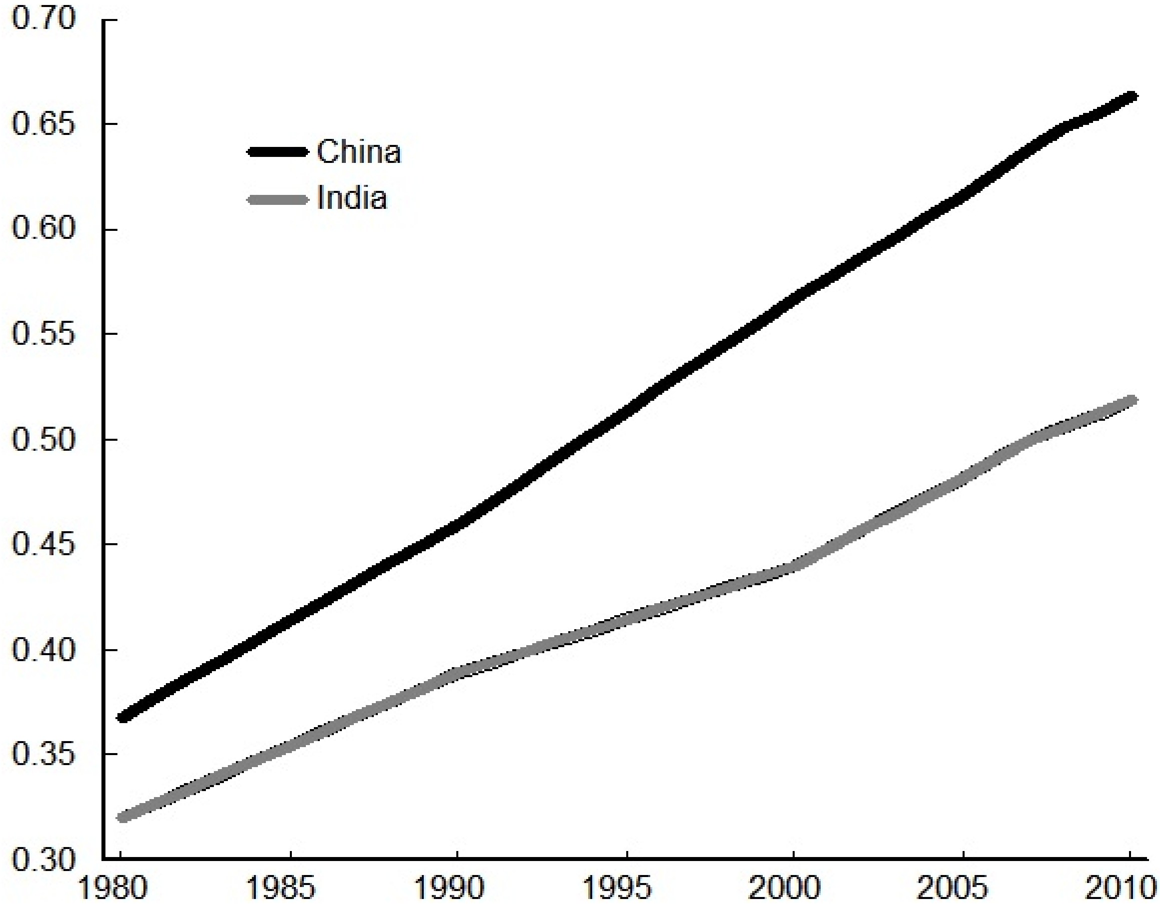
The dynamic nature of the relationship suggests that it can best be analysed and discussed through a context specific characterisation approach which is essentially illustrative in nature and is built upon the available empirical evidence. This approach is in line with Sen's view that identification of a canonical list of essential capabilities is difficult primarily due to two reasons: 1) the necessary specification of the context of their use; and 2) a disinclination to disvalue the domain of reasoning in the public sphere. Sen has argued that the task of weighing various capabilities should be left to both the ethical and political considerations and scrutiny of a given society based on public reasoning as the "richness" of the capability perspective is its insistence on the need for open value-based scrutiny for making social judgments.

Population stock is also relevant to the second dimension of human development - creating conditions so that people can use the capabilities that they already have or have acquired or the opportunity freedom. Here social class, child deprivation and gender discrimination are the key concerns which ultimately influence the entire human development process. In this context, the structure of the population by social class and by gender in addition to the population age structure has important implications to human development process. Similarly, it is imperative for the success of human development efforts including expansion of capabilities that these efforts are able to impact upon social class and child deprivation and gender discrimination that continue to be so pervasive in the society.

The above considerations constitute the conceptual foundations of the present monograph which adopts the characterisation approach to analysing and understanding human development and population interrelationships in the context of India, the second most populous country of the world and the only billion plus country other than China. The challenges posed by India in terms of both human development and population are simply enormous. Among the 169 countries for which, United Nations has prepared the human development index, India ranks a low 119 in the year 2010 (United Nations 2010). Moreover, between 2000 and 2010, the human development index in the country has recorded only a marginal increase despite the fact that during this period the country has recorded an impressive economic growth. In the year 2010, the human development index for India was estimated to be 0.519 which is well below the human development index in China, the only other billion plus country of the world. The pace of improvement in the human development index in India has been slower than that in China so that the gap between the two countries increased by almost 5 times since 1980 (Figure 1.2).

Similarly, in terms of transition in the population stock, India's challenge is revealing. According to the medium variant of the population projections prepared by the United Nations, India's

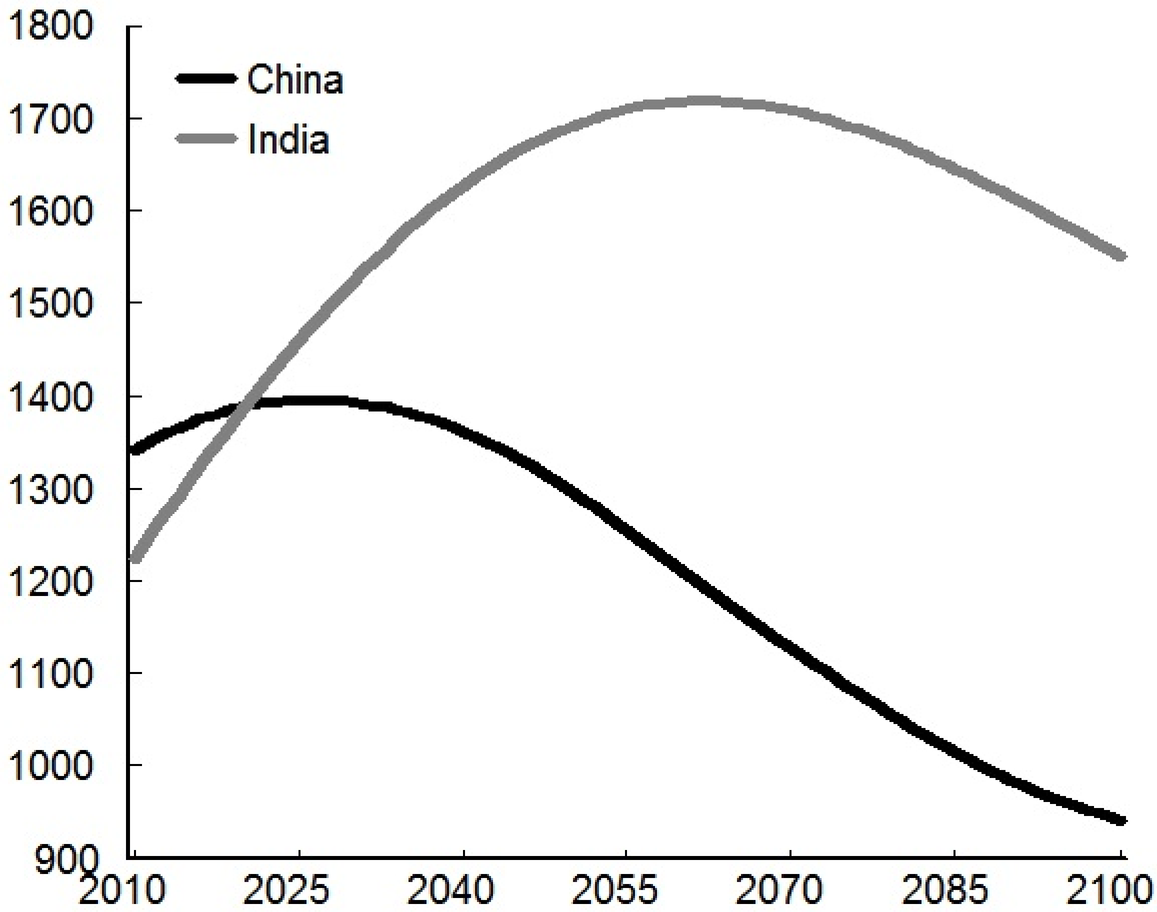
Figure 1.2
Trends in human development index in China and India



population will peak to more than 1.7 billion by the year 2062. By comparison, the population of China will start decreasing after 2025 (Figure 1.3). United Nations projections also suggest that by the year 2021, India's population will surpass the population of China, making it the most populous country of the world. Between 2010 and 2050, India's population is projected to increase by more than 467 million whereas the population of China is projected to decrease by around 46 million (United Nations, 2011).

Figures 1.2 and 1.3 reveal the complexity of human development and population scenario in India. The huge population stock of the country associated with slower than expected transition in the population stock and marginal improvements in the human development despite rapid economic growth in recent years present a complex population and development scenario which is unparallel in the world. Tackling this complex scenario in the context of improving the life of the people of the country requires a deeper understanding of the prevailing human development

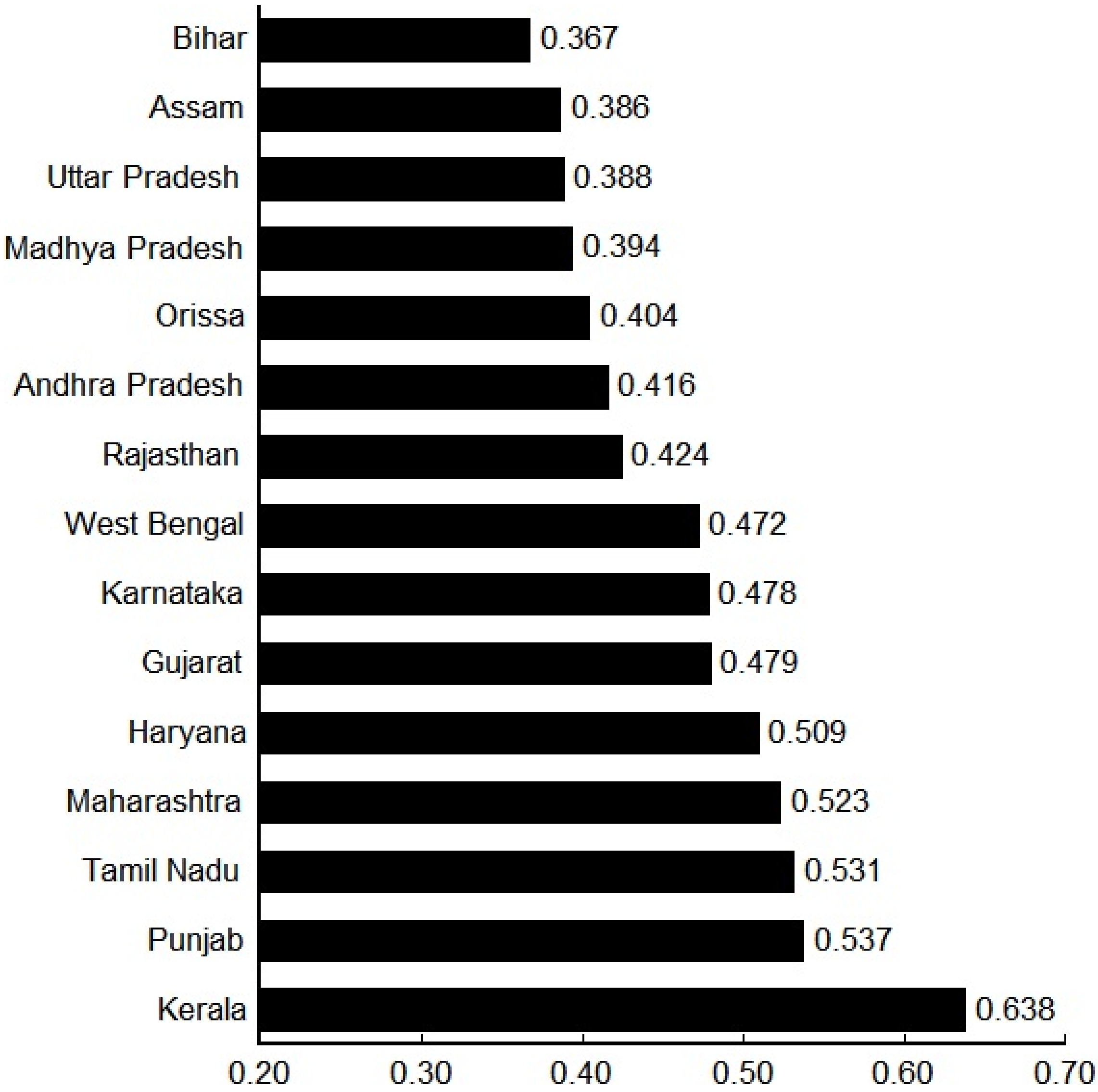
Figure 1.3
Future population growth (million) in China and India



and population related issues. The present monograph attempts to expand the understanding in this regard.

A major challenge to discussing human development and population issues in India is its baffling social, cultural, economic, environmental and political diversity. Because of this diversity, India is often referred to as the country of countries. This diversity also implies that understanding pertinent human development and population related issue in the national context carried little meaning. Rather, amore appropriate approach is to focus on the constituent states as the constituent states of India can be distinguished not only in terms of culture and society but also in terms of the level of social and economic development and population transition, although within the constituent states, there are considerable diversity in both human development and population scenario that has persisted over time. Moreover, because of the federal structure of the political and administrative system in the country, it is the responsibility of the constituent

Figure 1.4
Human development index in Indian states, 2001



states to address population and development needs of the people through appropriate planning and programming. As such, state specific discussion on human development and population is more pertinent than the national level analysis.

In line with the above argument, this monograph is confined to the analysis of human development situation and population scenario in Madhya Pradesh which lags behind most of the states of India in terms of both human development and population transition. The human development index in the state was estimated to be 0.394 circa 2001 compared to national average of 0.472 (Government of India, 2001). Although, Madhya Pradesh is one of the few states in India which have been able to improve their rank vis-a-vis other states of the country, yet, the state continues to rank amongst the five poorest states of the country in terms of the human development as measured by the human development index. Madhya Pradesh was the first state of India to bring out the human development report specific to the state way back in 1995 (Government of Madhya Pradesh, 1995). Since then, the state has prepared human development report in 1998, 2002 and 2007 to chart the progress, to highlight the challenge of human development being faced by the state and to emphasise that Madhya Pradesh requires a holistic approach to addressing human development issues and concerns facing the people. These reports underline the agenda to break the vicious cycle of poor economic and human development in the state and to move towards a virtuous cycle of accelerated economic development and human progress (Chaurasia, 2010). These reports also highlight some very strong, within state, inter-district diversity in different dimensions of human development that have persisted over time. This diversity is the result of both inter-district variations in the key dimensions of human development and inter-district diversity in the population structure by social class across the districts. The key message that emanates out of these reports is that reducing inter-district disparities in human development can contribute significantly to accelerating the pace of human development in the state.

The state is also in the early stages of population transition characterised by an abnormally high rate of population growth associated with high birth rate and high death rate. The risk of death in the first five years of life in the state is the highest in the country. Similarly, the death rate in the rural areas of the state is also the highest in the country and the situation has remained virtually unchanged over the last 40 years. It is argued that one of the reasons of slower than expected transition in the population of the state is the poor development situation. At the same time, it is also argued that accelerating population transition can go a long way in hastening the pace of human development in the state.

The present monograph is a collection of papers related to a specific human development and population concern specific to Madhya Pradesh. These concerns are characterised on the basis of the available empirical evidence and application of appropriate analytical tools. The underlying theme of the monograph is to highlight, wherever possible, inter-district, social class and rural-urban disparities. This focus is necessary as inter-district, social class and rural-urban disparities in almost all aspects of life in Madhya Pradesh are perhaps the widest in India and the available evidence suggests that these disparities appear to have increased in recent years. Madhya Pradesh has attempted to address the disparities in human development and in population transition through a decentralised population and development planning approach but the effectiveness of such an approach is hampered by the lack of understanding about issues and concerns related to human development and population transition, particularly at the local level.

The present monograph comprises of eleven papers in addition to the this prologue and the customary epilogue. The first six papers of the monograph are related to human development issues while the last five papers are related to specific population issues which have implications for human development. The first paper of the monograph focuses on the disparities in human development in Madhya Pradesh as reflected through variations in the human development index by social class across the districts of the state. The analysis suggests that the challenge for Madhya Pradesh is to create, strengthen and sustain institutions at the local level that can effectively address social class disparities in human progress that are so pervasive in the state. Although, Madhya Pradesh has taken a number of exemplary initiatives in the past in some key areas of human development, yet the current scenario does not appear to be encouraging. The state can make significant achievements in human development through empowering Panchayats - the democratically constituted and constitutionally legal organisations of the people. This, however, requires strong political commitment and a long term human development policy which is currently missing in the state.

The second paper of the monograph is directed towards measuring child deprivation on the basis of a child deprivation index which is very similar to the human poverty index. The paper reveals that child deprivation is quite pervasive in the state and children belonging to Scheduled Tribes face extreme deprivation. Child deprivation has also been found to be very high in Scheduled Castes. Scheduled Castes and Scheduled Tribes constituted almost 40 per cent of the children in the state at the 2001 population census. Any significant improvement in child deprivation in the state is therefore possible only when children belonging to these social classes are ensured services and interventions which are critical to their survival, growth and development. Meeting the needs of children requires both an agent (intervention) and a way to get the agent to children (the delivery strategy). It is well known that there are agents which are capable of reducing very significantly, if not eliminating, child deprivation. The challenge for Madhya Pradesh is to get these agents to those who need them the most. The analysis reveals that despite the availability of services and interventions that have the potential of meeting needs of the children, the gap between what can be done and what is actually being done continue to persist in the state.

The third paper of the monograph discusses poverty trends and differentials in Madhya Pradesh. The analysis is based on the human poverty index that has been calculated for all the districts of the state by social class and by residence. The human poverty index has been found to vary widely across the districts of the state as well as across social classes and residence within the district and the social class inequality in poverty is quite substantial. The analysis indicates towards a concentration of income and consumption in the non Scheduled Castes/Tribes population in the urban areas in the state and in all of its districts. The paper argues that a multi-dimensional approach is needed to address poverty. There is a pressing need to understand and conceptualise different dimensions of poverty. The paper emphasises that the first and, perhaps, the most important issue in articulating a poverty reduction strategy for the state is to decide about the starting point of the poverty reduction path. This starting point may be increasing endowments or building capacities or creating opportunities.

The fourth paper of the monograph highlights concerns related to economic growth in Madhya Pradesh. Using the official estimates of domestic product, the analysis reveals that the growth of the economy of the state has been very slow in real terms and a very substantial proportion of this growth has been subsumed by the growth in population so that there has been hardly any increase in the per capita income so that economic growth has contributed little to poverty reduction. Another disheartening feature of the economic growth in the state is that the growth has been highly skewed. There is hardly any evidence of the growth of the economy in the rural areas. Most of the growth in the economy of the state, in real terms, has been confined to such components of the economy as communication, transport including railways and banking and insurance which benefit primarily the urban population. Growth of manufacturing sector in the state appears to have been negative in real terms while that of agriculture has been almost stagnant. Obviously, most of the state population remains devoid of the benefits of economic growth. The analysis also indicates that state initiatives in accelerating the growth of the economy appear to be without clear direction and is somewhat inadequate.

The fifth paper of the monograph discusses issues related to health and longevity, an important element of human development. Madhya Pradesh has the dubious distinction of having the lowest expectation of life at birth among the major states of India and there are wide social class and spatial disparities in all indicators of mortality. Prevailing levels of mortality in the state suggest that efforts directed towards meeting the health needs of the people of the state have fallen short of the needs of the people and a large proportion of the population, especially the poor and the marginalised, remains devoid of even the basic minimum health care and an acceptable level of nutritional status. The situation appears to have been compounded by mass illiteracy, especially among women; rampant poverty; and low to very low levels of social and economic development. The paper also discusses the efforts of the state government to address the prevailing situation and suggests an alternative strategy to meet the health and family welfare needs of the people.

Concerns about universalisation of the primary education in Madhya Pradesh are discussed in the sixth paper of the monograph. The record of Madhya Pradesh has been comparatively better in primary education as compared to health and other components of human development, although, there is still scope for improvement as the goal of universal primary education still remains a dream in the state. The analysis reveals that qualitative aspects of primary education are particularly weak in the state and there is still a pressing need of substantive additional investments to improve the infrastructure, facilities and manpower in schools to create a conducive learning environment.

Remaining five papers of the monograph are related to population transition in the state as they have implications to human development. Population growth and structure and the process of population ageing are the focus areas of the seventh and the eighth papers of the monograph. The population of the state continues to be in the early stages of population transition with a typically triangular population pyramid with a broad base and thin top resulting in a high young dependency. Such an age structure has implications to human development processes as the capability set for the young population is radically different from the capability set for the adult and the old population. Another interesting observation concerning Madhya Pradesh is that despite the fact that the state continues to be in the early stages of population transition, there is a very substantial increase in the number of old people because of the decrease in mortality. This increase has implications to human development processes. In addition to planning and programming for the human development needs of the young population, the state needs to look into the needs of a growing number of old people, specifically in terms of their security in the family and the society, their health care and rehabilitation as well as in terms of their productive utilisation.

The ninth paper of the monograph is related to the patterns of fertility. The relevance of fertility to human development processes lies in the fact that fertility is a major factor in determining the reproductive health status of women. In Madhya Pradesh, fertility levels have always remained well above the national average. Within the state, fertility varies widely across social groups and across districts. The analysis presented in the paper calls for a district specific approach to hasten the pace of fertility transition in the state. It is important that the factors influencing fertility and the age pattern of fertility are identified at the district level and, accordingly, local situation specific policies and programmes of fertility transition are evolved and implemented. The current approach towards fertility reduction in the state is essentially normative in scope that does not take into account district specific factors that largely determine the level and the age pattern of fertility.

The last two papers of the monograph are related to child mortality, an important components of human development. The extremely poor child survival scenario in the state may be judged from the fact that Madhya Pradesh has the poorest child survival probability in India and the situation has largely remained unchanged over the last 40 years. However, the state understanding about child mortality and its determinants remains poor. The papers included in this monograph suggests that the risk of death in early childhood varies widely across districts as well as across rural-urban areas and across social classes within the districts. The analysis also suggests that most of the observed spatial inequality in child mortality in the state is the result of the within districts social class variations in the risk of death during infancy and early childhood. As such, an accelerated reduction in social class inequality in childhood mortality within the district is likely to have a very strong impact on the overall spatial inequality in childhood mortality in the state.

In conclusion, the monograph highlights the unsatisfactory human development situation and slow pace of population transition in Madhya Pradesh. The state appears to lack the minimum threshold of development that is necessary to hastening the pace of population transition. At the same time, it appears that the slow pace of population transition in the state has some serious implications to human development processes. Integration of the programmes and interventions directed towards hastening the pace of population transition with human development processes appear necessary for improving the quality of life of the people of the state. Unfortunately, there is little recognition of the need for such an integration. Institutional mechanisms and institutional capacity necessary for such an integration do not exist in the state. The economy of the state needs revitalisation to generate resources necessary for investments in such critical areas of human development as health and education. An accelerated progress in human development is necessary to create necessary threshold for hastening the pace of population transition. Population transition, in turn will have implications for human development processes. Another imperative for Madhya Pradesh is to create, strengthen and sustain institutions for capacity building. Capacity building is critical to both human development and population transition. Empowering the Panchayat Raj Institutions - democratically constituted and constitutionally mandated organisations of the people - may be a much needed initiative. However, empowering the Panchayat Raj Institutions requires strong political commitment and long term human development strategy.

A major limitation of understanding human development concerns and population transition issues and the inter-linkages between the two in Madhya Pradesh is the availability of the information necessary for the analysis of the multidimensional nature of human development as well as the multidimensional nature of population transition. Most of the analysis presented in this monograph is based on the information available through the 2001 population census as information available through the population census is virtually the only source for analysing the human development situation and measuring and monitoring the pace of population transition especially at the local level. Although, the information available through the 2001 population census is ten years old and may not reflect the situation that prevails today, yet there are few options available. The 2011 population census has recently been carried out and it will take some time when the information collected during the latest population census will be available for analysis. Till then, the only source of information to analyse and explore human development processes and population transition patterns at the sub-state level continues to be the 2001 population census. Although, there is currently considerable emphasis on decentralised district population and development planning in the country, yet appropriate population and development data system necessary to facilitate evidence-based planning and programming for human development and population transition is largely missing.

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DISPARITIES IN HUMAN DEVELOPMENT

Introduction

Madhya Pradesh was the first state in India to prepare sub-national human development report in 1995 to chart human progress at the district level. The 1995 Report has since been followed by similar reports in 1998, 2002 and 2007 (Government of Madhya Pradesh, 1995; 1998; 2002; 2007). An integral feature of these reports is the estimation of human development index (HDI) for constituent districts which are based on the approach popularised by United Nations but use different set of indicators. The choice of indicators has largely been influenced by the availability of information at the district level. The human development reports prepared by the Government of Madhya Pradesh, provide estimates of HDI for the districts of the state but, interestingly, not for the state. Estimates of HDI for Madhya Pradesh are prepared by the Government of India along with other states which suggest that human development in the state continues to be amongst the poorest in the country, although, the state has been able to improve its rank in HDI *vis-a-vis* other states of the country (Government of India, 2002).

State attempt to measure and monitor human development is also silent about social class and rural-urban disparities in human development. Social class and rural/urban disparities in development are well known. Around 20 per cent of the population in Madhya Pradesh was classified as Scheduled Tribes while more than 15 per cent as Scheduled Castes at the 2001 population census and there are significant inter-district variations in these proportions. Chakraborty (2000) has questioned the logic of computing HDI at the district level without giving attention to inequalities in human development by socio-demographic groups.

The aim of the present paper is to analyse social class and rural-urban disparities in human development in Madhya Pradesh and in its constituent districts on the basis of HDI by social class and residence. The analysis suggests that social class and rural-urban inequalities in human development in the state and in its constituent districts are very strong and appear to have persisted over time. We also calculate the inequality adjusted human development index (IHDI) to present the true state of human development in the state. The analysis emphasises the need to take into consideration the social class and residence inequalities in the human development planning and programming in the state.

The paper is organised as follows. The next section presents a brief review of HDI and modifications suggested to improve its relevance. The third section describes the methodology and data source used in the analysis. Fourth section presents estimates of HDI by social class and residence for the state and for its constituent districts. Sixth section of the paper analyses social class and residence inequalities in human development on the basis of intra- and inter-district variation in HDI. Estimates of IHDI are presented in the seventh section of the paper. The last section of the paper discusses implications of the observed social class and residence inequality to human development in the state.

The Human Development Index

HDI is a response to the need of a measure that could better represent human development in several basic capabilities than conventional income based measures (Kelly, 1991; Anand and Sen, 1994; Haq, 1995). HDI has never made a claim to be a comprehensive measure of human development and well-being (Kovacevic, 2010). Rather, it focusses on the three basic capabilities - a long and healthy life, knowledge, and a decent standard of living. It does not cover other dimensions of human development. However, it is argued that if these three basic capabilities are achieved, they would open up opportunities in other dimensions of human development also (Jahan, *no date*).

The HDI is now used universally to measure and monitor progress in human development. Every year, United Nations estimates HDI for its member states and lists and ranks them on the basis of the index. If the rank of a country in HDI is high, it is used as a means of national aggrandizement. Alternatively, if the rank is low, it is used to highlight national insufficiencies. The HDI has now been universally recognised as a standard yardstick for international comparison in human development despite its many deficiencies. The index has also been used to measure the impact of economic policies on the quality of life (Davis and Quinlivan, 2006).

HDI has been criticised on many grounds. A comprehensive review of this critique is given by Kovacevic (2010) along with different alternatives proposed. It has also been argued that HDI is based on the assumption that provision of material amenities is sufficient for human development. If human development, in the true sense, embraces both material and moral development and well-being, then human development efforts should not end up in amelioration of material deprivation alone. It must undertake to bring about spiritual and moral development to assist the biped to become truly human (Basu, 2005). As a result of this criticism, there has been a continuous evolution of the conceptualisation as well as the methodology of estimation of HDI. Table 2.1 presents a summary of this evolution. The most radical changed have been introduced by the United Nations in the latest 2010 Human Development Report with the replacement of linear aggregation of the three dimensions of HDI by geometric aggregation which embodies imperfect substitutability across all HDI dimensions (United Nations, 2010). At the same time, HDI now uses new indicators to measure achievements in the education dimension of human development.

The framework of HDI is parallel to the framework of capabilities expansion propounded by Sen (1985, 1990). Capability is the ability and the potential to do and to be. Development, in this framework, is the quality of life in terms of capabilities expansion - broadening of the set of valuable beings and doings an individual can achieve. Capabilities give the combinations of functionings achievable by an individual. It is a set of functionings that reflects the freedom of an individual to make choices of possible livings desired by the individual. Capabilities include endowment, individual capacity and social opportunity. Endowments are at individual, household and societal levels, with capability at individual level and social opportunities at societal level. Sen’s approach suggests that, in the context of capabilities, there are three core values of development - sustenance or the ability to keep individual alive, self-esteem and freedom from servitude and poverty.

The three components of capability expansion, as propounded by Sen, are congruous with the three components of the HDI - endowment is congruent with the standard of living; individual capacity is congruent with longevity; and social opportunity with congruent with education. This congruency suggests that improvements in HDI also reflect improvements in capability expansion. This congruency also suggests that HDI may also be viewed and analysed as a measure of broader human development processes directed towards individual capabilities expansion and just not in the narrow context of income, health and education as is generally the case. This perspective also argues that social class and other disparities in HDI are essentially a reflection of the disparities in the capabilities of different population groups.

There are considerable variations in the indicators used for estimating HDI in India and in its constituent states. These variations are compelled primarily by the availability of the information required at the lower levels of administration and state specific human development priorities. The HDI prepared by the Government of India for the country and for its constituent states and Union Territories employs a different indicator set than the indicator set used by different states and Union Territories. Table 2.2 presents the list of indicators used by United Nations, Government of India, and Government of Madhya Pradesh for estimating HDI. There are variations in setting up the goal posts also. Because of these variations, estimates of HDI prepared by United Nations, Government of India, and Government of Madhya Pradesh are not strictly comparable.

Methodology and Data Source

In the context of estimation of HDI by social class and residence, the main constraint is the availability of the information related to indicators of education and living standards used by United Nations in its latest Human Development Report. Estimates of per capita income for different social classes as well as separately for rural and urban areas are not available for Madhya Pradesh and for its constituent districts. Similarly, information necessary to estimate mean years of schooling and expected years of schooling is also not available. It may however be pointed out that the individual income has been taken as a surrogate of the standard of living in the calculation of HDI. The relevance of average per capita income in the estimation of HDI may be seriously questioned in situations where there are large and persistent inequalities in average per capita income as is the case with Madhya Pradesh. In fact, inclusion of average per capita income in the estimation of HDI means that the HDI of any geo-political or administrative unit will be less sensitive to the well-being of the most deprived and marginalised members of the unit (Chaurasia, 2010). Two ways have been suggested to circumvent the problems associated with including average income per capita in the calculation of HDI. The first is to exclude income component from the construction of any index designed to measure human development. This may be done by using index like the physical quality of life index (Morris, 1979). The second approach is to construct modified HDI which takes into consideration the education and health components of the conventional HDI but excludes the economic component (Ramirez et al., 1998). A more rational approach, on the other hand, is to examine the three components of the HDI separately.

A third approach suggested to address the limitations of the monetary measure of the standard of living is to focus on asset ownership rather than on household or individual income. Assets that a household possesses, or to which, the household has an access, can be related to household income in the sense that the latter may be conceptualised as returns to these assets. In this view, individual or household income reflects the assets that it commands and the returns that it is able to earn on these assets. At the same time, household assets also reflect the accumulation of income. Assets are also important to households in their own right. They represent wealth and status, economic and social security and easier access to credit, among others. They insure households against economic shocks. They also capture the long-term dynamics of household economics better than the measure of income at one or two points in time and can, in principle, be considered in a range of different dimensions of the capital including the social capital. Assets measure living standards directly in terms of the availability of material goods or social activities. By contrast, non availability of assets may reflect inability of the household or the individual to afford assets because of the lack of either resources or opportunities or because of different choices and preferences. In this way, assets-based indicators also take into account the role of preferences and choices of the households and the individuals. Deprivation of household assets is a better measure of the persistence of 'ill-being' than the contemporary income or consumption-based measures of the standard of living. Lack of household assets and adequate housing conditions is more likely to be associated with a deficiency of resources over a prolonged period of time than with the current income or consumption expenditure. In fact, deprivation indicators allow a broader look at exclusion because of the lack of either resources or opportunities or specific preferences or choices.

Another indicator that we have used to measure the living standard in the absence of monetary measures of standard of living like per capita income is the use of banking facilities, although the use of banking facilities may be constrained by the availability of these facilities, especially in the rural and remote areas. Banking facilities are primarily used for deposits and credits (Thapa, 1995). In this sense, use of banking facilities may be related to access to resources. It may be assumed that the higher is the use of banking facilities the greater is the access to resources and hence better is the standard of living.

The 2001 population census provides information about the availability of six household assets - radio/transistor, television, telephone, bicycle, scooter/motorcycle/moped, and car/jeep/van - and the use of banking facilities for every household of the country. This information permits estimation of the proportion of households having none of the six specified assets by social class and by residence. In this paper, we assume that the proportion of households having none of the six households assets is an indicator of deprivation. Accordingly, we assume that the proportion of households having at least one of the six specified household assets and the proportion of households using banking facilities, in combination, reflect the living standard of the household.

Selection of these indicators is obviously based on the availability of the information by social class and by residence for the districts of the state as these indicators can be derived from the information available from the 2001 population census. We also give equal weight to the two indicators to arrive at the index of the standard of living.

In order to justify our assumption, we have also regressed the logarithm of per capita net district domestic product at constant prices on the proportion of households not having any of the six assets and the proportion of households not using banking services on the basis of district level data. Estimates of per capita net district domestic product have recently been prepared by the Government of Madhya Pradesh (2009) for the total population but not separately by social class and residence. Results of the regression analysis, presented in table 2.3 show that the two explanatory variables account for more than 70 per cent of the variation in the per capita net district domestic product at constant prices. Moreover, both the regression coefficients are statistically significant and are in expected direction. Results of the regression analysis justify our assumption.

Finally, we use the adult literacy rate and combined school enrolment ratio to estimat the index of education as information about mean years of schooling and expected years of schooling is not available at the state and district level. These two indicators have been used by the United Nations to measure attainments in education in the past.

The indicator set used for estimating HDI now comprises of the following five indicators:

Standard of living	1) Proportion of households having at least one of the six household assets - radio/transistor, television, telephone, bicycle, scooter/motorcycle/moped, and car/jeep/van (A), 2) Proportion of households using banking facilities (U)
Health and longevity	3) Expectation of life at birth (E)
Knowledge and education	4) Adult (15+) literacy rate (L), and 5) Combined school enrolment ratio (S)

Using the above indicators, we follow the same approach as described in the 2010 Human Development Report (United Nations, 2010) to estimate HDI for Madhya Pradesh and its constituent districts by social class and residence. First the variables are normalised. The goal posts used for normalisation of the variables are 0 and 1 for all indicators except the expectation of life at birth for which minimum and maximum values are taken to be 25 years and 85 years respectively. Notice however that the goal posts for the expectation of life at birth in the 2010 Human Development Report are taken to be 20 years and 83.2 years respectively. The HDI is then calculated as

$$HDI = (IE * IH * IL)^{1/3}$$

where

$$IE = (l^{2/3} * s^{1/3})$$

$$IH = h$$

$$IL = (a^{1/2} * u^{1/2})$$

and l, s, h, a, and u are the normalised values of L, S, H, A, and U respectively.

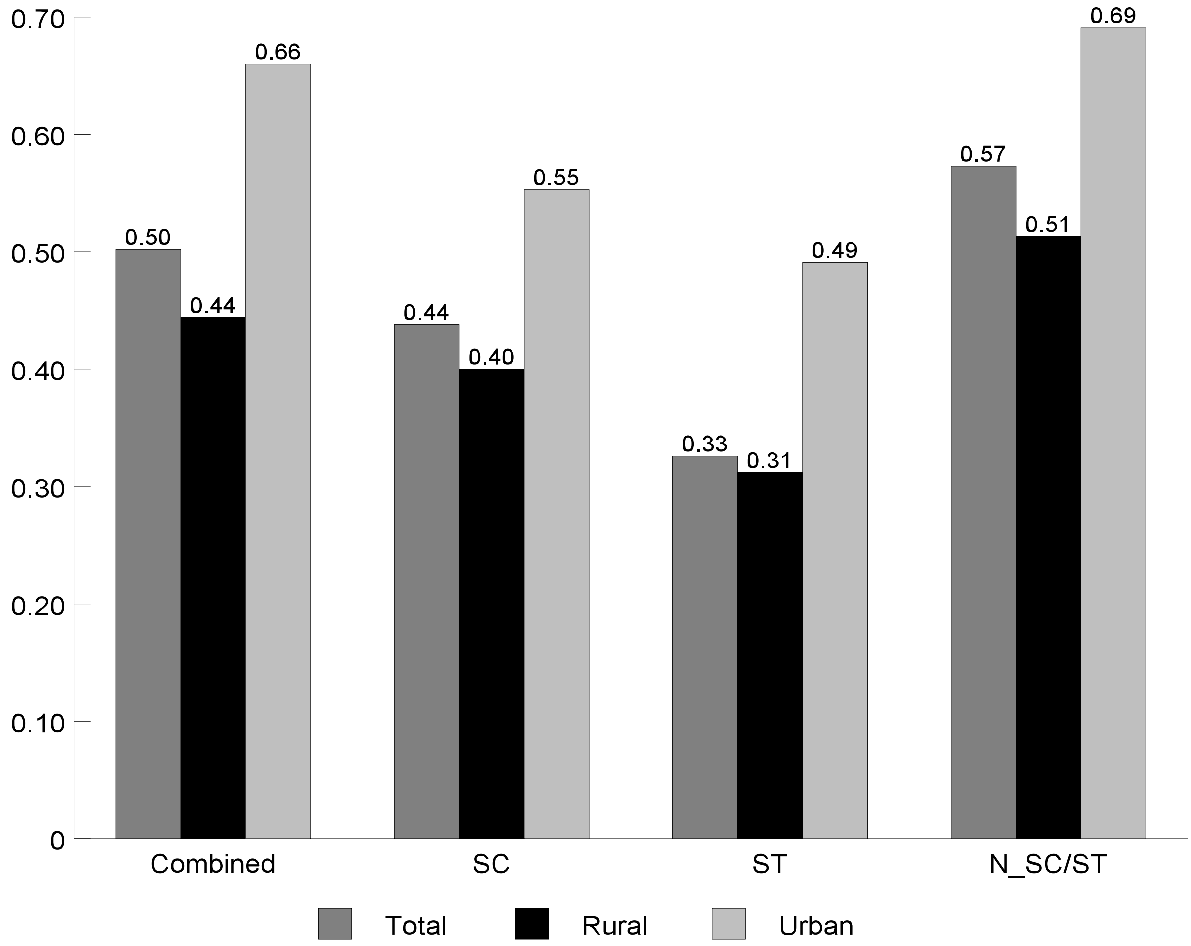
Human Development in Madhya Pradesh

State level estimates of the five indicators used in estimating HDI are given in table 2.4 separately by social class and residence. The table suggests that social class and rural-urban variations in all the five indicators of human development are quite strong in the state. It is also clear that the human development situation, as reflected through the five indicators used in the present analysis is the poorest in Scheduled Tribes followed by Scheduled Castes. On the other hand, the situation appears to be markedly better in the non-Scheduled Castes/Tribes. Similarly, the rural-urban gap has also been found to be very wide in all the five indicators which reflects wide urban-rural disparity in the human development situation in the state.

Based on the information presented in table 2.4, the HDI in Madhya Pradesh is estimated to be 0.502 circa 2001 for the total population. HDI has been estimated to be substantially higher in urban (0.660) than in rural (0.444) areas of the state. Similarly, HDI has been estimated to be the highest in non Scheduled Castes/Tribes population (0.573) but the least in Scheduled Tribes (0.326). HDI has also been estimated to be quite low in Scheduled Castes (0.438). Table 2.4 also reveals that urban-rural divide in human development is very wide in the state. The HDI in the urban areas of the state has been found to be approximately 1.5 times higher than that in the rural areas of the state. This gap is more than two times between the Scheduled Tribes population living in the rural areas (0.312) and the non-Scheduled Castes/Tribes population living in the urban areas (0.691).

Inter-district variations in HDI are revealing. HDI varies widely across the district and the pattern of variation is not same in different social classes as well as in rural and urban areas. Estimates of HDI by social class and by rural-urban residence have been given in appendix table 2.A for each of the 45 districts of the state as they existed at the 2001 population census. For the total population, HDI varies from the lowest in district Dindori (0.353) to the highest in district Indore

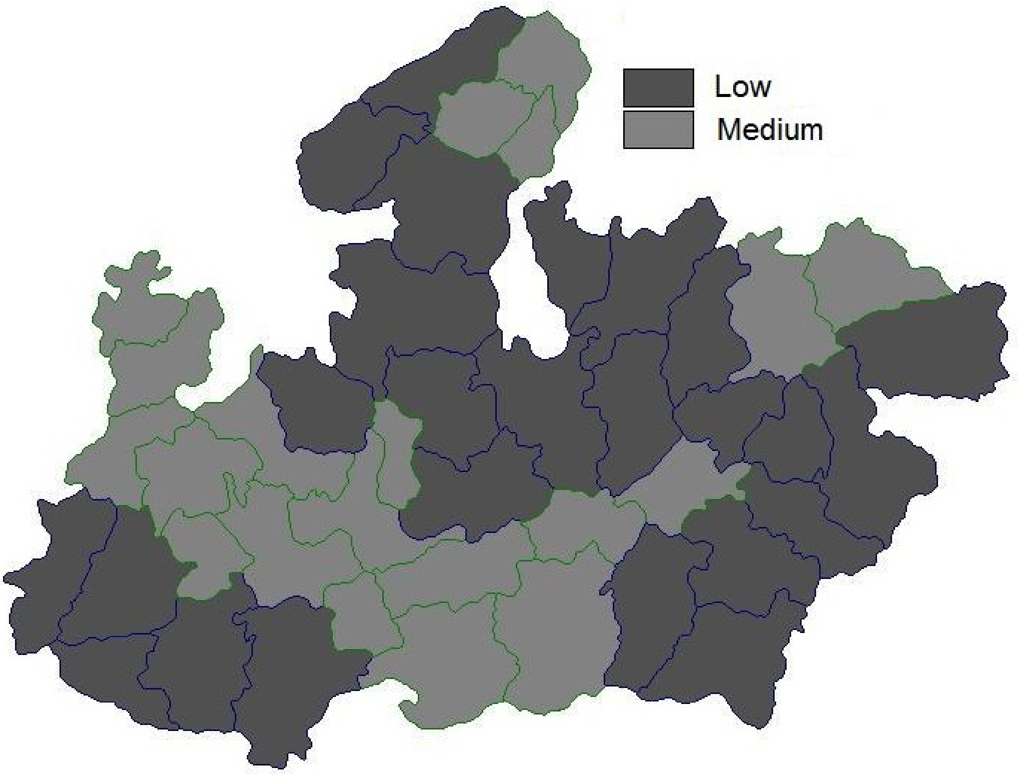
Figure 2.1
HDI in Madhya Pradesh, 2001



(0.664). In Scheduled Castes, it varies from the lowest in district Sheopur (0.319) to the highest in district Betul (0.573) and in Scheduled Tribes from district Sheopur (0.178) to district Bhopal (0.501). Finally, in non Scheduled Castes/Tribes, HDI varies from the lowest in district Dindori (0.422) to the highest in district Jhabua (0.714). In rural and urban areas of the state, districts with the lowest and the highest HDI are however different (Table 2.5).

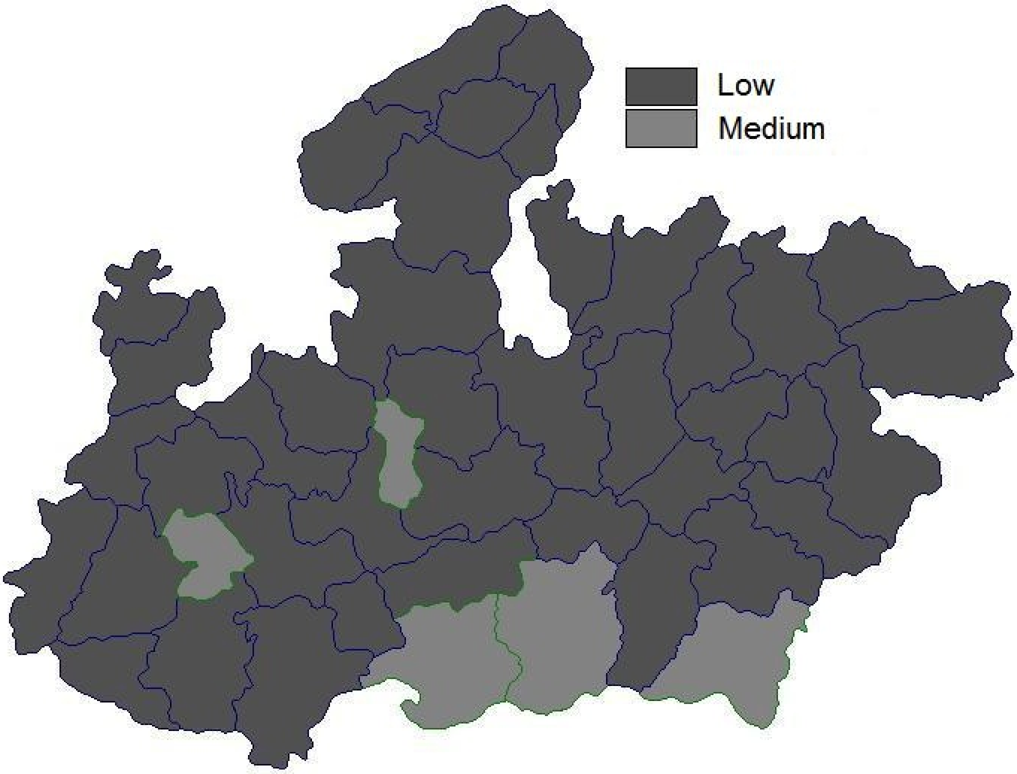
Table 2.5 also presents values of inter-district weighted coefficient of variation (Firebough, 1999) in HDI which measures the inter-district inequality in HDI. In general, the inter-district weighted coefficient of variation is not large in the state as well as in different population groups and across rural and urban areas within the state which suggests that there is not much difference in HDI across the districts of the state either in the total population or in different population groups. The only exception to this general pattern appears to be inter-district inequality in Scheduled Tribes in the urban areas.

Figure 2.2
HDI in districts of Madhya Pradesh
Total Population



United Nations has classified the HDI as low if it has a value less than 0.5; medium if it ranges between 0.5 and 0.7; high if the HDI ranges between 0.7 through 0.8 and very high if the HDI is 0.8 and above (United Nations, 2010). In the context of Madhya Pradesh, we have added another category to this classification to account for very low HDI. We classify HDI as very low if it is less than 0.3. According to this classification, there was no district in the state where the HDI was estimated to be high or very high circa 2001. On the other hand, HDI was estimated to be medium in 20 districts and low 25 districts (Table 2.6). In the Scheduled Tribes population of the state, the HDI has been estimated to be very low in 19 districts and low in 25 districts. Similarly, in the Scheduled Castes population, the HDI is estimated to be low in all but five districts. By contrast, in the non Scheduled Castes/Tribes population, HDI has been estimated to be low in only 8 districts. The social class disparities in human development, as measured through HDI are very much apparent from the table. Similarly, the urban-rural disparity in HDI may be judged from the fact that there were only 6 districts in the state where HDI in the rural areas is estimated to be medium, while the index has been estimated to be medium in 44 districts in the urban areas.

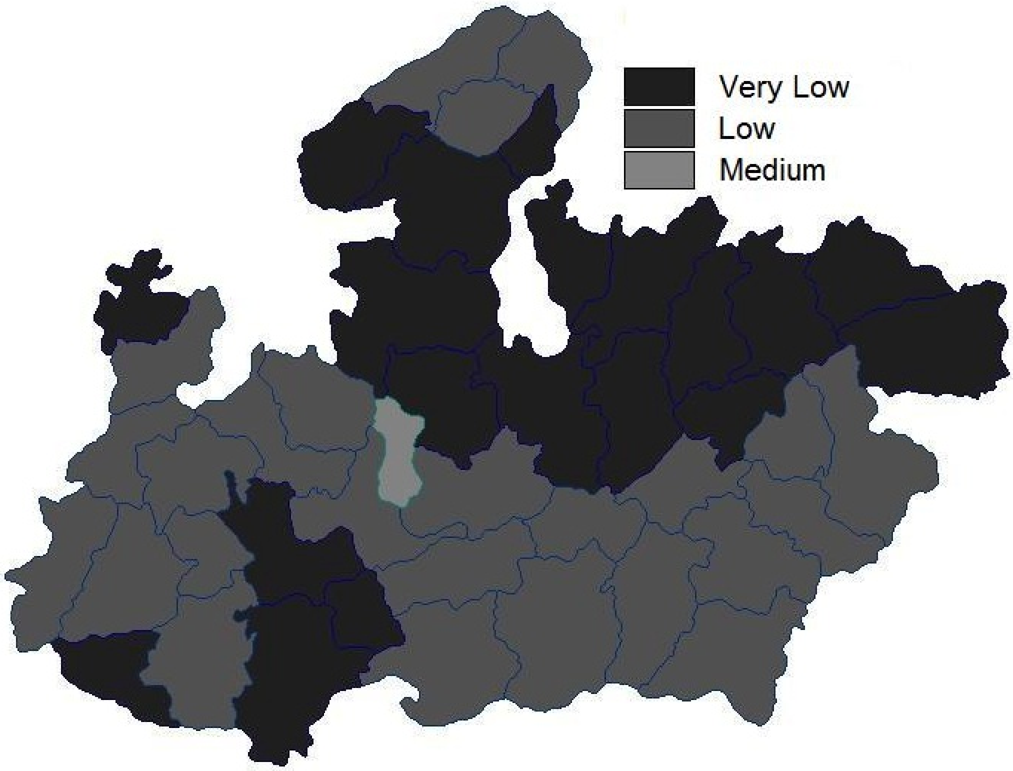
Figure 2.3
HDI in districts of Madhya Pradesh
Scheduled Castes



The poor to very poor human development situation in Scheduled Tribes is also very much evident from table 2.6. There was only 1 district in the state where HDI in Scheduled Tribes was medium with the situation being even worse in the rural areas. A similar scenario prevailed in Scheduled Castes also, although the situation appears to be a shade better but in non Scheduled Castes/Tribes, the situation was contrastingly different as the HDI, in this population group, was estimated to be low in only 8 districts. Moreover, there was no district where the HDI in the urban areas was low; it was medium in 35 districts and high in 10 districts.

The foregoing analysis suggests that the Scheduled Tribes living in the rural areas remain the most deprived population group in Madhya Pradesh as well as in all of its constituent districts in the context of human development as reflected through HDI. On the contrary, non Scheduled Castes/Tribes living in the urban areas appear to be the most advantaged population group in the state and in all of its districts. The distribution of HDI by social class and by residence also suggests that benefits of social and economic development in the state and in its constituent

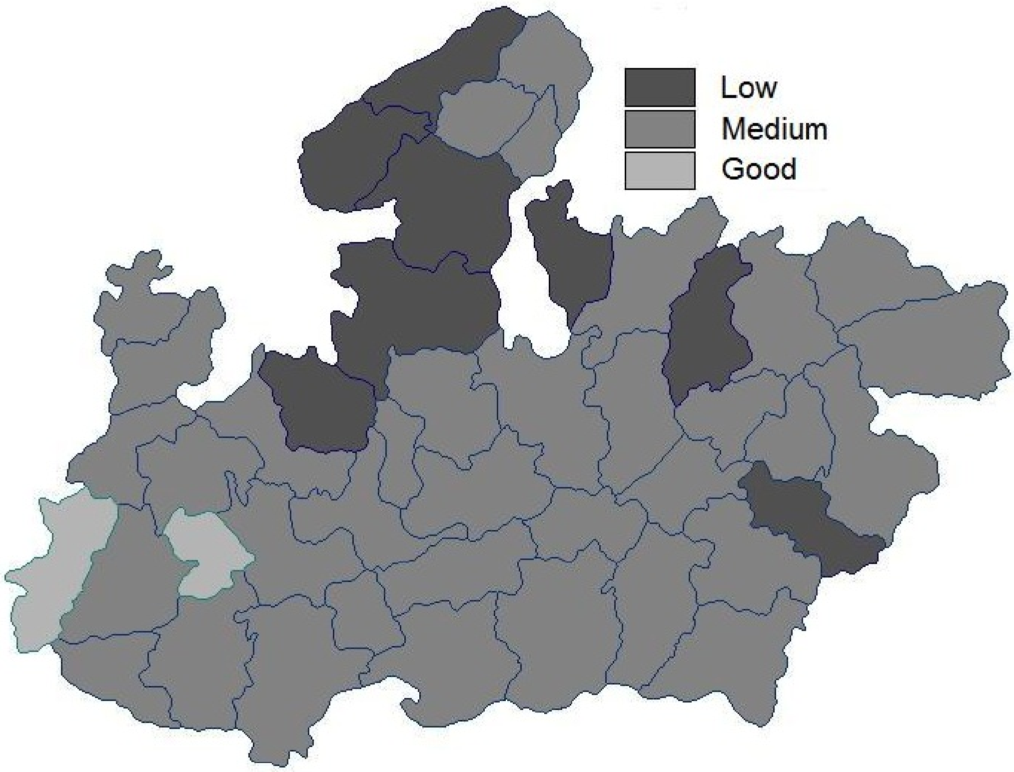
Figure 2.4
HDI in districts of Madhya Pradesh
Scheduled Tribes



districts have largely been confined to non Scheduled Castes/Tribes population living in the urban areas. Scheduled Tribes and Scheduled Castes, which constitute more than 35 per cent of the state population according to the 2001 population census, remain marginalised in the development process.

The HDI is the simple average of the indices of the standard of living, health and longevity and knowledge and education. As such, social class, urban-rural and inter-district variations in HDI are the result of social class, urban-rural and inter-district variations in the three indices that constitute the HDI. Table 2.7 presents values of the indices of standard of living index (SDI), health attainment index (LDI) and education attainment index (EDI) by social class and by rural urban residence along with inter-district coefficient of variation to reflect the inter-district inequality in the three basic components of human development. The situation appears to be relatively the poorest in Scheduled Tribes in all the three dimensions in rural as well as in urban areas whereas the situation is relatively the best in all the three dimensions in non Scheduled Castes/Tribes. At the same time, the inter-district inequality in the three indexes has also been

Figure 2.5
HDI in districts of Madhya Pradesh
Non Scheduled Castes/Tribes



found to be the lowest in non Scheduled Castes/Tribes which suggests that inter-district variation in different dimensions of human development in the state is the lowest in the non Scheduled Castes/Tribes.

Table 2.8 gives the distribution of districts in the three dimensions of HDI. The situation appears to be somewhat satisfactory in the dimension of education in the urban areas as the EDI is estimated to be high in 34 and very high in 9 districts. In case of non Scheduled Castes/Tribes population, the EDI has been estimated to be very high in 21 districts. By contrast, there was no district where the LDI is estimated to be high or very high. Similarly, SDI was high in the urban areas in only 3 districts. Table 2.8 clearly indicates that whatever progress in human development has been there, it has been limited to the dimension of education only and that too confined largely to non Scheduled Cates/Tribes population in the urban areas. It appears that human development efforts in the state have not been able to address the human development needs of Scheduled Castes and Scheduled Tribes of the sate, especially Scheduled Castes/Tribes living in the rural areas. The SDI in Scheduled Castes is very low in 19 districts but very low in

Scheduled Tribes in 40 districts. Similarly, the LDI is low to very low in 41 districts in case of Scheduled Tribes and in 29 districts in case of Scheduled Castes. Another important observation of table 2.8 is that the social class and residence inequalities in human development are quite pervasive in all the districts of the state. In other words, HDI varies not only across the districts of the state but also within districts.

Decomposition of Disparities in Human Development

It is possible to decompose the observed inter-district disparity in HDI and in its three dimensions into within district social class and residence disparity or inequality in HDI and between district disparity in HDI to examine how the two contribute to the over all inter-district disparity or inequality in HDI and in its three dimensions. In order to do so, we apply the technique of subgroup decomposition to HDI, EDI, LDI and SDI. This involves calculating two components of aggregate inter-district inequality or disparity - a weighted average 'within district' inequality or disparity known as the 'within-district' component; and a 'between district' component which captures the inequality or disparity due to variations in the average values of the index across districts. This can be done in two ways. One way to do this is the age-old analysis of variance procedure. The other way that we adopt in this paper is to estimate an inequality index which has the convenient property that the overall inequality can be decomposed into within-group and between-group components.

The most common type of inequality indexes used for the purpose of decomposition are the entropy class of inequality measures popularised by Theil (1967, 1972) and later explored in more detail by Bounguignon (1979), Shorrocks (1980, 1984, 1988), Cowell and Jenkins (1995) and Foster and Shneyerov (2000). In the present paper, we use the single parameter entropy index for measuring inter-district disparity or inequality in HDI as well as in EDI, LDI and SDI and then decompose the observed inequality into within group (district) social class and residence inequality and between group (district) inequality in HDI and in the three dimensions of human development that constitute the HDI. The purpose of the decomposition exercise is to analyse the relative contribution of the within districts and between district inequality to overall inter-district disparity or inequality in HDI.

The methodology essentially comprises of estimating the mean logarithmic deviation (MLD) which is the special case of single parameter entropy family with *c=0* (Shorrocks and Wan, 2005). The MLD is defined as

$$E_0(Y) = (1/n)\sum_{i \in N} \ln(\mu / y_i)$$

where μ is the human development index for the state as a whole while y_i is the human development index for the sub-group i of the population. Now suppose that the set of geographical entities N is partitioned into m proper sub-groups N_k ($k = 1, 2, ...m$) with respective human development index vector Y_k, mean human development index μ_k, population sizes n_k and population shares $v_k=n_k/n$. Then, it can be shown (Shorrocks and Wan, 2005) that

$$E_0(Y) = \sum_{k=1}^{m} v_k E_0(Y_k) + \sum_{k=1}^{m} v_k \ln(\mu / \mu_k) = W + B$$

Here W is the weighted average of the index in different social classes within the district. It is traditionally referred to as the 'within district' component of the spatial inequality. On the other hand, B is the 'between districts' component of the spatial inequality or disparity. It is obtained by replacing the index of each social class within the district by the average index of the district concerned. In this way, the overall spatial inequality in the human development index in the state can be expressed as the exact sum of the inequality in the index across social classes within the district and the inequality in the index which is due purely to differences across districts.

Results of the decomposition analysis are presented in table 2.9. In case of HDI, almost two-third of the total disparity or inequality is accounted by the within district component while the remaining one third is accounted by the between district component. In the urban areas of the state, within district component account for more than 78 per cent of the observed inequality or disparity in HDI. Clearly, the observed inequality or disparity in HDI is largely the result of within district social class and residence inequality or disparity in human development. This observation again suggests that the dividends of social and economic progress are not being shared equally by different social classes equally and there are large rural-urban gaps. It also indicates towards the exclusion of Scheduled Castes and Scheduled Tribes, the poorest and the most marginalised sections of the population, from the main stream social and economic development activities. This exclusion may be due to both factors exogenous and factors endogenous to the social and economic production system. Exogenous factors are primarily related to life style, culture and tradition while endogenous factors may be related to the demands of the social and economic production processes which lead to the marginalisation of people.

As regards the three dimensions of HDI, results of the decomposition exercise are very similar in case of EDI and SDI. Moreover, these patterns are also very similar to that of HDI. In both these dimensions, the major contributor to the observed inter-district inequality or disparity is the social class inequality within the district. In the urban areas of the state, almost 90 per cent of the observed inequality in EDI is accounted by within district social class inequality. The pattern, however, is radically different in case of the health dimension of HDI as between district component of LDI accounts for more than 80 per cent of the observed inter-district inequality in LDI while the within district component has been found to account for only a small proportion of the total variation in the index. This indicates that the observed inter-district inequality in the health dimension of HDI is largely the result of the inequality in the health status of the people across the districts of the state. The within district social class inequality in the health status does not appear to be a dominant factor in deciding the observed inter-district inequality in health. This is in quite contrast to SDI and EDI where the within district social class inequality is the dominating factor.

The decomposition of inter-district inequality in HDI highlights the within district social class and residence inequality in human development. In order to analyse social class and residence effects on HDI, we have applied the mean polish technique (Selvin, 2004) which is the same as the median polish technique (Tukey, 1977). Mean or median polish is an exploratory data analysis technique for examining the significance of various factors in a multi-factor model. It is a robust method for computing additive decomposition of a two-way table. An additive decomposition of a two way table Z, having *r* rows and *c* columns, is a vector *x* of row effects, vector *y* of column effects, a table R of residuals and mean or median μ such that

$$Z_{jk} = \mu + x_j + y_k + R_{jk} \text{ for all } j \text{ and } k.$$

The method of mean or median polish makes no assumption about the distribution or structure of the data. It remains effective even when the tabulated data are either rates or counts or any other type of data classified in a two way table. Median is preferred over mean in situations where there are outliers and extreme values in the distribution. In the present case, we are interested in finding out the social class effect and the residence effect of within state or within district disparity in HDI so that mean is preferred as it takes into all the values in the distribution. We use weighted mean to account for the underlying population structure by social class and by residence.

Application of the mean polish technique to state HDI by social class and residence suggests that, for the state as a whole, the common value or the grand mean of HDI is 0.498. The HDI in the rural areas is lower than this grand mean by around 0.043 points which reflects the effect of living in the rural areas. Similarly, HDI in Scheduled Tribes is estimated to be lower by about 0.142 points which reflects the effect of belonging to Scheduled Tribes. On the other hand, HDI in non-Scheduled Castes/Tribes is estimated to be higher by around 0.058 points from the grand mean or the weighted average HDI of the state.

Application of polish mean technique permits decomposition of HDI of a population group into grand mean, social class effect and residence effect. For example, and HDI of 0.343 in Scheduled Tribes living in the rural areas of the state can be decomposed in the following manner:

0.312	=	0.498	+	-0.043	+	-0.142	+	-0.001
Observed value		Grand median		Residence effect		Social class effect		Residual

On the other hand, an HDI of 0.690 in non Scheduled Castes/Tribes in the urban areas can be decomposed as

0.690	=	0.498	+	0.131	+	0.058	+	0.003
Observed value		Grand median		Residence effect		Social class effect		Residual

Similarly, an HDI of 0.439 for Scheduled Castes in the rural areas can be decomposed as

0.400	=	0.498	+	-0.043	+	-0.057	+	0.002
Observed value		Grand median		Residence effect		Social class effect		Residual

It is also possible to analyse how social class and residence impact upon disparities in HDI. For example, HDI in non Scheduled Castes/Tribes living in urban areas of the state is estimated to be 0.690 which is the highest in the state while HDI in Scheduled Tribes living in rural areas is estimated to be 0.312 which is the lowest in the state. The within state disparity in HDI (measured in terms of the difference between highest and lowest HDI) is therefore 0.379. This gap may be decomposed into social class effect of around 0.200 points, residence effect of around 0.174 points and a very small residual effect of 0.004 points (Table 2.10). Residuals in the polish mean exercise are actually interaction effects which are not accounted by the additive model.

Across the districts of the state, the grand mean of HDI is found to vary between district Dindori (0.344) to district Indore (0.696) whereas the within district disparity has been found to vary from district Bhind (0.269) to district Gwalior (0.500). On the other hand, the social class disparity in HDI within the district has been found to be the highest in district Jhabua where the HDI ranges from 0.755 in non Scheduled Castes/Tribes in the urban areas to only 0.297 in Scheduled Tribes in the rural areas. Both social class and residence effects contribute almost equally to the observed disparity in HDI within the district and there is a large interaction effect that contributes to further increase in this disparity. In 10 other districts of the state, the within district disparity in HDI has been found to be very high - at least 0.4 points. By contrast, within district disparity in HDI has been found to be the lowest in district Shajapur (0.227) where the HDI ranges from 0.691 in non Scheduled Castes/Tribes population in the urban areas to 0.464 in the Scheduled Tribes population in the rural areas. There are seven other districts in the state where the within district social class and rural urban disparity in HDI has been found to be less than 0.300.

The decomposition exercise suggests that very low HDI in Scheduled Tribes living in the rural areas of the state appears to be the result of both social class effects and residence effects. The social class effects of HDI is a reflection of the marginalisation of a particular class - Scheduled Tribes in the present case - from the mainstream social and economic production system for a host of reasons and circumstances. On the other hand residence effects of HDI is a reflection of some very strong disparities in social, cultural, economic and environmental conditions in rural and urban areas that determine the level of human development. Our analysis suggests that both marginalisation of Scheduled Tribes in the social and economic production system and urban-rural disparity in different dimensions of development contribute to the observed low HDI in Scheduled Tribes in rural areas in the state and in its constituent districts. Results of the mean polish exercise also suggest that high level of participation of non Scheduled Castes/Tribes in production processes accounts for high HDI in the urban areas.

Inequality Adjusted Human Development Index

Given some very strong social class and residence inequality in HDI in the state and in its constituent districts, it is logical to calculate the inequality adjusted HDI. To estimate the inequality adjusted HDI, we follow the methodology adopted by the United Nations in its 2010 Human Development Report (United Nations, 2010). The Inequality-adjusted Human Development Index (IHDI) adjusts the HDI for inequality in the distribution of each of the three dimensions of HDI across the population. It is based on a distribution-sensitive class of composite indices proposed by Foster, Lopez-Calva, and Szekely (2005), which draws on the Atkinson (1970) family of inequality measures. It is computed as a geometric mean of geometric means, calculated across the population for each of the three dimensions of HDI separately (Alkire and Foster 2010). In the present case, IHDI accounts for inequalities by social class and residence in different dimensions of HDI by “discounting” each dimension’s average value according to its level of inequality. The IHDI equals HDI when there is no inequality across social classes and residence. It is less than the HDI when there is inequality in HDI across social classes and residence. In this sense, the IHDI is the actual level of human development (accounting for this inequality), while the HDI can be viewed as an index of "potential" level of human development (or the maximum level of HDI) that could be achieved if there was no inequality. The "loss" in potential level of human development due to inequality is given by the difference between the HDI and the IHDI and can be expressed as a percentage.

The procedure for calculating IHDI comprises of first calculating the inequality measure $A = 1-g/\mu$ where g is the geometric mean and μ is the arithmetic mean of HDI across social classes and residence in the state and in districts. The measure A is calculated for each of the three dimensions of HDI - EDI, LDI and SDI and then inequality adjusted index is calculated as IEDI = (1 - A) EDI, etc. Once the inequality adjusted indexes are calculated for each of the three dimensions, the IHDI has been estimated in the same way as the HDI is calculated - geometric mean of IEDI, ILDI, and ISDI.

In the present analysis, we have used weighted geometric mean and weighted arithmetic mean to calculate the inequality measure A. This is necessary because we shall be measuring within state and within district inequality in HDI across six population groups defined in terms of social groups and residence. Finally, we have also calculated the loss in HDI as the result of the prevailing social class and residence inequality in HDI within the state and within its constituent districts. This loss suggests how reducing social class and residence inequality contributes to improving HDI.

Estimates of the inequality adjusted human development index (IHDI) for Madhya Pradesh and its constituent districts are presented in table 2.11. For the state as a whole, social class and residence inequality in HDI accounts for a loss of almost 4 per cent in HDI so that the IHDI in the state is 0.482 which is low by United Nations standards. In fact, there are only 12 districts in the state where the IHDI is estimated to be more than 0.5 but no district with an IHDI of more than 0.7. The poor state of human development in Madhya Pradesh is obvious. Moreover, since the within district social class and residence inequality varies widely across the districts, the loss in HDI resulting from this inequality also varies across the districts with the highest loss of more than 8 per cent estimated in district Sheopur. This loss has been estimated to be the least - less than 1 per cent - in district Shajapur. In all, there are 8 districts where this loss has been found to more than 5 per cent. By contrast, in 7 districts, this loss has been estimated to be less than 2 per cent.

Conclusions

The most critical challenge to human development in Madhya Pradesh appears to be reduction in social class and residence inequalities which appear to have persisted over time. It is also apparent that the state somewhere lacks political commitment, administrative capacity and organisational efficiency in evolving policies and programmes in meeting the human development needs of different population groups, especially Scheduled Tribes which constitute at least one fifth of the state population. Social class and residence disparities in human development, as measured through HDI, persist in all districts irrespective of the level of social and economic development and social class and rural-urban composition of the population. It is obvious that reducing these inequalities can go a long way in hastening the pace of human development in the state. In this context, there is a need to evolve an alternate philosophy of human development as the existing approach is found to be wanting in the state.

One approach to reducing disparities in human development is through creating, strengthening and sustaining institutions for human capacity building. Institutions can make great difference in capabilities expansion in at least three contexts. First, they create the environment for proper functioning of the social and economic production system. Without proper institutions individuals and societies cannot develop in the context of capabilities expansion. Right kind of development depends upon right kind of policies. Institutions are required for developing right kind of policies. The relationship between development and institution means that there is a causality in both directions - good institutions contribute towards improving the productivity of the social and economic production system and increased productivity of the social and economic system produces good institutions.

Second, institutions might enhance the pro-poor orientation of social and economic development processes, thus aiding the most deprived and marginalised population groups directly. Absence of institutions may contribute to the evolution of development policies that foster the general interest, with little or no special concern for the poor and the marginalised. Third, institutions, especially institutions of higher education and research are necessary for developing new technologies for the economic and social production system and for providing thoroughly trained and skilled manpower necessary for enhancing productivity.

Institutions can be grouped into four categories- state or public institutions, social institutions, market institutions and political institutions. State institutions are essentially government organisations oriented and committed towards human development and human welfare. Social institutions include religious and cultural organisations, non-government agencies and as non-market organisations. Markets, on the other hand, are institutions created by conscious design and governed by well defined sets of rules. They govern production of goods and services. Although, in theory, markets are equal opportunity institutions, in practice, they provide different opportunities to different people. Finally, political institutions encompass the 'constitutional' element of the polity and may be distinguished from public policy and political events, both of which are generally more evanescent.

One common theme that runs across all institutions and that is particularly relevant to human development is decentralisation (Klugman 1994). A shift from highly centralized institutional settings of production of goods and services to a decentralised institutional setup in which local people actively participate in production activities and where local level forces dominate the economic and social production system, is widely regarded as essential for local capacity building and individual capabilities expansion. A decentralised economic and social production system also provides better opportunities for the participation of the people in the production processes.

Madhya Pradesh was the first state in India to implement the 73rd and 74th amendments of the Indian Constitution which was a sincere attempt to seek people's participation in the development processes through democratically elected people's representatives. Decentralisation efforts in the state were attempted through empowering Panchayat Raj Institutions and through the district government model (Government of Madhya Pradesh, *no date*). There were also efforts to promote popular participation in the existing public institutions, especially in health and education. These included constitution of Rogi Kalyan Samiti in every public hospital and Participatory Management Committee in every graduate and post graduate college in the state. The logic of these efforts was to bring the development decision-making nearer to the people. It was expected that democratically elected people's organisations like Gram Panchayat would play a proactive role in all matters related to development. It was also conceived that the process of institutional strengthening at the local level would revive popular involvement in the decision-making processes thereby improving the local capacity and capability for action.

There is, however, little evidence to suggest that the decentralisation efforts in the state have contributed towards any significant decentralisation of the social and economic production system as these efforts could not be able to include the excluded in the economic and social production system (Sah, 2004). Moreover, these efforts were initiated at the political level and therefore had political sensitivity. Unfortunately, this political sensitivity turned out to be the bane of these efforts and, with the change in the democratic government, they met with a totally undesired, premature death. Decentralisation efforts in the state, today, are largely notional in contexts and contents and are dominated by bureaucratic preferences and choices. There is little political initiative. The poor and the deprived in the state continue to remain marginalised not only in the economy but also in other dimensions of human development.

The state can make significant achievements in expanding the capabilities of its citizens through empowering Panchayats - the democratically constituted and constitutionally legal organizations of the people. This, however, requires a long term vision, a strong political commitment and a long term human development policy. Unfortunately, at present, all the three necessary components are currently missing in the state.

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Table 2.1

Evolution of HDI

Year	Indicators used	Method of aggregation	Goal posts
1990	1. Adult literacy rate 2. Expectation of life at birth 3. Gross national product per capita	Linear aggregation	Observed maximum and minimum
1991	1. Adult literacy rate 2. Expectation of life at birth 3. Gross national product per capita 4. Mean years of schooling	Linear aggregation	Observed maximum and minimum
1995	1. Adult literacy rate 2. Expectation of life at birth 3. Gross national product per capita 4. Gross enrolment ratio	Linear aggregation	Fixed goal posts based on trends and projections
2010	1. Mean years of schooling 2. Expected years of schooling 3. Expectation of life at birth 4. Gross national income per capita	Geometric aggregation	Fixed goal posts based on trends and projections

Table 2.2

Indicators used for the calculation of HDI in India and Madhya Pradesh

Report	Health	Education	Living Standard
National Human Development Report 2001	1. Expectation of life at age 1 2. Infant mortality rate	3. Literacy rate in population 7 years and above 4. Intensity of formal education	5. Per capita real consumption expenditure adjusted for inequality
Madhya Pradesh Human Development Report 1995	1. Infant mortality rate	2. Literacy rate in population 7 years and above 3. Female literacy rate 4. Children in school	5. Per capita income 6. Rural poverty index 7. Level of deprivation of the poor
Madhya Pradesh Human Development Report 1998	1. Expectation of life at birth	2. Literacy rate in population 7 years and above 3. Combined school enrolment	4. Per capita income adjusted for distribution and poverty
Madhya Pradesh Human Development Report 2003	1. Expectation of life at birth	2. Literacy rate in population 7 years and above 3. Combined school enrolment	4. Per capita income adjusted for distribution and poverty
Madhya Pradesh Human Development Report 2007	1. Expectation of life at birth	2. Literacy rate in population 7 years and above 3. Combined school enrolment	4. Per capita income adjusted for distribution and poverty

Table 2.3

Results of the regression of logarithm of per capita net district domestic product at constant prices on the proportion of asset less households and the proportion of households not using banking facilities, Madhya Pradesh, 2000-01

Variables in regression	B	SE(B)	β	t	p
Constant	4.718	0.120		39.164	0.000
Proportion of asset less households	-0.469	0.134	-0.448	-3.509	0.001
Proportion of households not using banking facilities	-0.699	0.210	-0.425	-3.330	0.002
$F = 49.095$, $p=0.000$				$R^2 = 0.700$	

Source: Author's calculations

Table 2.4

Estimates of HDI in Madhya Pradesh by social class and residence

Indicator	Total	Scheduled Castes	Scheduled Tribes	Non Scheduled Castes/Tribes
			Combined	
Proportion of house holds with at least one asset (per cent)	57.85	52.89	34.32	67.19
Proportion of households using banking facilities (per cent)	27.92	19.69	13.53	35.04
Expectation of life at birth (years)	55.76	52.92	50.27	58.44
Adult literacy rate (per cent)	60.39	52.63	35.13	69.25
School enrolment ratio (per cent)	70.95	71.54	51.08	77.83
HDI	0.502	0.438	0.326	0.573
			Rural	
Proportion of house holds with at least one asset (per cent)	49.54	46.62	31.91	58.62
Proportion of households using banking facilities (per cent)	21.10	15.93	12.10	26.87
Expectation of life at birth (years)	54.34	51.84	50.06	57.10
Adult literacy rate (per cent)	53.21	48.68	33.81	62.28
School enrolment ratio (per cent)	67.41	70.03	50.19	74.96
HDI	0.444	0.400	0.312	0.513
			Urban	
Proportion of house holds with at least one asset (per cent)	82.01	73.39	63.81	85.16
Proportion of households using banking facilities (per cent)	47.74	31.99	30.95	52.18
Expectation of life at birth (years)	60.65	56.90	54.02	61.79
Adult literacy rate (per cent)	78.18	63.90	52.69	81.89
School enrolment ratio (per cent)	81.88	76.33	64.62	81.18
HDI	0.660	0.553	0.491	0.691

Table 2.5

Districts with the lowest and the highest HDI in Madhya Pradesh

Population group	Total	Scheduled Castes	Scheduled Tribes	Non Scheduled Castes/Tribes
		Total		
Lowest	Dindori	Sheopur	Sheopur	Dindori
	(0.353)	(0.319)	(0.178)	(0.422)
Highest	Indore	Betul	Bhopal	Jhabua
	(0.664)	(0.573)	(0.501)	(0.714)
Coefficient of variation	0.135	0.141	0.135	0.108
		Rural		
Lowest	Jhabua	Sheopur	Sheopur	Dindori
	(0.323)	(0.288)	(0.168)	(0.392)
Highest	Shajapur	Betul	Shajapur	Jhabua
	(0.556)	(0.531)	(0.435)	(0.669)
Coefficient of variation	0.118	0.130	0.126	0.102
		Urban		
Lowest	Sheopur	Rewa	Shivpuri	Sheopur
	(0.573)	(0.430)	(0.317)	(0.605)
Highest	Indore	Betul	Seoni	Jhabua
	(0.711)	(0.660)	(0.606)	(0.755)
Coefficient of variation	0.049	0.095	0.145	0.046

Source: Author's calculations
Remarks: Figures in parentheses are values of HDI

Table 2.6

Distribution of HDI in districts of Madhya Pradesh

Population group	Number of districts where HDI is				
	Very low	Low	Medium	High	Very high
	<0.30	0.30-0.50	0.50-0.70	0.70-0.80	≥0.80
			Total		
All	0	25	20	0	0
Scheduled Castes (SC)	0	40	5	0	0
Scheduled Tribes (ST)	19	25	1	0	0
Non SC/ST	0	8	35	2	0
			Rural		
All	0	39	6	0	0
Scheduled Castes (SC)	1	42	2	0	0
Scheduled Tribes (ST)	24	21	0	0	0
Non SC/ST	0	21	24	0	0
			Urban		
All	0	0	44	1	0
Scheduled Castes (SC)	0	9	36	0	0
Scheduled Tribes (ST)	0	25	20	0	0
Non SC/ST	0	0	35	10	0

Source: Author's calculations

Table 2.7

Indices of the three dimensions of HDI

Population	EDI			LDI			SDI		
	Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban
					Index				
Total	0.615	0.552	0.773	0.513	0.489	0.594	0.402	0.323	0.626
SC	0.561	0.527	0.656	0.465	0.447	0.532	0.323	0.272	0.485
ST	0.381	0.369	0.550	0.421	0.418	0.484	0.215	0.196	0.444
Non SC/ST	0.695	0.635	0.806	0.557	0.535	0.613	0.485	0.397	0.667
					Inter-district weighted coefficient of variation				
Total	0.139	0.152	0.046	0.105	0.104	0.062	0.218	0.192	0.083
SC	0.157	0.176	0.101	0.133	0.141	0.088	0.215	0.189	0.149
ST	0.218	0.225	0.185	0.131	0.132	0.143	0.222	0.216	0.193
Non SC/ST	0.093	0.105	0.041	0.090	0.099	0.056	0.188	0.186	0.083

Source: Author's calculations

Remarks: SC Scheduled Castes

ST Scheduled Tribes

Table 2.8

Distribution of education development index (EDI), health development index (LDI) and standard of living index (SDI) in the districts of Madhya Pradesh

Population group	Number of districts				
	Very low <0.30	Low 0.30-0.50	Medium 0.50-0.70	High 0.70-0.80	Very high ≥0.80
			EDI (Total)		
Total	0	3	38	4	0
SC	0	13	27	5	0
ST	8	30	7	0	0
Non SC/ST	0	0	23	21	1
			EDI (Rural)		
Total	1	6	27	1	0
SC	0	20	21	4	0
ST	11	31	3	0	0
Non SC/ST	0	3	37	5	0
			EDI (Urban)		
Total	0	0	2	34	9
SC	0	2	32	8	3
ST	0	17	26	2	0
Non SC/ST	0	0	2	22	21
			LDI (Total)		
Total	0	21	24	0	0
SC	0	29	16	0	0
ST	3	38	4	0	0
Non SC/ST	0	9	36	0	0
			LDI (Rural)		
Total	0	25	20	0	0
SC	0	33	12	0	0
ST	3	39	3	0	0
Non SC/ST	0	13	32	0	0
			LDI (Urban)		
Total	0	0	45	0	0
SC	0	14	31	0	0
ST	0	29	16	0	0
Non SC/ST	0	0	45	0	0

Population group	Number of districts				
	Very low <0.30	Low 0.30-0.50	Medium 0.50-0.70	High 0.70-0.80	Very high ≥0.80
			SDI (Total)		
Total	4	37	4	0	0
SC	19	26	0	0	0
ST	40	5	0	0	0
Non SC/ST	1	27	16	1	0
			SDI (Rural)		
Total	21	24	0	0	0
SC	35	10	0	0	0
ST	44	1	0	0	0
Non SC/ST	3	37	5	0	0
			SDI (Urban)		
Total	0	1	41	3	0
SC	0	29	16	0	0
ST	6	29	10	0	0
Non SC/ST	0	36	9	0	0

Source: Author’s calculations.

Table 2.9

Decomposition of inter-district inequality in HDI, EDI, LDI and SDI

Population		HDI	EDI	LDI	SDI
Total	MLD	0.033	0.042	0.007	0.064
	Within district	72.71	73.84	17.86	63.48
	Between districts	27.29	26.16	82.14	36.52
Rural	MLD	0.031	0.044	0.008	0.060
	Within district	76.94	68.97	27.87	67.78
	Between districts	23.06	31.03	72.11	32.22
Urban	MLD	0.006	0.010	0.002	0.010
	Within district	79.11	88.54	16.89	58.42
	Between districts	20.89	11.46	83.11	41.58

Source: Author's calculations

Table 2.10

Grand mean and within state/district disparity in HDI in Madhya Pradesh

State/district	Grand mean	Within district disparity			
		Total	Residence effects	Social class effects	Residual
Madhya Pradesh	0.498	0.379	0.174	0.200	0.004
Sheopur	0.360	0.437	0.202	0.232	0.003
Morena	0.455	0.388	0.179	0.167	0.042
Bhind	0.531	0.269	0.117	0.138	0.013
Gwalior	0.594	0.500	0.202	0.202	0.096
Datia	0.510	0.441	0.156	0.254	0.030
Shivpuri	0.439	0.425	0.171	0.260	-0.006
Guna	0.436	0.400	0.175	0.223	0.002
Tikamgarh	0.465	0.368	0.153	0.225	-0.010
Chhatarpur	0.454	0.411	0.208	0.202	0.000
Panna	0.423	0.433	0.207	0.221	0.004
Sagar	0.483	0.426	0.214	0.194	0.019
Damoh	0.446	0.385	0.192	0.196	-0.003
Satna	0.496	0.410	0.119	0.295	-0.004
Rewa	0.505	0.424	0.124	0.300	-0.000
Umaria	0.445	0.378	0.169	0.199	0.011
Shahdol	0.467	0.403	0.214	0.190	-0.001
Sidhi	0.422	0.412	0.197	0.217	-0.002
Neemuch	0.554	0.420	0.145	0.280	-0.005
Mandsaur	0.540	0.343	0.127	0.221	-0.005
Ratlam	0.518	0.378	0.136	0.228	0.014
Ujjain	0.560	0.291	0.149	0.160	-0.017
Shajapur	0.540	0.291	0.150	0.150	-0.008
Dewas	0.500	0.415	0.147	0.264	0.004
Jhabua	0.403	0.458	0.171	0.326	-0.040
Dhar	0.476	0.305	0.055	0.252	-0.002
Indore	0.656	0.429	0.136	0.238	0.055
West Nimar	0.468	0.331	0.122	0.210	-0.001
Barwani	0.380	0.391	0.155	0.236	0.000
East Nimar	0.486	0.360	0.129	0.222	0.010
Rajgarh	0.464	0.279	0.177	0.093	0.009
Vidisha	0.452	0.407	0.167	0.221	0.018
Bhopal	0.605	0.423	0.203	0.134	0.086
Sehore	0.504	0.372	0.150	0.213	0.009
Raisen	0.481	0.320	0.123	0.203	-0.005
Betul	0.537	0.384	0.128	0.251	0.005
Harda	0.501	0.419	0.121	0.300	-0.002
Hoshangabad	0.535	0.363	0.169	0.181	0.013
Katni	0.445	0.440	0.221	0.227	-0.008

State/district	Grand mean	Within district disparity			
		Total	Residence effects	Social class effects	Residual
Jabalpur	0.580	0.421	0.212	0.206	0.003
Narsimhapur	0.517	0.319	0.138	0.179	0.002
Dindori	0.344	0.320	0.219	0.061	0.040
Mandla	0.425	0.364	0.219	0.143	0.001
Chhindwara	0.532	0.358	0.161	0.188	0.009
Seoni	0.469	0.339	0.198	0.135	0.006
Balaghat	0.491	0.331	0.190	0.138	0.003

Source: Author's calculations

Remarks: Total disparity in HDI in the state/district is the arithmetic difference between the highest and the lowest HDI in the state/district.

Table 2.11

Inequality adjusted human development index in Madhya Pradesh.

State/ District	IEDI	ILDI	ISDI	IHDI	Loss %
Madhya Pradesh	0.596	0.508	0.371	0.482	3.919
Sheopur	0.403	0.455	0.211	0.338	8.494
Morena	0.612	0.509	0.290	0.449	2.541
Bhind	0.687	0.587	0.378	0.534	1.358
Gwalior	0.657	0.568	0.538	0.586	3.014
Datia	0.695	0.478	0.397	0.509	1.844
Shivpuri	0.546	0.439	0.323	0.426	3.941
Guna	0.548	0.454	0.307	0.424	4.335
Tikamgarh	0.527	0.469	0.395	0.460	1.691
Chhatarpur	0.494	0.471	0.395	0.451	2.788
Panna	0.577	0.406	0.298	0.412	4.174
Sagar	0.631	0.484	0.311	0.457	4.551
Damoh	0.575	0.452	0.303	0.428	3.730
Satna	0.608	0.453	0.407	0.482	3.950
Rewa	0.590	0.517	0.390	0.491	4.166
Umaria	0.550	0.437	0.312	0.422	4.472
Shahdol	0.549	0.473	0.335	0.443	6.439
Sidhi	0.482	0.444	0.316	0.407	5.884
Neemuch	0.611	0.572	0.453	0.541	2.539
Mandsaur	0.655	0.556	0.442	0.544	1.138
Ratlam	0.609	0.503	0.401	0.497	5.155
Ujjain	0.663	0.570	0.490	0.570	1.997
Shajapur	0.672	0.570	0.483	0.570	0.814
Dewas	0.564	0.520	0.396	0.488	4.732
Jhabua	0.319	0.435	0.280	0.338	5.624
Dhar	0.470	0.525	0.390	0.458	4.193
Indore	0.712	0.645	0.596	0.649	2.240
West Nimar	0.566	0.546	0.311	0.458	3.773
Barwani	0.348	0.459	0.259	0.346	6.813
East Nimar	0.551	0.509	0.347	0.460	4.903
Rajgarh	0.510	0.532	0.374	0.466	1.581
Vidisha	0.582	0.459	0.330	0.445	3.152
Bhopal	0.719	0.579	0.556	0.614	1.812
Sehore	0.605	0.539	0.379	0.498	2.845
Raisen	0.689	0.537	0.284	0.472	3.403
Betul	0.614	0.530	0.369	0.494	5.542
Harda	0.601	0.463	0.390	0.477	5.406
Hoshangabad	0.667	0.497	0.423	0.520	3.274
Katni	0.586	0.388	0.332	0.423	5.168
Jabalpur	0.715	0.541	0.418	0.545	4.870

State/ District	IEDI	ILDI	ISDI	IHDI	Loss %
Narsimhapur	0.743	0.561	0.318	0.510	2.179
Dindori	0.511	0.491	0.162	0.344	2.521
Mandla	0.563	0.464	0.222	0.387	4.822
Chhindwara	0.624	0.544	0.366	0.499	4.126
Seoni	0.619	0.535	0.284	0.455	2.991
Balaghat	0.659	0.528	0.311	0.477	2.234

Source: Author's calculations

Table 2.A

Human development index by social class and rural-urban residence in districts of Madhya Pradesh

District	Total				Rural				Urban			
	Total	SC	ST	Non SC/ST	Total	SC	ST	Non SC/ST	Total	SC	ST	Non SC/ST
Sheopur	0.369	0.319	0.178	0.444	0.326	0.288	0.168	0.397	0.573	0.467	0.362	0.605
Morena	0.460	0.376	0.302	0.485	0.415	0.355	0.244	0.434	0.598	0.456	0.548	0.632
Bhind	0.541	0.451	0.469	0.568	0.509	0.433	0.392	0.532	0.630	0.508	0.528	0.661
Gwalior	0.604	0.499	0.322	0.645	0.469	0.431	0.217	0.506	0.687	0.557	0.565	0.717
Datia	0.518	0.439	0.277	0.552	0.482	0.417	0.232	0.513	0.649	0.555	0.504	0.672
Shivpuri	0.444	0.394	0.219	0.498	0.408	0.374	0.215	0.460	0.613	0.524	0.317	0.640
Guna	0.443	0.367	0.243	0.499	0.396	0.342	0.233	0.448	0.602	0.473	0.386	0.633
Tikamgarh	0.468	0.421	0.267	0.498	0.439	0.400	0.259	0.467	0.601	0.539	0.329	0.627
Chhatarpur	0.464	0.374	0.270	0.504	0.414	0.348	0.259	0.448	0.638	0.500	0.425	0.670
Panna	0.430	0.340	0.265	0.497	0.398	0.326	0.262	0.459	0.638	0.454	0.340	0.694
Sagar	0.478	0.395	0.273	0.532	0.412	0.347	0.257	0.462	0.645	0.520	0.510	0.684
Damoh	0.445	0.359	0.279	0.501	0.405	0.328	0.273	0.458	0.621	0.500	0.422	0.658
Satna	0.502	0.391	0.271	0.576	0.469	0.379	0.268	0.543	0.629	0.447	0.321	0.678
Rewa	0.513	0.360	0.279	0.587	0.486	0.350	0.272	0.560	0.643	0.430	0.343	0.697
Umaria	0.442	0.436	0.327	0.544	0.404	0.399	0.316	0.498	0.618	0.544	0.429	0.694
Shahdol	0.474	0.454	0.343	0.588	0.394	0.390	0.321	0.489	0.678	0.589	0.494	0.724
Sidhi	0.433	0.361	0.280	0.521	0.390	0.324	0.269	0.474	0.635	0.529	0.412	0.680
Neemuch	0.555	0.493	0.295	0.594	0.510	0.455	0.277	0.551	0.674	0.602	0.401	0.697
Mandsaur	0.550	0.462	0.350	0.579	0.523	0.452	0.340	0.551	0.666	0.547	0.424	0.683
Ratlam	0.524	0.472	0.320	0.618	0.460	0.432	0.307	0.569	0.669	0.603	0.509	0.685
Ujjain	0.581	0.468	0.460	0.626	0.514	0.428	0.418	0.559	0.683	0.575	0.526	0.710
Shajapur	0.574	0.479	0.451	0.609	0.556	0.472	0.435	0.592	0.654	0.548	0.582	0.670
Dewas	0.512	0.420	0.290	0.589	0.457	0.386	0.270	0.538	0.646	0.527	0.429	0.684

District	Total				Rural				Urban			
	Total	SC	ST	Non SC/ST	Total	SC	ST	Non SC/ST	Total	SC	ST	Non SC/ST
Jhabua	0.358	0.426	0.306	0.714	0.323	0.376	0.297	0.669	0.681	0.624	0.537	0.755
Dhar	0.478	0.462	0.361	0.630	0.450	0.447	0.358	0.614	0.611	0.516	0.421	0.662
Indore	0.664	0.556	0.402	0.710	0.545	0.464	0.310	0.617	0.711	0.601	0.526	0.739
West Nimar	0.476	0.429	0.338	0.571	0.446	0.412	0.334	0.541	0.634	0.534	0.446	0.665
Barwani	0.371	0.364	0.279	0.572	0.326	0.327	0.273	0.511	0.610	0.477	0.431	0.664
East Nimar	0.484	0.457	0.299	0.578	0.431	0.427	0.292	0.534	0.635	0.556	0.465	0.652
Rajgarh	0.474	0.386	0.395	0.499	0.441	0.372	0.372	0.462	0.624	0.477	0.546	0.651
Vidisha	0.460	0.353	0.241	0.504	0.418	0.330	0.224	0.462	0.605	0.473	0.461	0.631
Bhopal	0.625	0.512	0.501	0.652	0.449	0.381	0.261	0.481	0.664	0.559	0.569	0.685
Sehore	0.513	0.425	0.323	0.567	0.479	0.403	0.306	0.536	0.655	0.564	0.526	0.678
Raisen	0.489	0.407	0.331	0.548	0.455	0.386	0.320	0.518	0.613	0.525	0.421	0.640
Betul	0.523	0.573	0.342	0.645	0.476	0.531	0.332	0.610	0.694	0.660	0.542	0.716
Harda	0.504	0.459	0.288	0.617	0.461	0.435	0.282	0.582	0.666	0.567	0.403	0.701
Hoshangabad	0.537	0.468	0.357	0.591	0.475	0.408	0.327	0.534	0.669	0.600	0.558	0.690
Katni	0.446	0.382	0.277	0.520	0.393	0.350	0.267	0.458	0.654	0.516	0.372	0.707
Jabalpur	0.573	0.497	0.353	0.636	0.432	0.399	0.297	0.499	0.685	0.574	0.509	0.718
Narsimhapur	0.521	0.444	0.374	0.566	0.495	0.429	0.364	0.538	0.652	0.537	0.482	0.683
Dindori	0.353	0.378	0.315	0.422	0.338	0.365	0.311	0.392	0.594	0.631	0.476	0.627
Mandla	0.407	0.487	0.322	0.510	0.375	0.452	0.316	0.463	0.663	0.651	0.552	0.680
Chhindwara	0.520	0.553	0.366	0.607	0.465	0.511	0.348	0.555	0.681	0.649	0.557	0.705
Seoni	0.469	0.497	0.363	0.532	0.442	0.479	0.356	0.499	0.680	0.631	0.606	0.694
Balaghat	0.488	0.523	0.372	0.519	0.459	0.494	0.350	0.489	0.658	0.649	0.550	0.681

Source: Author's calculations

IGNOMINY OF CHILD DEPRIVATION

Background

In recent years, there has been an increased interest on the impact of poverty on survival, growth and development of children (Lister, 2004). This focus is best reflected in the Millennium Development Goals which are part of the Millennium Development Agenda adopted by the United Nations (United Nations, 2000). Two of the eight Millennium Development Goals - universal primary education and reduction in child mortality - are directly related to survival and growth and development of children while the goal of eradicating extreme poverty and hunger has an indirect impact on the well-being of children. The Millennium Development Agenda which constitutes the basis for the Millennium Development Goals, promotes policies that improve lives of poor children worldwide. Poverty, at this early stage of life, has enduring consequences on those who survive into adulthood. It condemns them to recurrent poverty spells and a life full of hardship (Grinspun, 2004).

Another reason behind increased attention towards the well-being of children is the Convention on the Rights of the Child which lays down the principles of non discrimination in the best interest of the child along with the common standards for various rights of children. It takes into account the different cultural, social, economic and political realities in which children live.(United Nations, 1989). By ratifying the Convention in 1992, India has committed herself to protecting and advancing children's rights, to developing and undertaking all actions and policies in the light of the best interests of children, and has agreed to hold herself accountable for this commitment before the international community. Since then, there have been numerous attempts to mainstreaming child rights issues in the development discourse of the country. These included Campaign against Child Labour launched in 1992, Campaign against Child Trafficking in India launched in 2001 which is also a pert of the International Campaign against Child Trafficking, Child Rights Group within the World Social Forum, etc. At the government level also, there has been some renewed wisdom about issues related to children which has resulted in the draft Integrated Child Protection Scheme. The scheme is based on the cardinal principles of "protection of child rights" and "best interests of the child". It aims to promote the best interests of the child and prevent violations of child rights through appropriate punitive measures against perpetrators of the abuse and crimes against children and to ensure rehabilitation for all children in need of care and protection. It aims to create a protective environment by improving regulatory frameworks, strengthening structures and professional capacities at national, state and district level so as to cover all child protection issues and provide child friendly services at all levels (Government of India, 2007). The scheme was envisaged to be launched during the XI Five-year Development Plan (2007-2012). However, it is yet to see the light of the day.

In India, rights of children are enshrined in the fundamental rights and the directive principles of the state policy as inscribed in the Constitution of India. These rights have been reaffirmed in the National Policy on Children which was announced, for the first time, in 1974 (Government of India, 1974). This policy states that it shall be the policy of the state to provide adequate services to children, both before and after birth and through the period of growth, to ensure their full physical, mental and social development. The policy also articulates that the state shall progressively increase the scope of such services so that, within a reasonable time, all children in the country enjoy optimum conditions for their survival, balanced growth and cognitive development. In particular, the policy advocates that the following measures shall be adopted towards the attainment of these objectives:

- All children shall be covered by a comprehensive health programme.
- Programmes shall be implemented to provide nutrition services with the object of removing deficiencies in the diet of children.
- Programmes will be undertaken for the general improvement of the health and for the care, nutrition and nutrition education of expectant and nursing mothers.
- The state shall take steps to provide free and compulsory education for all children up to 14 years of age for which a time-bound programme will be drawn up consistent with the availability of resources.
- Special efforts will be made to reduce prevailing wastage and stagnation in schools, particularly in case of girls and children of the weaker sections of the society. The programme of informal education for pre-school children from such sections will also be taken up.

- Children who are not able to take full advantage of formal school education should be provided other forms of education suited to their requirements.
- Physical education, games, sports and other types of recreational as well as cultural and scientific activities shall be promoted in schools, community centres and such other institutions.
- To ensure equality of opportunity, special assistance shall be provided to all children belong to the weaker sections of the society, such as children belonging to the Scheduled Castes and Scheduled Tribes and those belonging to the economically weaker sections, both in urban and rural areas.
- Children who are socially handicapped, who have become delinquent or have been forced to take to begging or are otherwise in distress, shall be provided facilities of education, training and rehabilitation and will be helped to become useful citizens.
- Children shall be protected against neglect, cruelty and exploitation.
- No child under 14 years of age shall be permitted to be engaged in any hazardous occupation or be made to undertake heavy work.
- Facilities shall be provided for special treatment, education, rehabilitation and care of children who are physically handicapped, emotionally disturbed or mentally retarded.
- Children shall be given priority for protection and relief in times of distress or natural calamity.
- Special programmes shall be formulated to spot, encourage and assist gifted children, particularly those belonging to the weaker sections of the society.
- Existing laws would be amended so that in all legal disputes whether between parents or institutions, the interest of children are given paramount consideration.
- In organising services for children, efforts would be directed to strengthen family ties so that full potentialities of growth of children are realised within the normal family, neighbourhood and community environment.

Despite all these provisions and commitments, protecting rights of children in India remains a major development challenge because of a number of social, cultural and economic factors. Although, child protection is increasingly being recognised as a human rights concept, yet, children and their conditions are still considered to be the property of the father who is seen as the natural guardian of the child. Traditional structures of patriarchy and other social groupings continue to justify extreme forms of chastisement of children (Kushwah and Prasad, 2009). In order to realise the rights of the child and tackle child poverty, robust measures that quantify the nature and extent of deprivation experienced by children are required.

The aim of the present paper is to develop a composite child deprivation index to measure child deprivation in Madhya Pradesh and in its constituent districts by social class and residence. In terms of survival, growth and development of children, Madhya Pradesh requires a serious introspection. Latest data released by the Registrar General of India indicates that the state has the highest risk of death during infancy in the country and this situation has prevailed over the last six years. In fact, Madhya Pradesh has always remained amongst the five poorest states of India in terms of the risk of death during infancy or during the first five years of life. The XI Five-year Development Plan (2007-2012) of the state aims at reducing infant mortality rate to 40 infant deaths per 1000 live births by the year 2012 but the challenge remains how to achieve this goal. Almost 60 per cent children below five years of age have been estimated to be under nourished which appears to be a major contributing factor in the persistence of high to very high risk of death during infancy and during early childhood. The situation is compounded further by the prevailing levels of poverty, illiteracy, especially among women in the reproductive age group, poor health infrastructure and inadequate safe drinking water and sanitation facilities. Addressing the offending environment that children in Madhya Pradesh face is a major development challenge.

The present paper follows the rights framework of addressing the survival, growth and development needs of children. The child rights framework has been evolved in recognition of the fact that a child is a human being but is dependent upon other human beings till the time she or he grows and develops into a responsible yet productive member of the society. This implies that, as human beings, children have a certain moral status that needs to be recognised in the family and the society. This also means that there are things that should not be done to children for the simple reason that they are human beings and there are certain things that should be done to children to ensure that they become responsible and productive assets to the society. The child rights perspective is an attempt to ensure that children are treated in the family and the society in the morally right way.

The rights that serve the ‘best interests’ of children can be articulated in many ways but can broadly be grouped into two categories – positive rights and moral rights. Positive rights are those, which are recognised by law. Moral rights, on the other hand, are the ones, which are recognised by some moral theory and accepted by the society as a social norm. The important point is that entailing positive or legal rights to children does not ensure that they also have moral rights. One argument is that possession of a right is sufficient to outweigh or discount all other moral considerations (Nozick, 1974). The counter argument is that possession of rights may not out balance every other moral claim. An important consideration to decide between the two is the capability to exercise rights. This is particularly relevant in case of children as they do not have the necessary capability to exercise the rights bestowed upon them. They are dependent upon other members of the family and the society. Obviously, by just possessing a set of rights, children cannot serve their own 'best interests'. There must be conditions in place, which ensure that the child rights are actually exercised in an effective yet socially acceptable manner. These pre-conditions, obviously, are not controlled by children.

United Nations Convention for the Rights of the Child and the National Policy on Children provide the policy framework to enhance the capabilities of children. The child rights perspective also requires an operational framework for planning, implementing and evaluating interventions directed towards improving capabilities of children. Such an operational framework can be derived following the capability approach first propounded by Sen (1985) and later discussed in Sen and Nussbaum (1993). The Sen's approach has widely been applied in the welfare economics in shifting the focus from economic development to human development and is now widely accepted as the new paradigm of development.

The Child Deprivation Index

The conceptual basis of the child deprivation index is the idea of distinct domains of deprivation which can be recognised and measured separately. These are experienced by children living in an area (a country, a state, a district or a village, etc.). Children may be counted as deprived in one or more of the domains, depending on the number and types of deprivation that they experience.

The domains of deprivations can be defined in different contexts. In the context of child rights perspective, domains of child deprivation can be defined in the framework of child well-being - material well-being, health, education, housing and environment, etc. The domains of child deprivation can also be defined in the framework of Sen's capability approach according to which child deprivation may be conceptualised in terms of child endowments, child capacities and child opportunities. It is possible to establish a congruence between Sen's approach and the child well-being approach as shown in the table 3.1.

Each domain of child deprivation reflects a separate aspect of deprivation which avoids the need to make judgments about the complex links between different types of deprivation, and the contribution that each domain should make to the overall index of deprivation. It is possible, however, that the same child could be captured in more than one domain. This is expected as deprivation is often multi-dimensional in nature. It is therefore desirable and appropriate to capture deprivation occurring in more than one domain.

The child deprivation index, therefore, comprises of selecting domains and measuring deprivation in each domain through appropriate indicator of deprivation and combining them into a composite index. The actual choice of domain is determined by the availability of the data about the indicator which reflects the deprivation in the domain concerned.

Table 3.1
The domains of child deprivation

Sen's capability approach	Child well-being approach
Endowment domain	Material well-being domain
	Housing domain
Capacity domain	Health domain
Opportunity domain	Education domain
	Environment domain

In this paper, we have selected the following four variables to develop the child deprivation index:

1. Proportion of households having none of the six specified assets (radio/transistor, television, telephone, bicycle, moped/scooter/motorcycle, and jeep/car, etc.)
2. Proportion of live births not surviving up to their fifth birth day.
3. Proportion of children 7-14 years of age illiterate.
4. Proportion of households without latrines.

The four indicators reflect deprivation in terms of four domains of child well-being. The proportion of asset less households reflects deprivation in terms of material well-being. The proportion of live births not surviving up to their fifth birth days reflects deprivation in terms of health well-being. The proportion of children 7-14 years of age who are illiterate reflects deprivation in education domain while the proportion of households without latrines reflect the deprivation in terms of environment domain of child well-being. These indicators also represent Sen's capability domain. The first and the fourth indicator reflect the deprivation in endowment domain, the second in the capacity domain while the third in the opportunity domain. The indicators so selected have been normalised so that they vary between 0 and 100 with 0 representing no deprivation and 100 representing total deprivation. The normalised variables were then combined into the composite child deprivation index (CDI) according to the following formula

$$CDI = \{(a^3+u^3+e^3+s^3)/4\}^{(1/3)} \qquad (1)$$

where

a = proportion of asset less households as described above,

u = the risk of death in the first five years of life,

e = proportion of children 7-14 years of age illiterate, and

s = proportion of households without latrine.

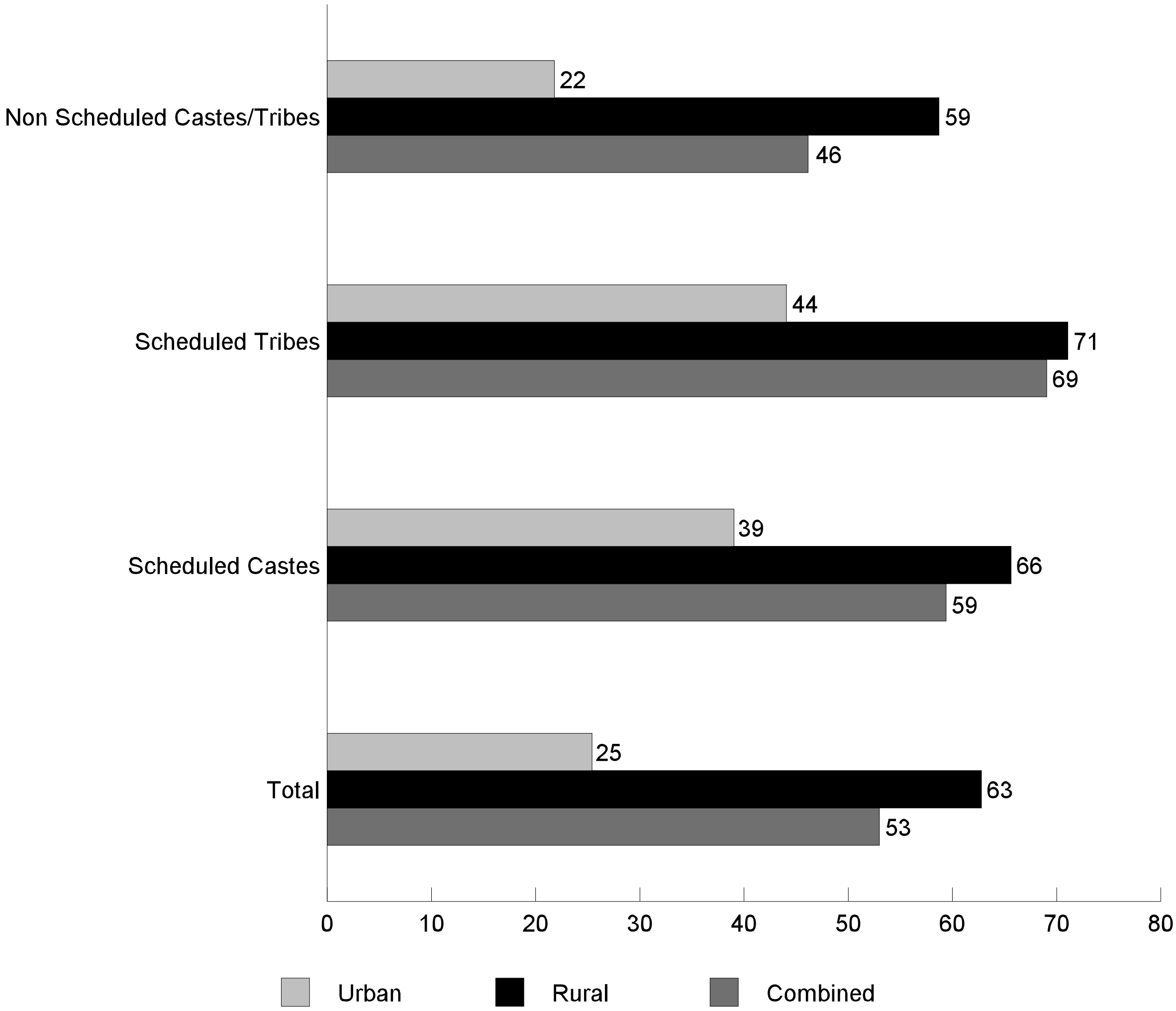
The child deprivation index defined by equation (1) ranges between 0 and 100. If the value of the index is 0, it means there is no deprivation. On the other hand, if the value of the index is 100, then it means total deprivation. The child development index defined by equation (1) is very similar to the human poverty index developed by the United Nations and used to measure multi-dimensional human poverty.

The four indicators used in calculating the child development index were estimated for the state and its constituent districts for different social classes and separately for rural and urban areas on the basis of the information available through the 2001 population census. Estimates of the proportion of asset less households, proportion of children 7-14 years of age illiterate and proportion of households without latrines were derived directly from the information available through the census. The estimates so obtained have then been normalised with a minimum value of 0 and a maximum value of 100. On the other hand, estimates of the risk of death in the first five years of life were derived from the children ever born and children surviving data available through the census using the methodology suggested by Brass (1975). Actual calculations were carried out using the MortPak-Lite software package for mortality estimation developed by the United Nations (United Nations 1988). Finally, the risk of death during the first five years of life so obtained was normalised using the minimum value of 0 and the maximum value of 0.340 which is the highest risk of death in the first five years of life ever recorded in the world.

Child Deprivation in Madhya Pradesh

Estimates of the child deprivation index in Madhya Pradesh around the year 2001 are given in table 3.2 for the state as a whole as well as for its different population subgroups - Scheduled Castes, Scheduled Tribes and non Scheduled Castes/Tribes - separately by residence. For the

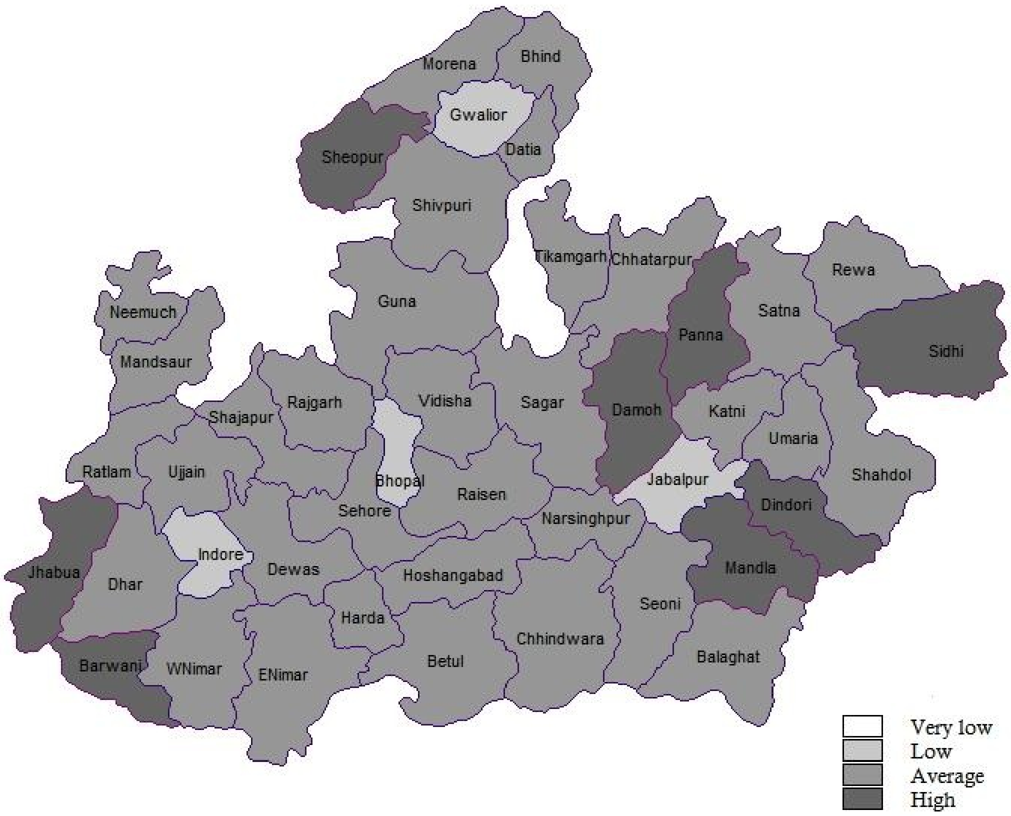
Figure 3.1
Child Deprivation Index in Madhya Pradesh



state as a whole and for all social classes combined, the child deprivation index has been estimated to be approximately 53 around the year 2001 which means that child deprivation in the state may be termed as high and unacceptable. There also exists a very wide gap in the child deprivation index in Scheduled Tribes (69) as compared to non-Scheduled Castes/Tribes (46). Similarly, the index has been found to be very high in rural (63) as compared to urban areas (25). The very strong social class differences and rural urban gap in child deprivation may be judged from the wide gap in the child deprivation index in rural Scheduled Tribes children (71) as compared to the urban non Scheduled Castes/Tribes children (22). It is clear that Scheduled Tribes children living in the rural areas of the state face extreme form of deprivation.

Among the districts of the state, the child deprivation index varies widely which reflects wide inter-district variations in child deprivation. Summary measures of inter-district variation in the

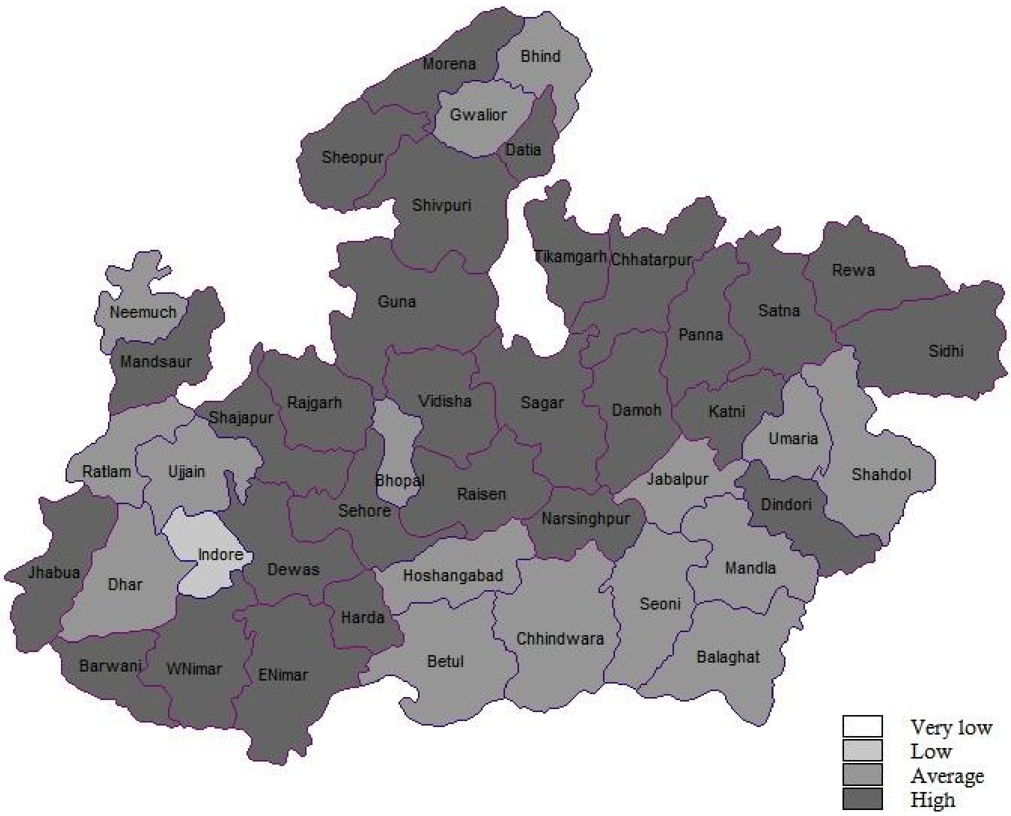
Figure 3.2
Child Deprivation Index in districts of Madhya Pradesh
Total population



child development index are given in table 3.2. For the total population, the child deprivation index varies from a low of around 24 in district Indore to a high of around 70 in district Dindori. In Sheopur, Panna, Damoh, Sidhi, Jhabua, Barwani and Mandla districts, the child deprivation index has been estimated to range between 60 and 70 indicating that children in these districts face a very high degree of deprivation. By contrast, there are only two districts - Indore and Bhopal - where the child deprivation index has been estimated to be less than 30. In case of Scheduled Castes, there were 28 districts where the child development index was 60 and above whereas in case of Scheduled Tribes, the child development index was 60 and more in 41 of the 45 districts of the state. In case of non Scheduled Castes/Tribes, there was only one district where the child deprivation index was more than 60.

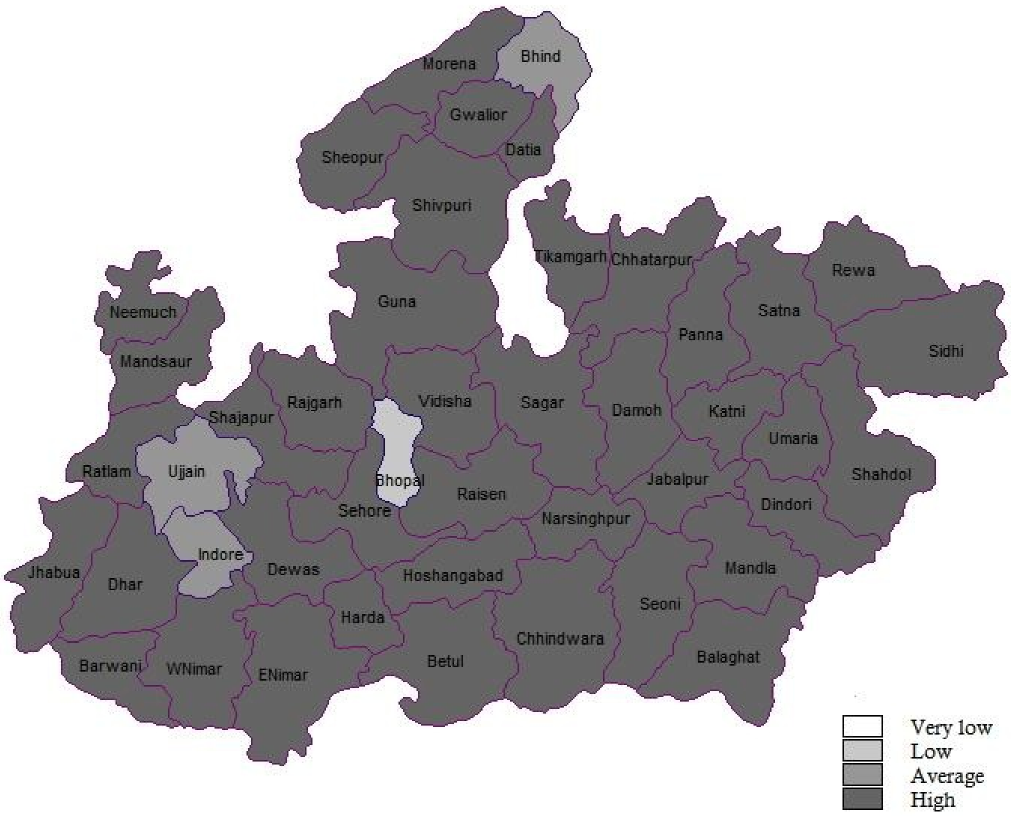
As regards rural-urban differentials in child deprivation, the situation appears to be the worse in the rural areas in all districts of the state (Table 3.3). In 34 districts of the state, the child development index in the rural areas has been found to be 60 and more whereas in case of

Figure 3.3
Child Deprivation Index in districts of Madhya Pradesh
Scheduled Castes population



Scheduled Castes living in the rural areas, there is only one district (Indore) where the child deprivation index is estimated to be less than 60. On the other hand, there is no district in the state where the child deprivation index in Scheduled Tribes living in the rural areas is estimated to be less than 60. There is also no district in the state where the child deprivation index in the urban areas has been found to be 60 and more. Similarly, there is no district in the state where the child deprivation index in Scheduled Castes in the urban areas is estimated to be 60 and more. In case of Scheduled Tribes living in the urban areas, there are only four districts - Sheopur, Panna, Satna and Rewa - where the child deprivation index has been found to be at least 60. Moreover, in all districts, the child deprivation index in non-Scheduled Castes/Tribes population has been found to be the lowest across all social classes either in rural or in urban areas whereas the index has been found to be the highest in the Scheduled Castes rather than in Scheduled Tribes in Bhind, Shajapur, Rajgarh and Bhopal districts. Similarly, in the urban areas also, the child deprivation index has been found to be the highest in the Scheduled Castes in Gwalior, Sagar, Mandsaur, Shajapur, Rajgarh and Bhopal districts. It appears that most of the dividends

Figure 3.4
Child Deprivation Index in districts of Madhya Pradesh
Scheduled Tribes population



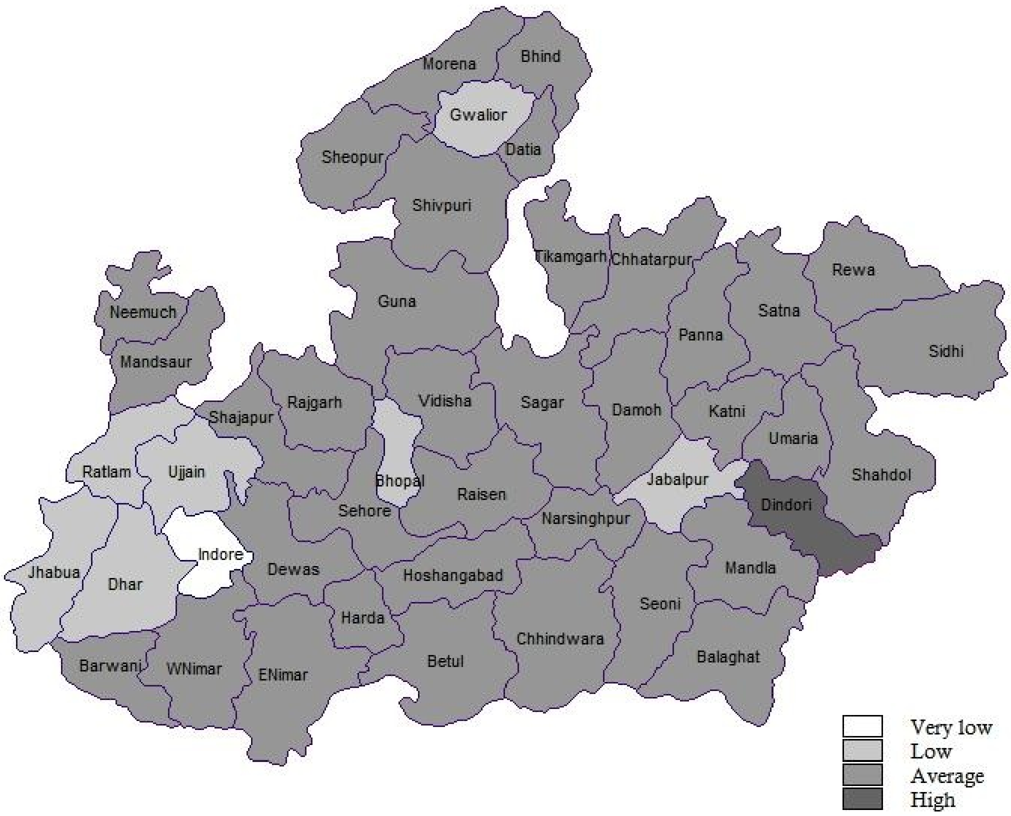
of social and economic development in general and child development efforts, in particular, have been confined to non-Scheduled Castes/Tribes population living in the urban areas in the state as well as in its constituent districts while Scheduled Tribes children living in the rural areas of the state continue to face the extreme level of deprivation.

Social Class and Residence Effects of Child Deprivation

Given the fact that child deprivation in Madhya Pradesh is affected by both social class and residence, we have used the technique of median polish (Tuckey, 1977) to analyse the social class and residence effects on the child deprivation index. Median polish is an exploratory data analysis technique for examining the significance of the various factors in a multi-factor model. It is a robust and resistant method for computing additive decomposition of a two-way table. An additive decomposition of a two way table Z having *r* rows and *c* columns is a vector *x* of row effects, vector *y* of column effects and a table R of residuals such that

$$Z_{ij} = x_i + y_j + R_{ij} \text{ for all } i \text{ and } j.$$

Figure 3.5
Child Deprivation Index in districts of Madhya Pradesh
Non Scheduled Castes/Tribes population



Median polish is more robust than the conventional analysis of variance model. It makes no assumption about the distribution or structure of the data. It is model free exploratory data analysis procedure. It remains effective when the tabulated data are rates or counts or any other kind of value classified in a two way table.

Results of the application of the median polish technique to analyse differentials by social class and residence in child deprivation are given in table 3.4. The common value or the grand median of the child development index is estimated to be 52.34 which is very close to the child development index for the total population (52.99). The child deprivation index in the rural areas is higher by 13.50 points from the grand median which reflects the effect of living in the rural areas. Similarly, the child deprivation index in Scheduled Tribes is higher by 5.23 points from the grand median which reflects the effect of belonging to Scheduled Tribes. On the other hand, the child deprivation index in Scheduled Castes is the same as the grand median but the child development index in non-Scheduled Castes/Tribes is lower by 12.075 points from the grand median.

It is possible to decompose the child deprivation index in terms of grand median, social class effects and residence effects. For example, the child development index of 71.07 in Scheduled Tribes living in the rural areas of the state can be decomposed in the following manner:

71.07	=	52.34	+	13.50	+	5.23	+	0.00
Observed value		Grand median		Residence effect		Social class effect		Residual effect

Similarly, the child development index for non Scheduled Castes/Tribes population in the urban areas can be decomposed as

21.810	=	52.340	+	-13.500	+	-12.075	+	-4.955
Observed value		Grand median		Residence effect		Social class effect		Residual effect

We have carried out similar exercise for all the 45 districts of the state which suggests that not only the grand median but also the residence effect and social class effect of child deprivation vary widely across the districts. In general, residence effects are larger than social class effects in all districts of the state (Table 3.4). Another interesting observation of the table is that interaction of social class effects and residence effects on child deprivation reflected by residuals in table 3.4 also varies widely across the districts. In some districts, interaction effects are zero or close to zero but in others, they are quite substantial.

Table 3.4 also permits analysis of how social class and residence impact upon the child deprivation. For example, the child deprivation index in rural Scheduled Tribes which is the highest in the state exceeds the child deprivation index in urban non-Scheduled Castes/Tribes which is the lowest in the state by about 49 points. This gap may be decomposed into a gap in social class effect of around 17 points, a gap in residence effect of around 27 points and a residual effect of around 5 points. Residuals in the polish median exercise are actually interaction effects which are not accounted by the additive model. In other words, extreme deprivation in Scheduled Tribes children living in the rural areas of the state appears to be the result of both social class effect as well as residence effect. The social class effect of child deprivation is a reflection of social exclusion of a particular class - Scheduled Tribes in the present case - whereas the residence effect is a reflection of the difference in the living standards in rural areas. Moreover, the residual effects are also substantial which indicate that social class and residence interact to keep child deprivation in Scheduled Tribes very high.

Results of the above exercise for all the 45 districts of the state are presented in table 3.5. The gap between the lowest and highest child development index varies from a low of 36 in district Tikamgarh to a high of 56 in district Ratlam. In 11 districts, this gap is found to be more than 50 whereas in 8 districts, it is found to be less than 40. There is no district in the state where the gap between the highest and the lowest child development index is less than 35. Obviously, within district social class and residence disparities in child deprivation are quite substantial. The table also suggests that both rural-urban effects and social class effects contribute to the observed disparity in child deprivation whereas the contribution of residuals is relatively small except in districts Satna, Rewa and Katni which constitute a geographical continuity.

Conclusions

The purpose of this paper was to develop an index of child deprivation and apply this index to measure child deprivation in Madhya Pradesh where the status of children is amongst the poorest in India. The child deprivation index which is very similar to the human poverty index suggests that child deprivation is quite pervasive in the state and children belonging to Scheduled Tribes face extreme deprivation. Child deprivation has also been found to be very high in Scheduled Castes children. Scheduled Castes and Scheduled Tribes in Madhya Pradesh constituted almost 40 per cent of the children in the state at the 2001 population census. Any significant improvement in child deprivation is possible only when children belonging to these most deprived social classes of the population are ensured services and interventions which are critical to their survival, growth and development.

The foregoing analysis suggests that both residence and social class have substantial impact on child deprivation in the state. The child deprivation is the least in non Scheduled Castes/Tribes children living in the urban areas whereas it is at its extreme in Scheduled Tribes children living in the rural areas. Residence effects of child deprivation are a reflection of significantly different living conditions in rural and urban areas. A substantially high child deprivation index in the rural areas of the state and in its constituent districts as compared to the urban areas clearly shows that there is substantial scope for improving living conditions in the rural areas which have an impact on the survival, growth and development of children, especially Scheduled Castes and Scheduled Tribes. The very substantial rural-urban gap in the child deprivation index also suggests that dividends of most of the development efforts directed towards meeting the survival, growth and development needs of children remain largely confined to the urban areas while rural areas of the state still lack even the basic infrastructure, amenities and facilities.

On the other hand, social class effects on child deprivation reflect social exclusion that appears to be quite pervasive in the state. The simple reason for a very high child deprivation index in Scheduled Tribes is that children of these Castes have not been reached by the services and interventions that serve their 'best interests'. A host of factors are responsible for this deprivation. These include both factors that operate at the level of the family and the society and factors that are associated with child related services and interventions. Unfortunately, very little is currently known why services and interventions directed towards survival, growth and development of children - immunisation, safe deliveries, schooling, etc. - are not reaching the Scheduled Tribes children and how barriers against the universal reach of these services can be removed.

Meeting the needs of children requires both an agent (intervention) directed towards specific needs of children and a way to get the agent to children and their families (the delivery strategy). It is well known that there are agents or interventions which are capable of reducing very significantly, if not eliminating, child deprivation. The challenge is to get these agents or interventions to those who need them the most. Unfortunately, despite the availability of a range of services and interventions that have the potential of meeting the needs of children, the gap between what can be done and what is actually being done continues to persist so that a very significant proportion of children, especially children belonging to the most deprived sections of the community, continue to remain in the state of deprivation. Since deprivation is essentially multi-dimensional in nature, it appears necessary that an integrated, rights-based approach is evolved for universalising the availability, access and use of services and interventions needed to meet the survival, growth and development needs of children which has a telling impact on child deprivation in the state. At present, planning and programming for children is subsumed under sectoral programmes and activities of the government. Instead of this compartmentalised approach of meeting the basic needs of children, there is a need of a comprehensive approach to guide how children's needs can be addressed by different development sectors. This will ensure that issues of children are addressed with special features and components most suited to them. Unfortunately, realisation of these variations in the policy discourse is yet to get reflected in the policies and programmes for children. The very high level of child deprivation in the state and some very strong social class and residence disparities call for a comprehensive policy response and a strong mechanism to monitor the implementation of a rights-based approach to meeting the basic needs of children.

Finally, it may be stressed here that the rights and needs of children cannot be articulated by children by themselves simply because children are not capable of articulation of their own needs. Recognising the needs of the child and meeting these needs is the responsibility of the family, the society and the state. Unfortunately, despite all constitutional and legal provisions, the mind set at the level of the family, the society and the state continues to seeing children as passive recipient of what the family, the society and the state may provide or fail to provide. This mind set needs to be changed and the sooner is the better. This is not only the harsh reality but a major development challenge for a state like Madhya Pradesh.

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Table 3.2

Child deprivation index in Madhya Pradesh, 2001

	All social classes	Scheduled Castes	Scheduled Tribes	Non Scheduled Castes/Tribes
		Total Population		
Madhya Pradesh	52.99	59.39	69.05	46.15
Minimum	23.77	35.97	39.16	18.56
First quartile	51.83	58.01	65.83	42.89
Median	56.02	61.00	69.73	50.96
Third quartile	59.15	64.72	72.68	54.17
Maximum	69.70	68.62	77.04	63.88
IQR	7.32	6.71	6.85	11.28
		Rural Population		
Madhya Pradesh	62.78	65.64	71.07	58.72
Minimum	50.52	57.68	63.89	38.18
First quartile	60.56	64.14	69.81	55.54
Median	63.48	65.82	71.66	59.45
Third quartile	64.67	67.41	73.20	61.83
Maximum	71.18	70.91	75.98	67.43
IQR	4.11	3.27	3.38	6.29
		Urban Population		
Madhya Pradesh	25.41	39.04	44.07	21.81
Minimum	16.49	29.27	28.22	14.33
First quartile	26.38	38.55	43.69	22.38
Median	29.20	42.64	48.19	25.37
Third quartile	32.59	48.61	54.30	27.73
Maximum	39.95	58.60	66.69	35.74
IQR	6.21	10.05	10.61	5.35

Source: Author's calculations

Table 3.3

Child deprivation index in districts of Madhya Pradesh, 2001

District/State	Total				Rural				Urban			
	Total	SC	ST	Non SC/ST	Total	SC	ST	Non SC/ST	Total	SC	ST	Non SC/ST
Madhya Pradesh	52.99	59.39	69.05	46.15	62.78	65.64	71.07	58.72	25.41	39.04	44.07	21.81
Sheopur	63.86	68.62	77.04	58.06	68.51	70.91	75.98	65.28	35.12	51.82	60.28	30.37
Morena	54.81	61.12	64.53	52.78	63.10	64.59	71.66	61.71	25.89	41.01	31.91	22.96
Bhind	51.83	59.36	50.68	49.50	59.65	62.42	63.89	57.73	31.01	48.86	43.69	25.94
Gwalior	32.53	43.16	61.47	28.03	57.91	61.12	71.69	55.54	19.40	29.99	28.22	16.92
Datia	54.55	63.04	68.96	50.96	59.94	64.75	66.98	57.93	27.81	43.63	44.68	24.38
Shivpuri	58.95	63.81	76.51	54.45	64.67	67.50	74.54	62.18	27.76	42.82	57.37	23.68
Guna	59.00	65.98	74.90	54.17	65.10	67.27	74.00	62.23	29.47	44.90	47.40	25.90
Tikamgarh	59.78	63.47	70.95	57.74	64.25	67.05	71.15	62.79	39.45	53.25	57.51	34.98
Chhatarpur	57.52	64.72	70.21	54.16	63.94	67.16	75.33	62.21	33.18	51.39	51.50	28.97
Panna	62.56	67.99	75.06	58.05	64.44	66.83	72.01	61.83	35.23	54.91	66.69	29.73
Sagar	56.02	64.28	73.42	51.01	64.35	67.50	72.86	61.59	28.36	46.18	44.25	23.07
Damoh	60.84	68.04	72.98	56.31	65.97	69.45	72.23	63.22	35.58	51.42	54.30	30.71
Satna	58.71	65.73	72.68	54.15	63.26	64.91	69.99	61.00	32.89	54.93	62.02	27.37
Rewa	59.15	64.95	70.26	55.98	64.55	67.41	70.47	62.89	35.99	58.60	60.91	30.75
Umaria	59.90	58.58	67.65	52.48	61.61	61.16	68.21	56.89	37.74	43.53	58.20	29.28
Shahdol	57.37	58.77	67.05	47.63	66.06	65.40	70.59	61.86	30.64	41.35	51.27	25.45
Sidhi	62.76	65.37	72.39	57.71	67.56	70.28	72.50	64.82	36.88	45.00	56.63	33.28
Neemuch	51.70	57.19	66.88	49.09	58.94	61.68	67.69	57.41	28.35	38.98	51.60	25.54
Mandsaur	53.56	62.30	63.10	51.00	60.60	65.31	66.40	58.66	27.96	45.86	43.97	25.37
Ratlam	49.96	58.01	69.98	39.86	62.18	64.08	71.69	54.19	19.02	29.27	34.45	15.37
Ujjain	43.67	57.38	55.09	37.91	63.48	68.91	69.71	60.28	23.38	34.72	41.96	20.80
Shajapur	54.66	63.98	62.54	51.26	62.27	65.82	66.98	59.71	30.60	42.64	42.22	28.29

District/State	Total				Rural				Urban			
	Total	SC	ST	Non SC/ST	Total	SC	ST	Non SC/ST	Total	SC	ST	Non SC/ST
Dewas	50.52	60.90	70.04	42.89	59.55	65.74	71.25	54.35	24.73	40.53	55.68	20.72
Jhabua	67.10	60.89	73.10	23.28	71.18	67.40	75.69	38.18	26.54	38.55	39.94	21.61
Dhar	54.41	58.01	68.32	35.81	60.72	62.65	70.03	45.35	27.14	40.00	51.24	22.26
Indore	23.77	35.97	48.54	18.56	50.52	57.68	65.38	45.44	16.49	29.47	35.17	14.33
West Nimar	57.63	63.46	69.73	48.96	65.86	69.04	75.64	59.45	29.74	47.40	49.80	25.09
Barwani	63.84	64.48	73.16	42.36	68.89	69.31	73.86	53.31	32.59	53.46	54.08	25.35
East Nimar	55.66	60.79	72.85	46.33	64.55	66.86	73.60	58.62	29.27	46.18	49.61	25.96
Rajgarh	58.20	65.70	65.56	56.00	64.37	67.98	68.12	62.94	32.74	50.20	45.70	29.42
Vidisha	57.70	68.36	74.39	53.43	64.27	69.59	75.94	61.54	27.82	45.39	48.19	23.66
Bhopal	27.23	42.27	39.16	23.85	60.56	66.69	71.70	57.66	22.89	37.38	35.63	19.46
Sehore	51.63	61.00	67.80	46.12	59.94	66.29	73.20	55.26	27.86	39.57	43.29	25.21
Raisen	53.29	62.38	68.37	47.57	59.81	66.18	70.44	55.15	26.38	39.66	45.02	23.11
Betul	55.78	55.45	69.82	45.99	62.28	62.06	69.81	55.74	25.98	34.30	43.76	22.38
Harda	52.39	60.92	73.41	40.43	58.76	65.10	72.84	48.29	25.92	41.52	47.44	21.68
Hoshangabad	47.37	56.23	64.74	41.38	55.26	62.39	66.15	49.76	21.28	33.00	31.24	18.74
Katni	59.59	64.92	71.52	53.94	63.95	65.66	71.49	60.50	29.20	49.92	58.02	22.42
Jabalpur	39.83	48.53	62.30	32.36	61.21	64.14	73.50	56.12	25.07	36.06	46.96	22.09
Narsimhapur	51.60	60.77	67.52	46.16	58.08	64.49	71.30	52.78	31.06	48.61	49.45	26.67
Dindori	69.70	68.11	72.65	63.88	71.04	69.26	75.25	67.43	39.95	38.94	56.66	35.74
Mandla	64.39	58.82	71.49	54.51	67.25	64.88	70.80	61.17	27.04	30.01	36.49	25.40
Chhindwara	55.64	54.89	69.31	47.32	65.28	63.81	72.74	59.38	31.30	37.62	46.72	27.17
Seoni	58.36	58.76	67.01	52.35	64.29	67.01	72.10	59.71	30.50	40.08	52.08	27.73
Balaghat	58.27	57.35	65.83	56.14	61.28	61.57	66.05	59.71	32.06	34.35	50.98	27.59

Source: Author's calculations

Table 3.4

Rural-urban and social class effects of child deprivation index in Madhya Pradesh, 2001

	Common value or grand median	Rural	Urban
		Madhya Pradesh	
Common value or grand median	52.340	13.500	-13.500
Scheduled Castes	0.000	-0.200	0.200
Scheduled Tribes	5.230	0.000	0.000
Non Scheduled Castes/Tribes	-12.075	4.955	-4.955
		Sheopur	
Common value or grand median	61.37	9.54	-9.54
Scheduled Castes	0.00	0.00	0.00
Scheduled Tribes	6.77	-1.69	1.69
Non Scheduled Castes/Tribes	-13.54	7.92	-7.92
		Morena	
Common value or grand median	51.78	19.37	-19.37
Scheduled Castes	1.01	-7.59	7.59
Scheduled Tribes	0.00	0.50	-0.50
Non Scheduled Castes/Tribes	-9.45	0.00	0.00
		Bhind	
Common value or grand median	53.79	10.10	-10.10
Scheduled Castes	1.85	-3.32	3.32
Scheduled Tribes	0.00	0.00	0.00
Non Scheduled Castes/Tribes	-11.95	5.79	-5.79
		Gwalior	
Common value or grand median	45.55	19.31	-19.31
Scheduled Castes	0.00	-3.74	3.74
Scheduled Tribes	4.40	2.42	-2.42
Non Scheduled Castes/Tribes	-9.32	0.00	0.00

	Common value or grand median	Rural	Urban
		Datia	
Common value or grand median	54.19	11.15	-11.15
Scheduled Castes	0.00	-0.59	0.59
Scheduled Tribes	1.64	0.00	0.00
Non Scheduled Castes/Tribes	-13.04	5.62	-5.62
		Shivpuri	
Common value or grand median	55.16	12.34	-12.34
Scheduled Castes	0.00	0.00	0.00
Scheduled Tribes	10.79	-3.76	3.76
Non Scheduled Castes/Tribes	-12.23	6.91	-6.91
		Guna	
Common value or grand median	56.08	13.30	-13.30
Scheduled Castes	0.00	-2.11	2.11
Scheduled Tribes	4.62	0.00	0.00
Non Scheduled Castes/Tribes	-12.02	4.87	-4.87
		Tikamgarh	
Common value or grand median	60.15	6.90	-6.90
Scheduled Castes	0.00	0.00	0.00
Scheduled Tribes	4.18	-0.08	0.08
Non Scheduled Castes/Tribes	-11.26	7.01	-7.01
		Chhatarpur	
Common value or grand median	59.28	11.91	-11.91
Scheduled Castes	0.00	-4.03	4.03
Scheduled Tribes	4.14	0.00	0.00
Non Scheduled Castes/Tribes	-13.69	4.71	-4.71
		Panna	
Common value or grand median	60.87	5.96	-5.96
Scheduled Castes	0.00	0.00	0.00
Scheduled Tribes	8.48	-3.30	3.30
Non Scheduled Castes/Tribes	-15.09	10.09	-10.09

Child Deprivation

	Common value or grand median	Rural	Urban
		Sagar	
Common value or grand median	56.84	14.31	-14.31
Scheduled Castes	0.00	-3.65	3.65
Scheduled Tribes	1.71	0.00	0.00
Non Scheduled Castes/Tribes	-14.51	4.95	-4.95
		Damoh	
Common value or grand median	60.43	9.02	-9.02
Scheduled Castes	0.00	0.00	0.00
Scheduled Tribes	2.83	-0.05	0.05
Non Scheduled Castes/Tribes	-13.47	7.24	-7.24
		Satna	
Common value or grand median	59.92	4.99	-4.99
Scheduled Castes	0.00	0.00	0.00
Scheduled Tribes	6.09	-1.01	1.01
Non Scheduled Castes/Tribes	-15.74	11.83	-11.83
		Rewa	
Common value or grand median	63.00	4.78	-4.78
Scheduled Castes	0.00	-0.38	0.38
Scheduled Tribes	2.69	0.00	0.00
Non Scheduled Castes/Tribes	-16.18	11.29	-11.29
		Umaria	
Common value or grand median	52.34	8.82	-8.82
Scheduled Castes	0.00	0.00	0.00
Scheduled Tribes	10.86	-3.81	3.81
Non Scheduled Castes/Tribes	-9.26	4.99	-4.99
		Shahdol	
Common value or grand median	53.38	12.02	-12.02
Scheduled Castes	0.00	0.00	0.00
Scheduled Tribes	7.55	-2.36	2.36
Non Scheduled Castes/Tribes	-9.73	6.18	-6.18

	Common value or grand median	Rural	Urban
		Sidhi	
Common value or grand median	57.64	12.64	-12.64
Scheduled Castes	0.00	0.00	0.00
Scheduled Tribes	6.92	-4.71	4.71
Non Scheduled Castes/Tribes	-8.59	3.13	-3.13
		Neemuch	
Common value or grand median	50.33	11.35	-11.35
Scheduled Castes	0.00	0.00	0.00
Scheduled Tribes	9.32	-3.30	3.30
Non Scheduled Castes/Tribes	-8.85	4.59	-4.59
		Mandsaur	
Common value or grand median	55.18	11.21	-11.21
Scheduled Castes	0.40	-1.49	1.49
Scheduled Tribes	0.00	0.00	0.00
Non Scheduled Castes/Tribes	-13.17	5.43	-5.43
		Ratlam	
Common value or grand median	46.67	18.62	-18.62
Scheduled Castes	0.00	-1.21	1.21
Scheduled Tribes	6.40	0.00	0.00
Non Scheduled Castes/Tribes	-11.89	0.79	-0.79
		Ujjain	
Common value or grand median	51.82	17.10	-17.10
Scheduled Castes	0.00	0.00	0.00
Scheduled Tribes	4.02	-3.22	3.22
Non Scheduled Castes/Tribes	-11.27	2.65	-2.65
		Shajapur	
Common value or grand median	54.23	12.38	-12.38
Scheduled Castes	0.00	-0.79	0.79
Scheduled Tribes	0.37	0.00	0.00
Non Scheduled Castes/Tribes	-10.23	3.33	-3.33

Child Deprivation

	Common value or grand median	Rural	Urban
		Dewas	
Common value or grand median	53.14	12.61	-12.61
Scheduled Castes	0.00	0.00	0.00
Scheduled Tribes	10.33	-4.82	4.82
Non Scheduled Castes/Tribes	-15.60	4.21	-4.21
		Jhabua	
Common value or grand median	52.98	14.43	-14.43
Scheduled Castes	0.00	0.00	0.00
Scheduled Tribes	4.83	3.45	-3.45
Non Scheduled Castes/Tribes	-23.08	-6.14	6.14
		Dhar	
Common value or grand median	51.32	11.33	-11.33
Scheduled Castes	0.00	0.00	0.00
Scheduled Tribes	9.31	-1.93	1.93
Non Scheduled Castes/Tribes	-17.52	0.22	-0.22
		Indore	
Common value or grand median	43.58	15.11	-15.11
Scheduled Castes	0.00	-1.00	1.00
Scheduled Tribes	6.70	0.00	0.00
Non Scheduled Castes/Tribes	-13.69	0.45	-0.45
		West Nimar	
Common value or grand median	58.22	12.92	-12.92
Scheduled Castes	0.00	-2.09	2.09
Scheduled Tribes	4.50	0.00	0.00
Non Scheduled Castes/Tribes	-15.95	4.26	-4.26
		Barwani	
Common value or grand median	61.38	9.89	-9.89
Scheduled Castes	0.00	-1.97	1.97
Scheduled Tribes	2.59	0.00	0.00
Non Scheduled Castes/Tribes	-22.05	4.09	-4.09

	Common value or grand median	Rural	Urban
		East Nimar	
Common value or grand median	56.52	12.00	-12.00
Scheduled Castes	0.00	-1.66	1.66
Scheduled Tribes	5.09	0.00	0.00
Non Scheduled Castes/Tribes	-14.23	4.33	-4.33
		Rajgarh	
Common value or grand median	56.91	11.21	-11.21
Scheduled Castes	2.18	-2.32	2.32
Scheduled Tribes	0.00	0.00	0.00
Non Scheduled Castes/Tribes	-10.73	5.55	-5.55
		Vidisha	
Common value or grand median	57.49	13.87	-13.87
Scheduled Castes	0.00	-1.77	1.77
Scheduled Tribes	4.58	0.00	0.00
Non Scheduled Castes/Tribes	-14.89	5.06	-5.06
		Bhopal	
Common value or grand median	52.03	18.04	-18.04
Scheduled Castes	0.00	-3.38	3.38
Scheduled Tribes	1.63	0.00	0.00
Non Scheduled Castes/Tribes	-13.47	1.06	-1.06
		Sehore	
Common value or grand median	52.93	14.96	-14.96
Scheduled Castes	0.00	-1.60	1.60
Scheduled Tribes	5.31	0.00	0.00
Non Scheduled Castes/Tribes	-12.69	0.07	-0.07
		Raisen	
Common value or grand median	52.92	13.26	-13.26
Scheduled Castes	0.00	0.00	0.00
Scheduled Tribes	4.81	-0.55	0.55
Non Scheduled Castes/Tribes	-13.79	2.76	-2.76

Child Deprivation

	Common value or grand median	Rural	Urban
		Betul	
Common value or grand median	48.18	13.88	-13.88
Scheduled Castes	0.00	0.00	0.00
Scheduled Tribes	8.61	-0.86	0.86
Non Scheduled Castes/Tribes	-9.12	2.80	-2.80
		Harda	
Common value or grand median	53.31	12.70	-12.70
Scheduled Castes	0.00	-0.91	0.91
Scheduled Tribes	6.83	0.00	0.00
Non Scheduled Castes/Tribes	-18.32	0.60	-0.60
		Hoshangabad	
Common value or grand median	47.70	15.51	-15.51
Scheduled Castes	0.00	-0.81	0.81
Scheduled Tribes	1.00	1.95	-1.95
Non Scheduled Castes/Tribes	-13.44	0.00	0.00
		Katni	
Common value or grand median	57.79	7.87	-7.87
Scheduled Castes	0.00	0.00	0.00
Scheduled Tribes	6.96	-1.13	1.13
Non Scheduled Castes/Tribes	-16.33	11.17	-11.17
		Jabalpur	
Common value or grand median	50.10	14.04	-14.04
Scheduled Castes	0.00	0.00	0.00
Scheduled Tribes	10.13	-0.77	0.77
Non Scheduled Castes/Tribes	-10.99	2.97	-2.97
		Narsimhapur	
Common value or grand median	56.55	10.93	-10.93
Scheduled Castes	0.00	-2.98	2.98
Scheduled Tribes	3.82	0.00	0.00
Non Scheduled Castes/Tribes	-16.83	2.13	-2.13

	Common value or grand median	Rural	Urban
		Dindori	
Common value or grand median	54.10	15.16	-15.16
Scheduled Castes	0.00	0.00	0.00
Scheduled Tribes	11.86	-5.86	5.86
Non Scheduled Castes/Tribes	-2.52	0.69	-0.69
		Mandla	
Common value or grand median	47.44	17.43	-17.43
Scheduled Castes	0.00	0.00	0.00
Scheduled Tribes	6.20	-0.28	0.28
Non Scheduled Castes/Tribes	-4.16	0.45	-0.45
		Chhindwara	
Common value or grand median	50.72	13.09	-13.09
Scheduled Castes	0.00	0.00	0.00
Scheduled Tribes	9.01	-0.09	0.09
Non Scheduled Castes/Tribes	-7.44	3.01	-3.01
		Seoni	
Common value or grand median	53.55	13.47	-13.47
Scheduled Castes	0.00	0.00	0.00
Scheduled Tribes	8.54	-3.46	3.46
Non Scheduled Castes/Tribes	-9.83	2.52	-2.52
		Balaghat	
Common value or grand median	47.96	13.61	-13.61
Scheduled Castes	0.00	0.00	0.00
Scheduled Tribes	10.55	-6.07	6.07
Non Scheduled Castes/Tribes	-4.31	2.45	-2.45

Source: Author's calculations

Table 3.5

Decomposition of state/district disparity in the child development index in residence effect and social class effect

State/District	Difference between maximum and minimum child development index	Difference attributable to residence affect	Difference attributable to social class effect	Residual
Madhya Pradesh	49.25	27.00	17.30	4.95
Sheopur	45.62	19.09	20.31	6.22
Morena	48.70	38.75	9.45	0.50
Bhind	37.95	20.20	11.95	5.79
Gwalior	54.77	38.62	13.73	2.42
Datia	42.61	22.31	14.67	5.62
Shivpuri	50.86	24.69	23.02	3.15
Guna	48.11	26.60	16.64	4.87
Tikamgarh	36.17	13.80	15.44	6.93
Chhatarpur	46.36	23.82	17.83	4.71
Panna	42.28	11.92	23.57	6.79
Sagar	49.79	28.61	16.23	4.95
Damoh	41.53	18.04	16.30	7.19
Satna	42.62	9.98	21.82	10.82
Rewa	39.72	9.56	18.87	11.29
Umaria	38.92	17.63	20.11	1.18
Shahdol	45.15	24.05	17.28	3.82
Sidhi	39.22	25.28	15.51	-1.58
Neemuch	42.15	22.70	18.17	1.28
Mandsaur	41.02	22.43	13.17	5.43
Ratlam	56.32	37.24	18.29	0.79
Ujjain	48.91	34.20	15.29	-0.58
Shajapur	38.69	24.76	10.60	3.33
Dewas	50.53	25.21	25.93	-0.61
Jhabua	54.08	28.85	27.92	-2.69
Dhar	47.77	22.65	26.83	-1.71
Indore	51.05	30.21	20.38	0.45
West Nimar	50.54	25.83	20.44	4.26
Barwani	48.51	19.78	24.64	4.09
East Nimar	47.65	23.99	19.32	4.33
Rajgarh	38.71	22.43	10.73	5.55
Vidisha	52.27	27.75	19.46	5.06
Bhopal	52.23	36.07	15.10	1.06
Sehore	47.99	29.91	18.01	0.07

State/District	Difference between maximum and minimum child development index	Difference attributable to residence affect	Difference attributable to social class effect	Residual
Raisen	47.33	26.52	18.60	2.20
Betul	47.44	27.76	17.73	1.94
Harda	51.15	25.40	25.15	0.60
Hoshangabad	47.40	31.02	14.44	1.95
Katni	49.07	15.74	23.30	10.04
Jabalpur	51.40	28.08	21.12	2.20
Narsimhapur	44.63	21.85	20.65	2.13
Dindori	39.52	30.32	14.37	-5.17
Mandla	45.39	34.87	10.36	0.17
Chhindwara	45.57	26.19	16.46	2.92
Seoni	44.37	26.93	18.37	-0.94
Balaghat	38.46	27.22	14.87	-3.62

Source: Author's calculations

POVERTY TRENDS AND DIFFERENTIALS

Poverty has traditionally been defined as the exclusion from ordinary living patterns, customs and activities due to lack of resources, usually measured in economic terms (Townsend, 1979). Low-income or consumption continues to be used as the most important proxy for poverty and income per capita or per household is the most widely used indicator of poverty. Poverty can be absolute or relative. An example of absolute poverty is the proportion of the population eating less food than is required to sustain the human body (approximately 2000-2500 calories per day for an adult male). The income per person or per household which ensures that required calories are available to sustain human body is termed as the poverty line. A person or household having income or consumption less than the poverty line is classified as poor. There are various methods of deriving poverty line. One is the food-energy intake (FEI) method which is based on the calorie norm. The other is the cost of basic needs (CBN) method (Ravallion, 1998).

Poverty can also be measured in relative terms. In this sense, poverty reflects the inequality in the distribution of income across individuals, households, families, societies, etc. Inequality in the distribution of income across social groups is generally used as an indicator of social exclusion. On the other hand, variation in income per capita or per household across geo-political units reflect the spatial inequality in income or consumption.

In India, calorie-based norm is used for deciding the poverty line. In 1973-74, this norm was fixed at 2400 calries per person per day in rural areas and 2100 kcal per person per day in urban areas. Using these norms, poverty lines were drawn in the rural and urban areas by the Expert

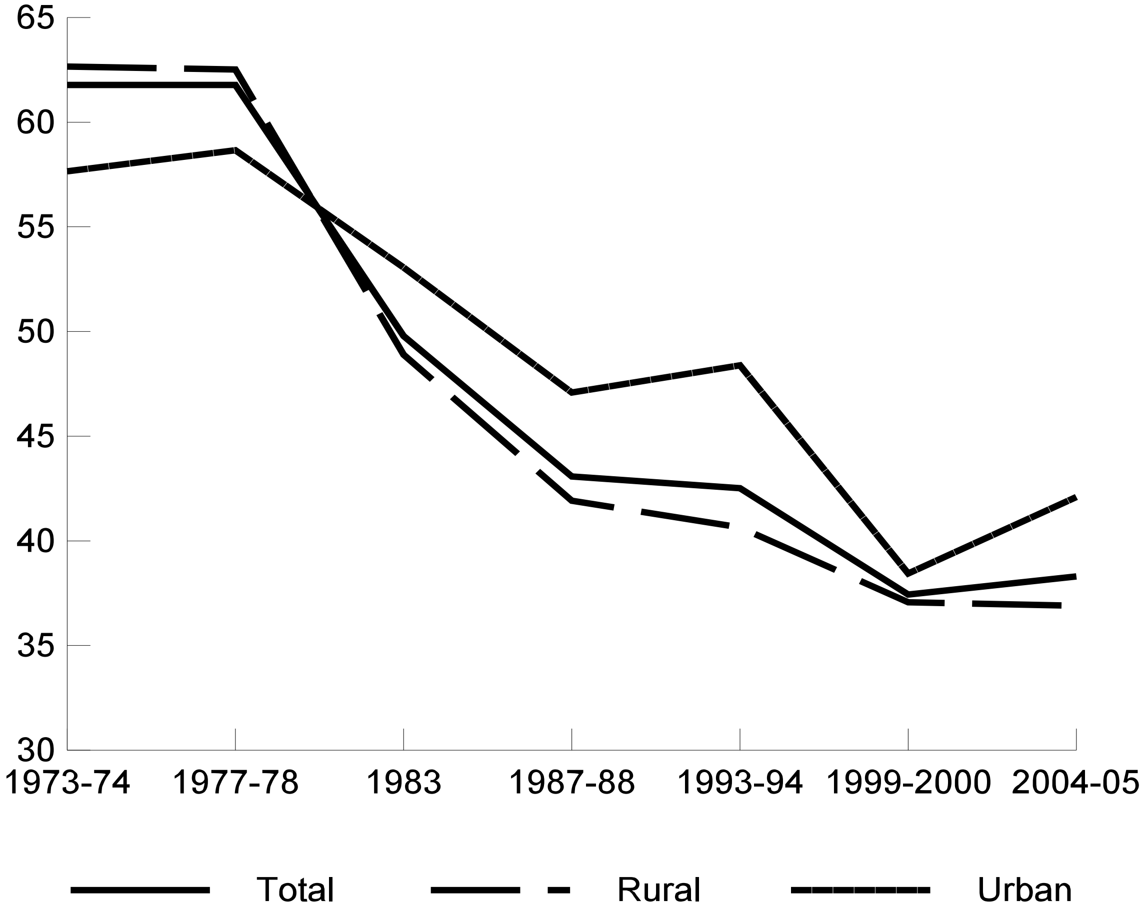
Group on the Estimation of Proportion and Number of Poor in India constituted by the Government of India in 1973. The original poverty lines have since been updated at regular intervals on the basis of consumer price index for agricultural labourers in the rural areas and consumer price index for industrial workers in the urban areas. In Madhya Pradesh, the poverty line was set at Rs 327.78 per person per month in the rural areas and Rs 570,15 per person per month in the urban areas for the year 2004-05 by the Planning Commission.

Once the poverty line is set, the level of poverty can be measured in many ways. The most commonly used method is the head-count ratio which is defined as the ratio of the number of persons or households having income or consumption below the poverty line to the total population or households. Estimates of per capita income or consumption are derived on the basis of the sample survey of household consumption expenditure conducted by the National Sample Survey Organisation. The consumption or expenditure data available through the survey are collected on the basis of two recall periods. The first one is the 30-day recall period for all items. This approach is termed as uniform recall period (URP). The second approach uses two recall periods - 365 days recall period for five infrequently purchased non-food items, namely, clothing, footwear, durable goods, education and institutional medical expenses and 30 days recall period for the remaining items. This approach is termed as mixed recall period (MRP). Planning Commission has estimated poverty in 2004-05 using both the distributions and using Expert Group methodology.

Based on the above methodology, the proportion of population living below the poverty line in Madhya Pradesh has been estimated to be 38 per cent during the period 2004-05 on the basis of uniform recall period and around 32 per cent on the basis of mixed recall period (Government of India, 2007). These estimates suggest that the proportion of population living below the poverty line in Madhya Pradesh remains significantly higher than the national average. For India as a whole, around 27-28 per cent of the population was estimated to be living below the poverty line circa 2004-05 on the basis of uniform recall period and around 22 per cent on the basis of the mixed recall period. Madhya Pradesh ranks amongst the 7 poorest states of India in terms of the proportion of population below the poverty line.

The head-count ratio is the simplest and the most widely used measure of poverty. One advantage of this measure of poverty is that it is straightforward and can be interpreted easily. However, one major limitation of this measure is that it treats all the poor equally. More specifically, it does not take into account ‘how poor are the poor’ and does not consider the inequality within the poor. In other words, it does not differentiate between transient and chronic poverty. Transient poverty

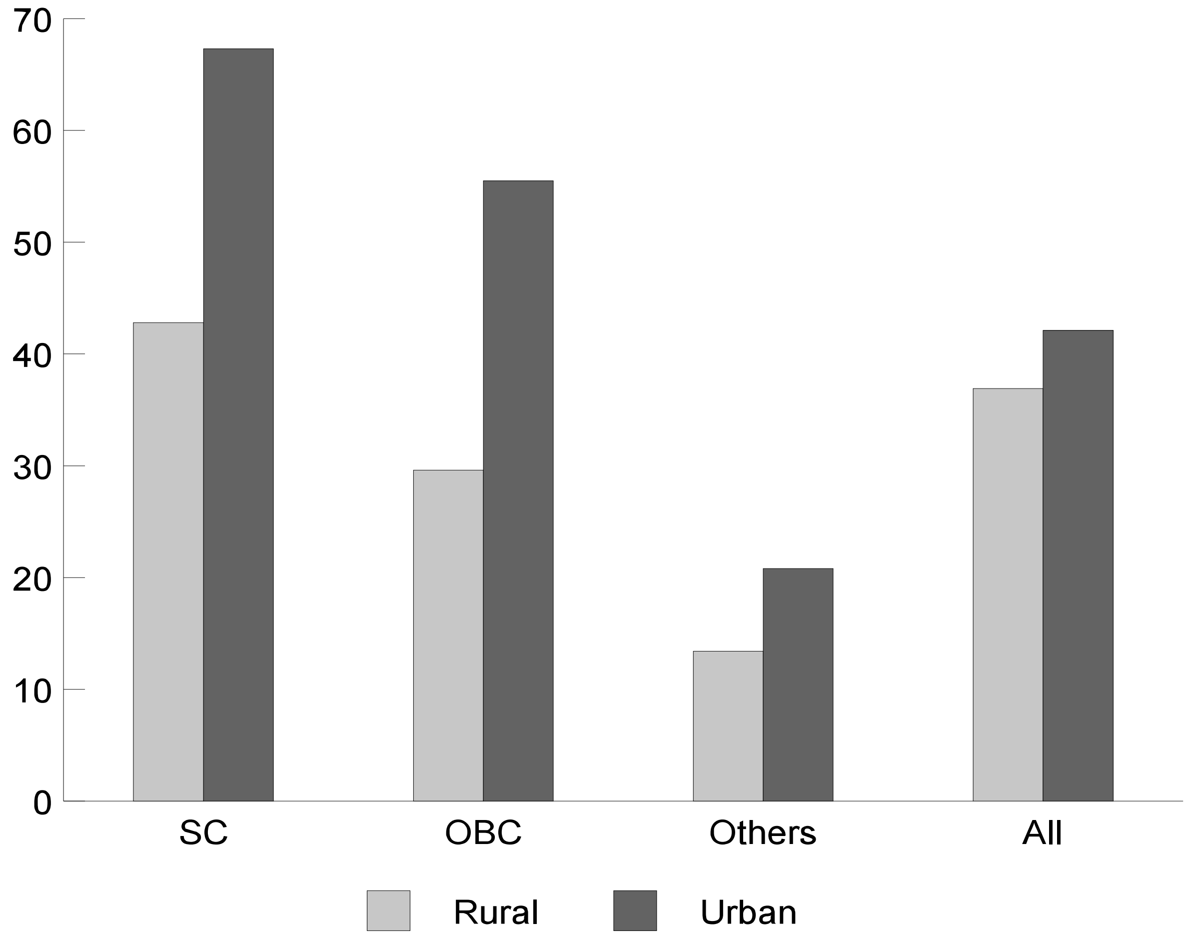
Figure 4.1
Proportion of population below poverty line (Head Count Ratio) in Madhya Pradesh based on uniform recall period



is the poverty close to the poverty line whereas chronic poverty is the poverty far away from the poverty line. It is argued that any measure of poverty must be able to reflect the gap between the income (or consumption) of the poor from the poverty line to distinguish between the transient poverty and the chronic poverty. This gap can be defined in terms of depth and in terms of severity. As such, the head-count ratio is generally complemented with the poverty gap ratio which measures the depth of poverty and squared poverty gap which measures the severity of poverty.

Estimates of poverty gap index and squared poverty gap index for Madhya Pradesh are available for the period 1999-2000 (Panda, 2003). When compared with India as a whole, these indexes suggest that both depth and severity of poverty in Madhya Pradesh is substantially higher than those in India. This implies that most of the poor in Madhya Pradesh suffer from severe and long

Figure 4.2
Proportion of population living below the poverty line by social class in Madhya Pradesh, 2004-05 based on uniform recall period



duration poverty as compared to India. This means that in Madhya Pradesh, poverty is not only chronic but also severe. Poverty reduction in the state is therefore a complex yet challenging proposition.

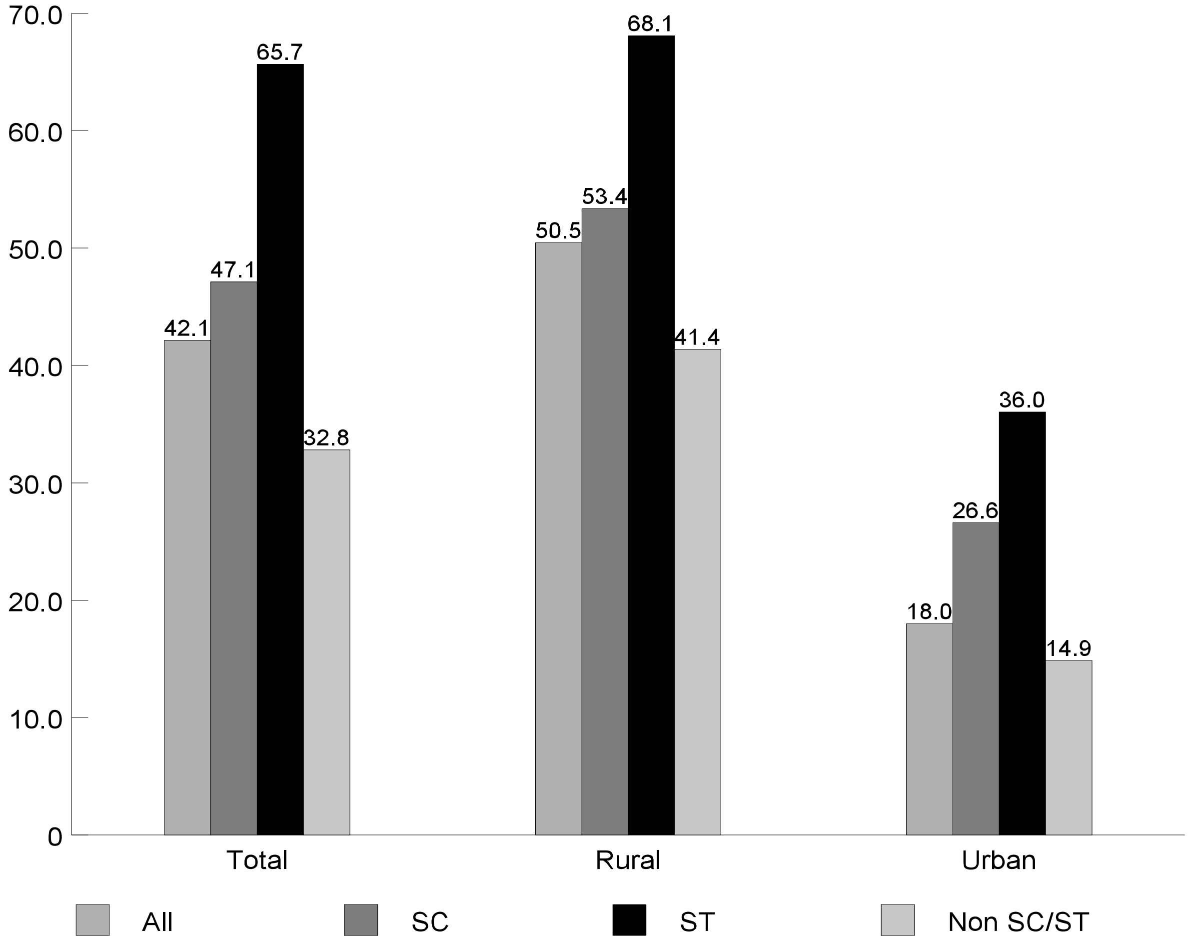
The good sign however is that the head count ratio has decreased in the state from about 62 per cent during the period 1973-74 to about 38 per cent during the period 2004-05. Moreover, the decrease appears to have been marginally faster in rural than in urban areas of the state (Figure 4.1). However, in recent years, the proportion of population living below the poverty line appears to have increased marginally from around 37 per cent in 1999-2000 to more than 38 per cent in 2004-05 with the increase being sharper in urban than in rural areas on the basis of the uniform recall period. However, estimates of poverty based on mixed recall period do not show any increase in the prevalence of poverty in the state. In fact, Planning Commission has emphasised that, because of different methodologies used, estimates of the proportion of population living below the poverty line estimated during the period 2004-05 on the basis of uniform recall period are not comparable to the estimates of the population living below the poverty line during the period 1999-2000. They are actually comparable to poverty estimates for the year 1993-94. On the other hand 2004-05 estimates based on mixed recall period are roughly comparable to the poverty estimates for the period 1999-2000.

The decrease in the proportion below poverty line in the state has however been slower than the decrease in the country and in most its major states. Between 1960-61 and 1999-2000, the head count ratio in Madhya Pradesh decreased at an average annual rate of just 0.63 per cent per year (Panda, 2003). If we exclude Assam where poverty increased rather than decreased during this period, then this rate of decline was the second slowest in the country, next only to Bihar. The situation is in quite contrast to Kerala where the proportion of population below the poverty line decreased at a very rapid rate of 3.3 per cent per year during the period under reference. The poverty gap and squared poverty gap indexes also decreased in the state during this period in the state but the rate of decrease in these indexes has also been slower than the national average and in most of the major states of the country.

Social class differentials in poverty in the state are also revealing. The proportion of population living below the poverty line in the state has always been higher in urban than in rural areas except for the period prior to 1983 with the gap being the widest during 1993-94. Latest estimates suggest that urban poverty in the state is the second highest in the country, next only to Orissa. According to poverty estimates for the year 2004-05, more than two-third of the Scheduled Castes population in the urban areas of the state was living below the poverty line compared to only around 43 per cent in the rural areas (Figure 4.2). In case of other backward classes, this proportion was 56 per cent and 30 per cent respectively. Even among the upper castes population, the proportion of the population below the poverty line in the urban areas was estimated to be substantially higher than that in the rural areas, although the gap is narrower. This pattern is in quite contrast to rural-urban differentials at the national level where poverty has always been higher in rural than in urban areas (Table 4.1).

A detailed profile of poverty in the state is available for the period 1999-2000 (Table 4.2). This profile also confirms that social class differentials in the proportion of the population below the poverty line is quite pervasive in the state in terms of all the three indicators of income or consumption poverty. The proportion of population living below the poverty line has been found to be the highest in the Scheduled Tribes population (57 per cent) followed by the Scheduled

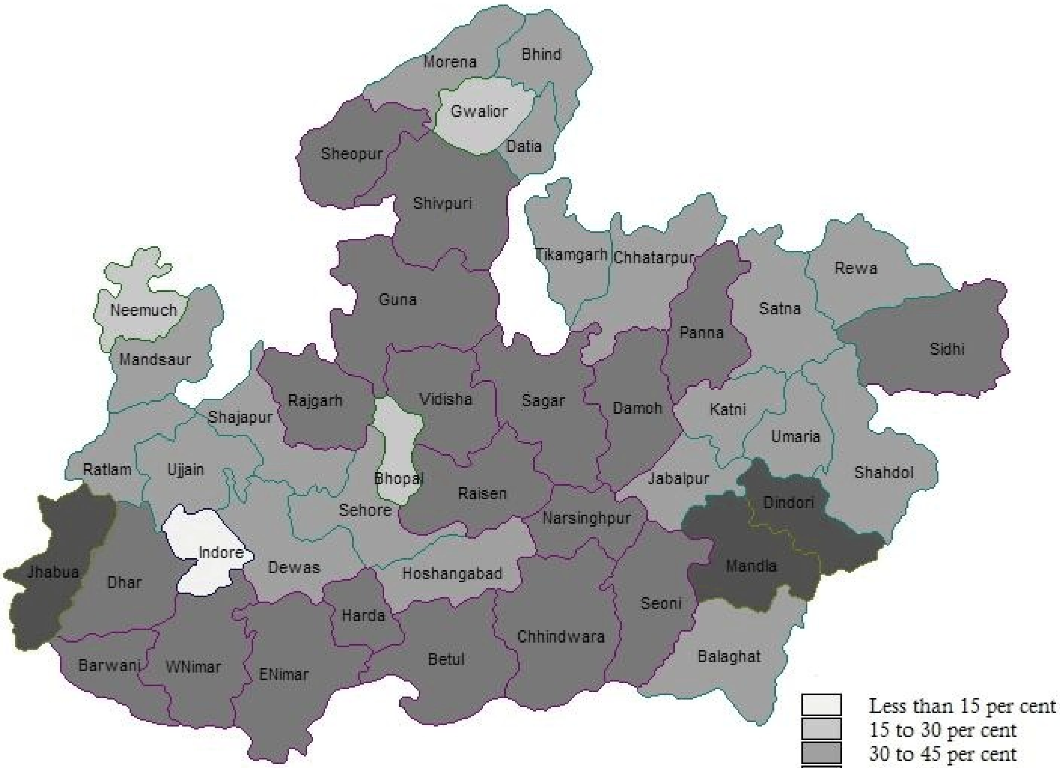
Figure 4.3
Proportion of households having none of the specified assets
in Madhya Pradesh, 2001



Castes population. By contrast, only about 12 per cent of the upper castes population in the state was having per capita income or consumption below the poverty line during this period. Similarly, the proportion of population living below the poverty line has been found to be the highest among non-agricultural labourers closely followed by agricultural labourers.

Income or consumption based definition of poverty, however, is not satisfactory for several reasons and many of the limitations of the monetary measures of poverty are widely accepted. First, it does not distinguish between the transitional poverty and the chronic poverty. Second, income or consumption is the means to achieve ultimate ends rather than the end in itself. Although, in practice, micro data suggest that income and the achievement of most of the ultimate ends tend to be positively correlated across individuals or households, yet such correlations tend to be modest (Appleton and Song, 1999). In other words, for a given income

Figure 4.4
Inter-district variations in the proportion of households having none of the specified assets
Madhya Pradesh, 2001



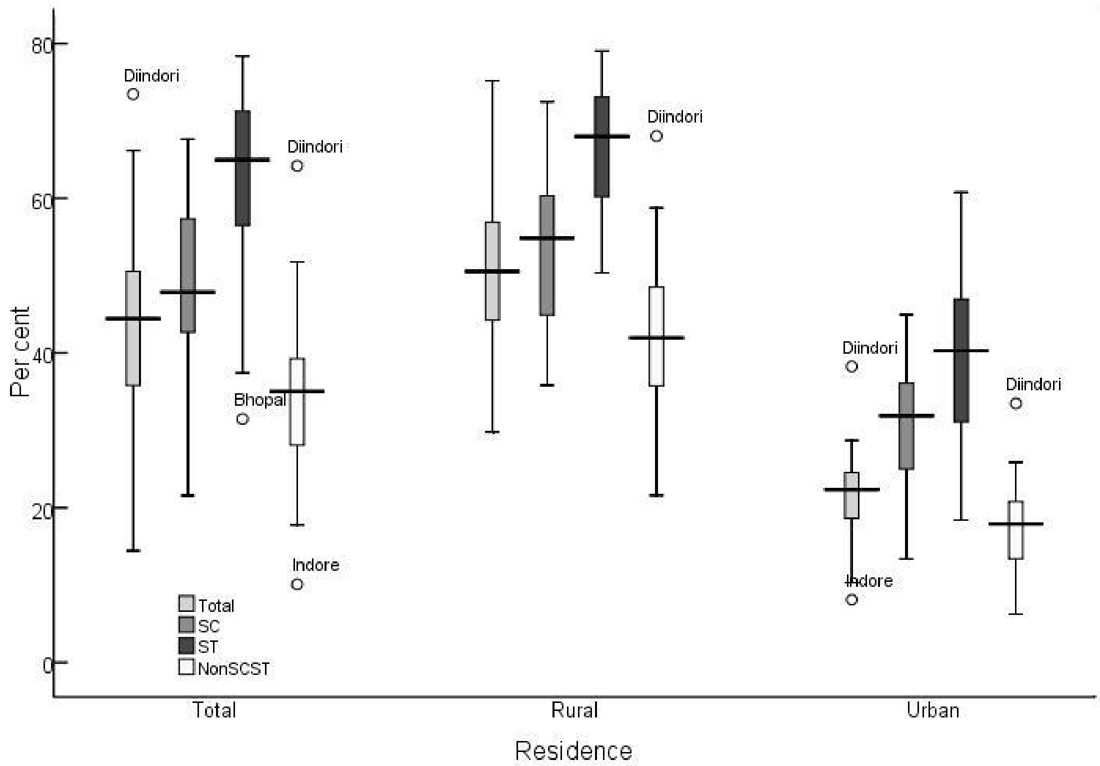
level, non-monetary welfare outcomes may vary widely. Second, contemporary income is defined in terms of financial inflows at one point of time. This implies that other resources available to the household, such as physical assets and savings, are ignored. The income-based approach of analysing poverty also ignores fluctuations in income-levels over time. It has been observed that income-based measures of poverty or well-being typically show large fluctuations over time, and this is often particularly significant for the poorest, although these fluctuations and the vulnerability they imply are a key aspect of ill-being (Hulme and McKay, 2005). Third, the extent of error typically associated with measuring income or consumption may be substantial. Measurement of both income and consumption is quite a complex exercise because of the diversity of consumption and the diversity of the sources of income. Data about income and consumption are normally collected through household survey in which the information collected is generally associated with significant recall errors, especially when the respondent is illiterate. In the regime of subsidised government services and facilities, there is also a tendency of not reporting actual income or actual consumption expenditure in such household surveys. This results in the under-estimation of the income or consumption expenditure and the degree of under-estimation may be quite substantive.

One alternative suggested to address these limitations is to focus on asset ownership given that assets capture longer term dynamics much better than a measure of income at one or two points in time. For this reason having longitudinal data may be less crucial. Moreover, assets can in principle be considered in a range of different dimensions including social capital. Assets that a household possesses, or to which it has access, can be related to household income in the sense that the latter may be conceptualised as returns to these assets. In this view, income of a household reflects the assets it commands and the return it is able to earn on these assets. In addition to the return in terms of income, assets are also likely to be important to households in their own right; representing wealth and status, economic and social security and easier access to credit. Deprivation of key assets may therefore be thought of a good indicator of ill-being in its own right. Indicators of deprivation of assets aim to measure living standards directly by looking at 'enforced lack' of a set of material goods or social activities. By enforced lack, we mean the items that a household would like to have but cannot afford because of the lack of either resources or opportunities or different choices and preferences. In this way, deprivation indicators also take into account the role of preferences and choices of the households and the individuals.

The assets-based approach is closely associated with the concept of poverty in a more intuitive way than simple income or consumption measures. A household may receive low income but live in comfortable self-owned house with all standard amenities. Deprivation indicators are better placed to measure 'persistence' of ill-being than the contemporary income or consumption based indicators. It is argued that lack of households assets and adequate housing conditions are more likely to be associated with lack of resources over a prolonged period of time than with the current income or consumption expenditure. Deprivation indicators permit to look more broadly at exclusion from life of a society either because of the lack of resources or because of the lack of opportunities or because of specific preferences and choices.

Information about the availability of six households assets - bicycle, radio/transistor, telephone, television, scooter/motorcycle/moped, and car/jeep/van - are available through the 2001 population census for the state as a whole as well as at the district and below district level. One may argue whether these assets can be used to classify households as poor or non-poor and there are reasons for this argument. First, the assets in question are consumer assets and not productive assets like land. Second, the composition of assets may vary from house to house depending upon

Figure 4.5
Inter-district variations in the proportion of households having none of the six specified assets by social class in Madhya Pradesh, 2001



a range of factors and conditions. However, ownership of none of these assets do provides important clues to household's command over resources. In fact, it has been found that there is a correspondence between the classification of households based on the asset index and consumption expenditures (Filmer and Pritchett, 1999). It has also been found that the mean per capita consumption expenditure for households not owning any of the above six assets is Rs 1779 while the mean per capita consumption expenditure for households owning at least one of the above assets is Rs 2770. This clearly illustrates that households not owning any of these assets are markedly poorer than the households owning at least one of these assets (Chandrasekhar and Ray, 2005).

Information available through the 2001 population census suggests, that there were slightly more than 4.6 million or around 42 per cent households in the state which did not have any of the six specified assets circa 2001. This proportion was more than 50 per cent in the rural households but only about 18 per cent in their urban counterparts. The highly inequitable distribution of the asset-less households in the state may be judged from the fact that more than 68 per cent of the Scheduled Tribes households in the rural areas of the state were not having any of the six household assets compared to less than 15 per cent non-Scheduled Castes/Tribes households in the urban areas.

An assessment of poverty in Madhya Pradesh can also be made on the basis of the survey of below poverty line families carried out by the Government of Madhya Pradesh in the year 2002-03 following the guidelines issued by the Planning Commission, although this survey is mired with a number of controversies because of the approach adopted to classify a household as a household below the poverty line. In this survey, no direct question related to household income or household consumption was asked. Rather, information related to 13 key questions was collected from every household of the state and for each question, a score ranging from 0 to 4 was given on the basis of the information provided by the household. The score given to all the thirteen question to a household were added up and households getting a score less than 14 were classified as households below the poverty line. This information, although to be interpreted with caution, suggests that about 4.4 million or about 45 per cent of the households in the rural areas of the state were classified as households below the poverty line during the period 2002-03. This number is very close to about 4.1 million asset less households enumerated at the 2001 population census. This gives credence to using asset-based approach to analysing poverty at the household level.

Any discussion on poverty in Madhya Pradesh is incomplete without a discussion on inter-district variations in poverty. Income or consumption based estimates of different indicators of poverty are not available for the districts of the state. However, some idea about inter-district variation in the level of poverty can be made from the information on the proportion of households having none of the six specified assets - bicycle, radio/transistor, television, telephone, scooter/motorcycle/moped, and car/jeep/van - available through the 2001 population census. This information is available separately for rural and urban areas and for Scheduled Castes and Scheduled Tribes households also.

Information available through the 2001 population census suggests that the proportion of households having none of the six specified assets varied from a minimum of 14.4 per cent in district Indore to a maximum of 73 per cent in district Dindori. Three districts of the state - Dindori, Mandla and Jhabua - may be termed as the poorest districts of the state as more than 60 per cent of the households in these districts were not having any of the six specified assets at the 2001 population census. By contrast, Indore was the only district in the state where the households not having any of the six specified assets were less than 15 per cent. In Bhopal, Gwalior, Jabalpur and Neemuch districts, the proportion of asset less households varied between

15 through 30 per cent. The rural urban divide in the availability of the six specified assets is also very clear. In the rural areas of the state, the proportion households not having any of the six specified assets varied from a maximum of 75 per cent (district Dindori) to a minimum of almost 30 per cent (district Indore). In the urban areas, this proportion varied from 38 per cent (district Dindori) to only 8 per cent (District Indore).

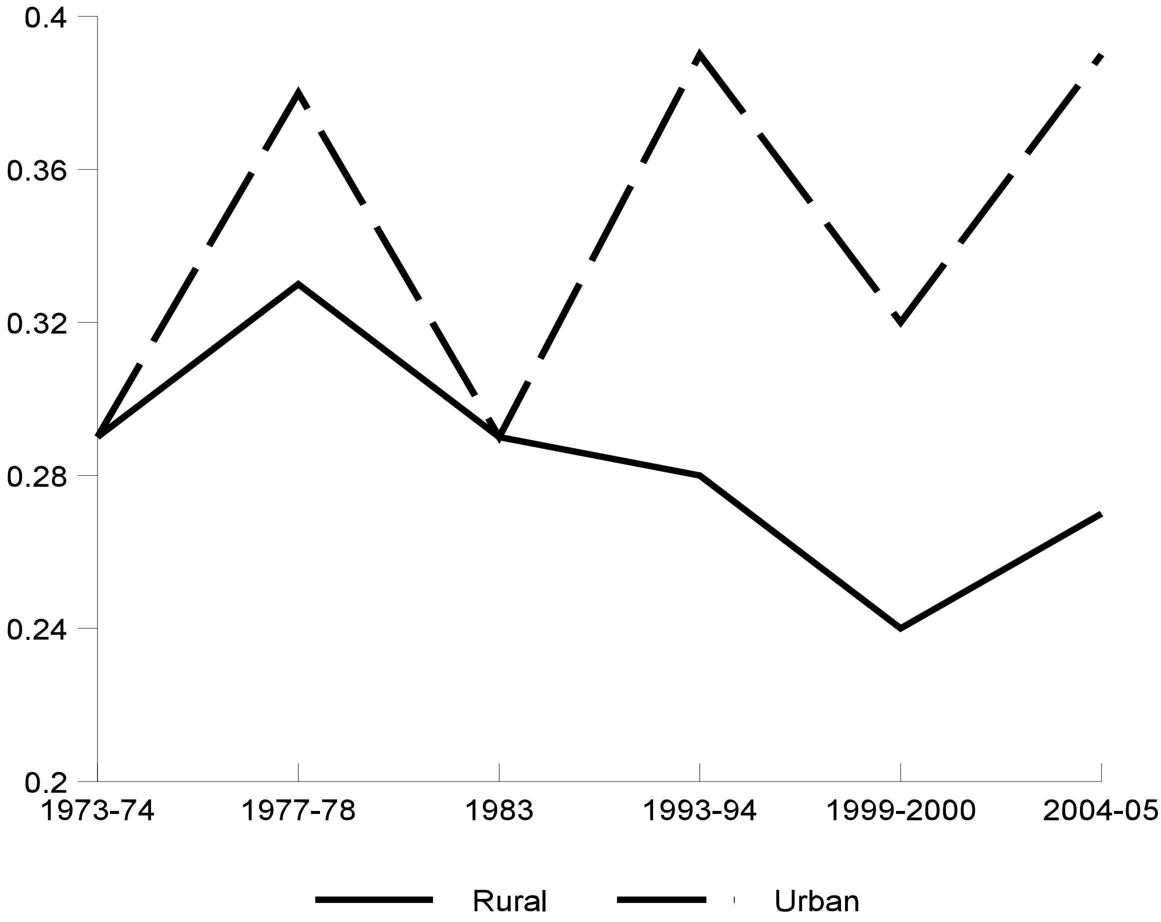
Availability of the six specified assets in the districts of the state also varies widely by social class in both rural and urban areas. The situation appears to be appalling in case of Scheduled Tribes in the rural areas as there is no district in the state where the asset less Scheduled Tribes households accounted for less than half of the total Scheduled Tribes households in the rural areas. In district Sagar, almost 80 per cent of the rural Scheduled Tribes households were not having any of the of the six specified assets at the 2001 population census. In addition, there are five districts - Morena, Damoh, East Nimar, Vidisha and Dindori - where at least three-fourth of the Scheduled Tribes households in the rural areas were not having any of the six specified assets. The situation in the urban areas appears no better at least in 7 districts of the state - Sheopur, Shivpuri, Panna, Satna, Rewa, Barwani and Dindori. In these districts, more than half of the Scheduled Tribes households were not having any of the six specified assets. Although, the situation appears to be marginally better in the Scheduled Castes households, yet there exists a wide gap between Scheduled Castes/Tribes and non Scheduled Castes/Tribes households in all districts of the state either in rural or in urban areas.

Relative Poverty or Distribution Inequality

A major determining factor of poverty is the inequality in the distribution of income and resources across different population groups or social classes. Distribution inequality implies that all sections of the population are not getting benefited equally by the dividends of social and economic development process in terms of the increase in income or accumulation of assets. As such, reducing the distribution inequality has widely been acknowledge as an optimal yet the most feasible approach of reducing poverty. For example, raising the income of all individuals and households above the poverty line will not only reduce poverty but will also lead to a reduction of the distribution inequality across individuals and households. An analysis of the distribution inequality, therefore, is imperative in any analysis of poverty.

Many indicators have been developed to measure the distribution inequality across population groups (Sen, 1997). These inequality measures can broadly be grouped into two categories: a) measures based on individual-mean differences in income or consumption or household assets,

Figure 4.6
Proportion of population below poverty line by residence in Madhya Pradesh



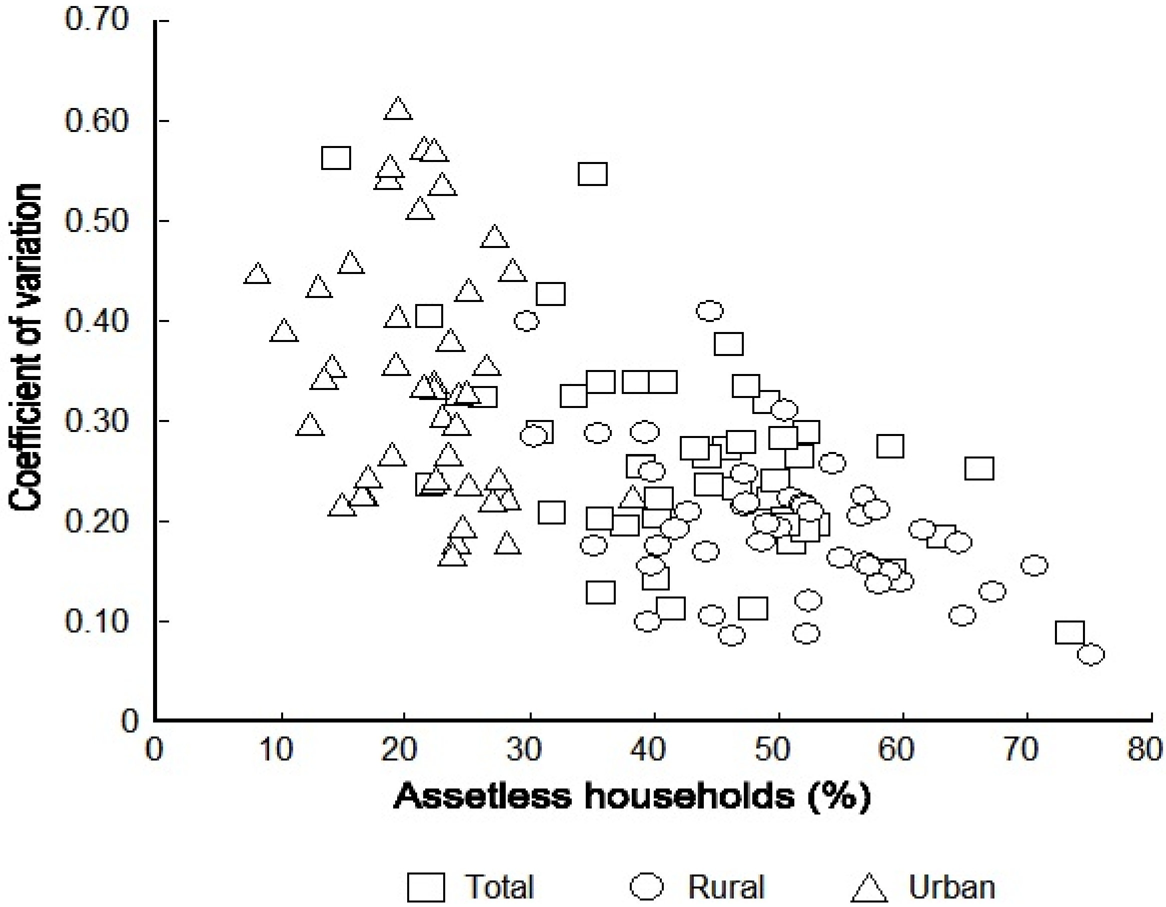
and b) measures based on inter-individual differences (Gakidou, Murray and Frenk, 2003). A common example of individual-mean differences is the coefficient of variation. Other example is the variance or standard deviation. On the other hand, Gini coefficient is the most well known and almost universally used example of measures of inter-individual differences in income (Gini, 1912). Estimates of Gini coefficient of the distribution of income in Madhya Pradesh have been prepared by the Planning Commission, Government of India on the basis of income or consumption expenditure collected in different round of national sample survey beginning 1973-74. These estimates suggest that inter-individual differences in the income or consumption expenditure appear to have marginally decreased over the years in the rural areas of the state. However, in the urban areas, there are definite indications that suggest that there has been an increase in the inequality in income distribution. For reducing poverty, it is important that there is a decrease in the distribution inequality. Unfortunately, this has not been the case in the urban areas of the state.

Estimates of Gini coefficients are not available at the district level to have an idea of distribution inequality in the districts of the state. However, some idea about distribution inequality within the district can be made by analysing the inequality in the proportion of asset less households by social class. This inequality can be captured through the coefficient of variation in the proportion of asset-less households by social class in the district. Coefficient of variation is one of the many indexes developed and used to capture distribution inequality. There are at least three reasons for selecting the coefficient of variation to reflect the social class inequality in the proportion of asset less households. First, it is a measure based on variance. Second, it evaluates variation relative to average proportion of asset less households in the state as a whole or the district as a whole, thus permitting meaningful comparison of distribution inequality when the average proportion of asset less households declines. Third, coefficient of variation can be decomposed into components that reflect differential change in the composition and the level. The coefficient of variation is always positive. When there is no inequality, the coefficient of variation is zero. On the other hand, higher values of coefficient of variation reflect a higher degree of distribution inequality across social classes.

For the state as a whole, the coefficient of variation in the proportion of asset less households by social class - Scheduled Castes, Scheduled Tribes and non Scheduled Castes/Tribes - has been estimated to be 0.314 which shows that there exists substantial social class inequality in the distribution of household assets in the state. This inequality has been found to be higher in the urban (0.351) as compared to the rural (0.225) areas which indicates that the concentration of income and resources as reflected through the household assets is relatively more in the urban as compared to the rural areas of the state.

Across the districts of the state, the distribution of the proportion of asset less households by social class varies widely. The coefficient of variation of the distribution of asset less households by social class has been found to be the highest in district Indore closely followed by district Ratlam. In district Indore, more than 37 per cent of the Scheduled Tribes households were having none of the specified household assets. This proportion was only 10 per cent in case of non-Scheduled Castes/Tribes households. Similarly, in Ratlam, more than 65 per cent of the Scheduled Tribes households were without any of the six specified assets compared to only about 21 per cent in case of non-Scheduled Castes/Tribes households. By contrast, the social class inequality has been found to be the lowest in district Dindori where more than 64 per cent of the non-Scheduled Castes/Tribes households in the district were without specified assets compared to 78 per cent in case of Scheduled Tribes households. Another important observation is that the distribution inequality by social class is higher in urban areas than in rural areas in all but three

Figure 4.7
Relationship between social class inequality (coefficient of variation) and proportion of asset less households in Madhya Pradesh, 2001



districts of the state. The three districts where the distribution inequality by social class is higher in the rural areas are Ratlam, East Nimar and Seoni.

The distribution inequality, measured in terms of the coefficient of variation, is independent of the average levels of income or consumption or average levels of household assets. It merely depicts the extent of divergence or deviation from average levels. Theoretically, distribution inequality will be zero when the distribution of income or consumption or household assets across social classes is the same irrespective of the average level of income or consumption or average levels of household assets. By contrast, distribution inequality is the highest in the extreme situation when all income or consumption or all household assets are concentrated in one specific population group or one specific social class. Figure 4.7 attempts to establish the relationship between the social class inequality in the proportion of asset less households and the proportion of households having none of the six specified household assets. It may be seen from the figure that the social class inequality, measured in terms of the coefficient of variation, is low when the proportion of asset less households is high in a district. However, when the proportion of asset less households is low, the social class inequality is high. This implies that the distribution of income is more unequal in those districts of the state where average levels of income as reflected through the proportion of asset less households, are high. Figure 4.7 suggests that the increase in income appears to have resulted in an increase in the concentration of income to the richer sections of the community thereby increasing the income inequality.

Multidimensional Poverty

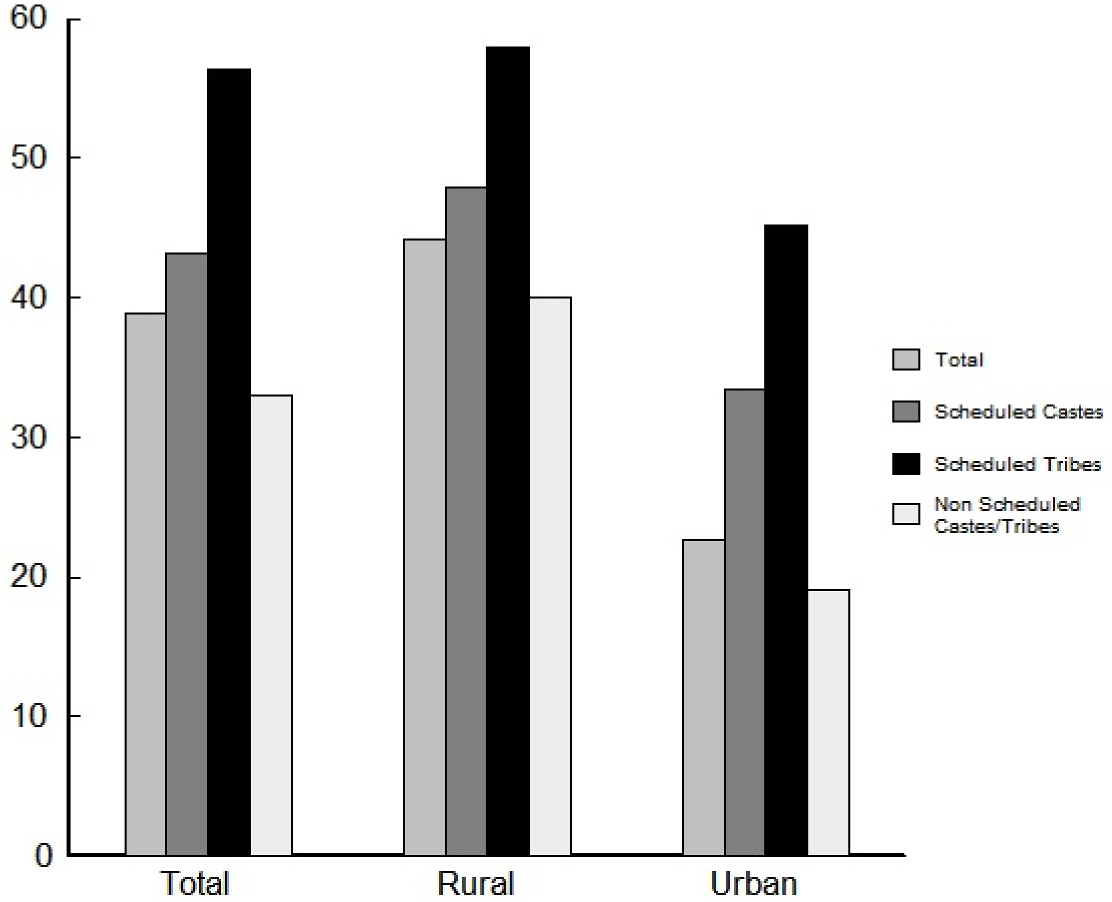
Sen (1979, 1985, 1987) has argued that poverty is essentially multidimensional, a proposition that has now been universally accepted. Following the framework suggested by Sen, poverty implies that opportunities and choices most basic to human development and human progress are denied. In this context, poverty means more than the lack of what is necessary for material well-being. From the perspective of human well-being, poverty of choices and opportunities is often more relevant than the poverty of income. The poverty of choices focuses on the causes of poverty and leads directly to strategies of empowerment and other actions to enhance opportunities for everyone. Recognising the poverty of choices and opportunities implies that poverty must be addressed in all its dimensions, not in terms of income alone.

In order to capture the multi-dimensional nature of poverty, United Nations has introduced the human poverty index (HPI) which measures poverty in terms of the three dimensions of well-being and quality of life to arrive at an aggregate judgment of the extent of poverty in a community or a country (United Nations, 1997; 2007). Instead of measuring poverty in terms of income or consumption, HPI uses indicators of deprivation in the three essential elements of human life: longevity, knowledge and a decent standard of living. The first dimension relates to survival. The second dimension relates to deprivation from the knowledge while the third dimension is related to a decent standard of living, in particular, overall economic provisioning.

United Nations has employed the following four indicators to measure the human poverty index for its member countries:

1. Probability of a new born not surviving to age 40 years.
2. Proportion of the adult population who is illiterate.
3. Proportion of population without access to safe drinking water, and
4. Proportion of children below five years who are under-weight for their age.

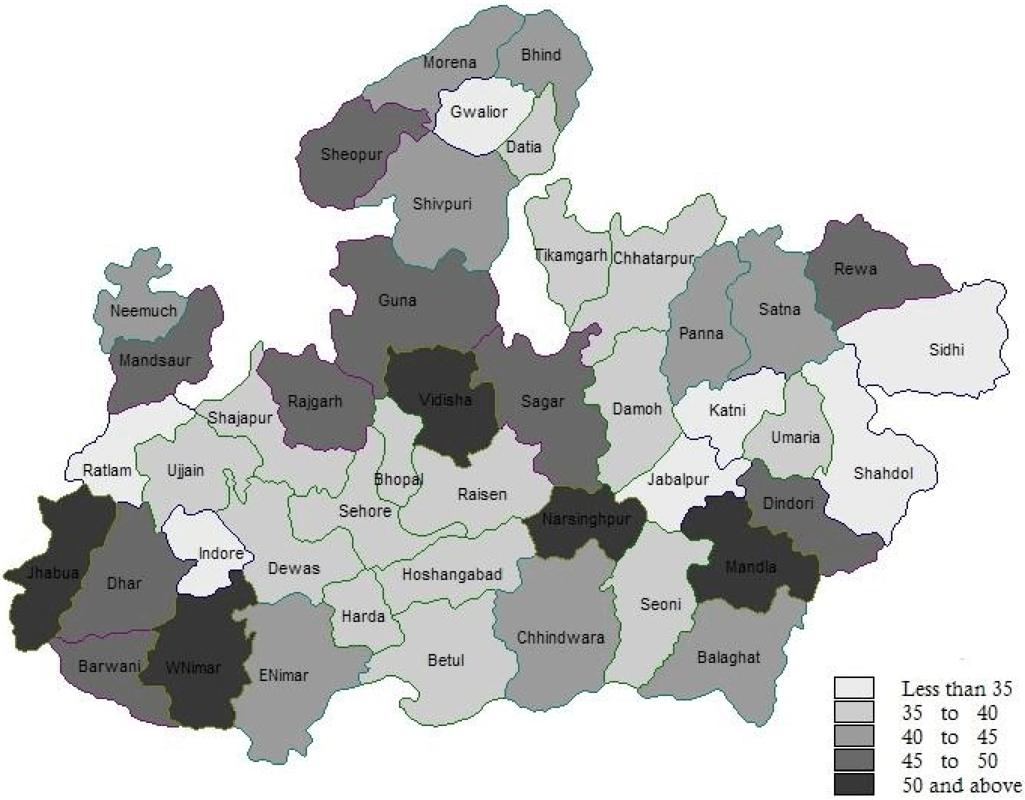
Figure 4.8
Multi-dimensional poverty in Madhya Pradesh, 2001



Estimates of human poverty index for Madhya Pradesh and for its constituent districts are not currently available because of the non-availability of information required for the estimation of the index. It is however possible to estimate a variant of the human poverty index on the basis of the information available through 2001 population census. This variant of the human poverty index is based on the following four indicators that can be estimated at the district level for the combined population as well as separately for different social classes and for rural and urban areas:

1. Probability of a new born not surviving to 5 years of age.
2. Proportion of population at least 15 years old illiterate-unable to read and write with understanding.
3. Proportion of asset less households, households having none of the following six assets - radio/transistor, television, telephone, bicycle, scooter/motorcycle/moped, and car/jeep/van.
4. Proportion of households without access to safe drinking water.

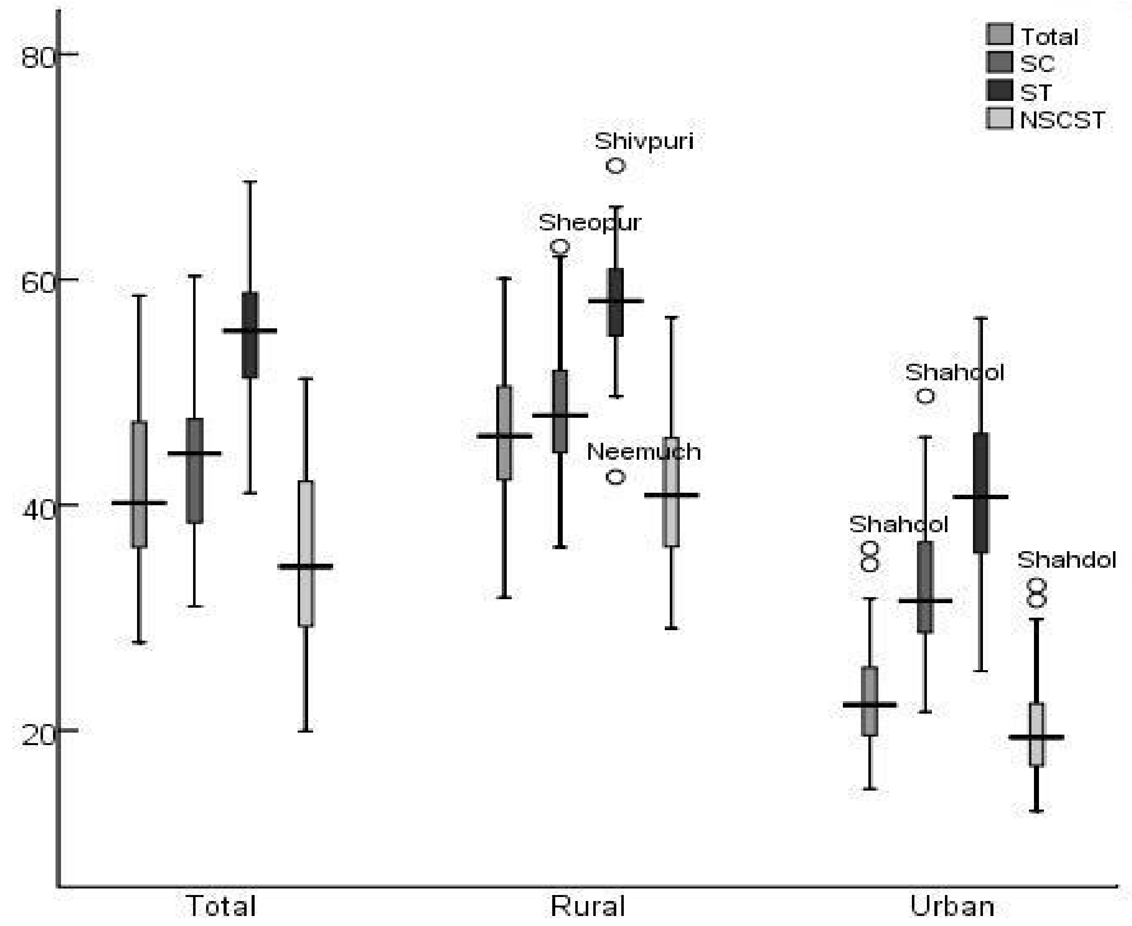
Figure 4.9
Human poverty index (HPI) in districts of Madhya Pradesh, 2001



For Madhya Pradesh as a whole, the human poverty index has been estimated to be almost 39 per cent in the year 2001. There exists wide rural-urban difference as the human poverty index in the rural areas has been found be almost two time the human poverty index in the urban areas (Figure 4.8). Similarly, more than 55 per cent of the Scheduled Tribes population in the state is estimated to be poor as compared to only about 33 per cent in the non Scheduled Castes/Tribes population. Social class disparities in multi-dimensional poverty in the state are revealing. In Scheduled Tribes population in rural areas of the state, almost 60 per cent of the population appears to be living in poor conditions compared to less than 20 per cent non Scheduled Castes/Tribes population in the urban areas.

Inter-district variations in the human poverty index are also revealing. The human poverty index varies from a low of about 28 per cent in district Indore to almost 60 per cent in district Jhabua. There are 6 districts - Jhabua, Dhar, West Nimar, Vidisha, Narsinghpur and Mandla - where the index has been estimated to be more than 50 per cent suggesting wide-spread poverty. By

Figure 4.10
Inter-district variations in human poverty index in Madhya Pradesh, 2001



contrast, there are only 3 districts - Indore, Ratlam and Shahdol - where the human poverty index has been estimated to be less than 30 per cent. In the rural areas, human poverty index varies from a low of about 32 per cent (district Neemuch) to a high of more than 60 per cent (district Shivpuri) whereas in the urban areas, the human poverty index varies from about 15 per cent in district Ujjain to more than 36 per cent in district Shahdol.

Among different population subgroups, inter-district variations in the human poverty index has been found to be the highest in the non Scheduled Castes/Tribes population. This population group has the lowest human poverty index among different population groups of the state. On the other hand, inter-district variability in the human poverty index has been found to be the least in the Scheduled Tribes which has the highest human poverty index among different population groups. This is because human poverty index is consistently low to very low in the Scheduled Tribes population across all the districts of the state. This is however not the case in the non

Scheduled Castes/Tribes population. In some of the districts of the state, the human poverty index in the non Scheduled Castes/Tribes population is very low whereas in some other districts, it is very high.

Another important observation is that within district social class inequality is also quite substantial. For Madhya Pradesh, the coefficient of variation in the human poverty index across social classes has been found to be 0.280 for the combined population, 0.641 for the urban population and 0.193 for the rural population. This shows that concentration of income and consumption in the urban areas is very high as compared to that in the rural areas. Among the districts, the lowest social class inequality in human poverty index has been estimated in district Jhabua (0.104) whereas the highest has been observed in district Ratlam (0.503). Similarly, in all but one districts (Sehore), within district social class inequality has been found to be very high in the urban areas as compared to the rural areas.

Issues in Poverty Reduction

It is now universally recognised that a multi-dimensional approach is required to reduce poverty because poverty is essentially multi-dimensional in nature. Developing a multi-dimensional strategy of reducing poverty first requires conceptualising different dimensions of poverty. An understanding of the nature of poverty is necessary to design strategies and interventions for poverty reduction.

The multi-dimensional nature of poverty can be captured through the concept of poverty space. A poverty space comprises of many dimensions of poverty that can broadly be grouped into three sub-spaces - the endowment sub-space; the capacity sub-space; and the opportunity sub-space. Each of the three sub-spaces may comprise of many dimensions and may have some common elements. The importance and relevance of these dimensions may vary from place to place depending upon the local context of poverty.

Traditionally, poverty has been characterised in the context of the endowment sub-space only and that too within the very narrow dimension of individual income or consumption or household assets. The capacity sub-space and the opportunity sub-space of poverty have rarely been recognised and taken into consideration in defining and characterising poverty and in designing and implementing poverty reduction programmes. In view of the multi-dimensional nature of poverty, it is important that any strategy towards poverty reduction must address all the three sub-spaces of the poverty space.

The characterisation of the multi-dimensional nature of poverty as a poverty space is also important in the sense that the three sub-spaces of poverty can be defined at all the three levels - micro (*individual*) level, meso (*family or household*) level and the macro (*society or community*) level. This helps in analysing how poverty space at the macro level is linked to the poverty space at the meso level and the poverty space at the micro level. Analysis of these linkages, incidentally, are critical to the success of any poverty reduction strategy as most of the poverty reduction interventions are applied either at the micro level or at the meso level. For the reduction of poverty, it is necessary that dividends of micro and meso level poverty reduction interventions and efforts add up to macro poverty reduction goals and objectives. This requires that linkages among poverty spaces at macro, meso and micro levels are clearly established.

Poverty is basically a reflection of the malfunctioning of the social and economic production system. This malfunctioning gets manifested through a combination of low endowments, weak capacities and poor opportunities. As discussed earlier, there are innumerable factors and conditions both exogenous and endogenous that result in unsatisfactory outcomes for individuals in terms of endowments, capacities and opportunities and lead to poverty. If this is so then any poverty reduction strategy should be directed towards improving the functioning of the social and economic production system. A systems approach should therefore be adopted to address the multi-dimensional nature of poverty.

The results framework may be employed to operationalise the aforesaid concept of poverty space in not only analysing levels, differentials and determinants of poverty but also in designing, implementing and evaluating poverty reduction strategies and efforts. The results framework breaks down the measurement and analysis of poverty in terms of its three sub-spaces and for each sub-space, objectively verifiable indicators are identified at micro, meso and macro levels. While selecting indicators, it must be recognised that the three sub-spaces of the poverty space have different orientation at the micro level as compared to meso and micro levels. At the micro level, the endowment sub-space, for example, needs to be defined in an individual context; at the meso level, it is to be defined in a family or household context while at the macro level, it is to be defined in a social or community context. It should also be recognised that the basic orientation of the poverty space at the national and the state or at the macro level is radically different from the poverty space at the micro level, especially in the context of planning and programming for the reduction in poverty. It is the needs effectiveness and the capacity efficiency that is critical in the success of poverty reduction efforts at the micro level. By contrast, at national and state or at the macro level, the primary concern is on the realised efficiency of poverty reduction efforts.

The framework presented in the foregoing pages suggests that reduction in poverty in Madhya Pradesh will be contingent upon:

1. Increasing endowments at the level of individuals, families and societies,
2. Enhancing productive capacities of individuals, families and societies, and
3. Creating opportunities for individuals, families and societies for utilising their capacities.

The framework also suggests different pathways or causal orderings that may lead to increased endowments, enhanced capacities and better opportunities for individuals and families and hence to poverty reduction. Each pathway has a starting point and a destination. What is needed is to identify a starting point and a destination that is most suited to the prevailing context. It is in this context that a discussion on different starting points of implementing the multi-dimensional approach to poverty reduction is in order.

The first starting point for reducing poverty may be in terms of increasing the endowments of average individual. It is conjectured that increase in endowments will lead to either enhanced capacities or better opportunities which, in turn, would lead to better opportunities or enhanced capacities and hence further increase in endowments. The underlying assumption is that the poor people or poor families would utilise the additional income to increase their productivity either through enhance capacities or through better opportunities or both. The prerequisite for the effectiveness of this approach is that people and families must have necessary capacity for the productive utilisation of increased endowments and the social and economic production system must provide appropriate opportunities for maximising dividends resulting from the combination of endowments and capacities.

The second starting point may be in terms of enhancing the productive capacity of individuals so that they can increase their endowments by utilising the opportunities available or they can combine the enhanced capacity with the endowments to create better opportunities for maximising their productivity. This approach essentially comprises of building a knowledge society. The effectiveness of this approach requires that enhanced capacity of the people should be either matched with appropriate endowments to translate into better opportunity or associated with appropriate opportunity to convert the enhanced capacity into increased endowments.

The third and the last starting point may be in terms of creating better opportunities so that people may effectively use their capacities and endowments that they have to increase their productivity. It is important here to emphasise that better opportunities may not always lead to increased productivity if people, families and societies do not have the capacity and the endowments to en-cash the opportunities available. If people, families and societies have weak capacities or low endowments then just creating opportunities may not lead to reduction in poverty.

It is obvious that there is no universal path for poverty reduction. It may however be emphasised here that the endowments set, the capacity set and the opportunity set available to people, families and societies keep on changing, quite often, rapidly because of the transition in social and economic development processes as well as changes in endowments, capacities and opportunities at the level of individual, family and society. This means that poverty reduction itself is a very dynamic process. If this is so, then only a dynamic model of poverty reduction can be effective in actually eradicating poverty.

The first and, perhaps, the most important issue in articulating a poverty reduction strategy, therefore, is to decide about the starting point of the poverty reduction path. This starting point depends upon the characterisation of the prevailing poverty space which can be done in terms of characterising the endowments people have, their capacities for productive work and the opportunities available for their productive utilisation. As an example, one characterisation of the poverty reduction strategy may be described as under:

- The endowment sub-space may be characterised in terms of level indicators. For example low child survival probability or low levels of primary schooling or low levels of average income per capita may be taken as an indicator of low levels of endowments at the level of the family or the community or the society. Similarly, appropriate indicators may be defined at the individual level.
- The capabilities sub-space may be characterised in terms of social class inequalities which are essentially reflections of incapacities of particular class of individuals, families, and societies in en-cashing available opportunities and in increasing endowments.
- The opportunity sub-space may be characterised in terms of participation indicators. It is well known that participation in the social and economic production system is necessary for eradicating poverty. One of the necessary conditions for participation in the social and economic production system is that appropriate opportunities must be available within the production system.

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Table 4.1
Proportion of population below poverty line in Madhya Pradesh
The Head-count Ratio

Period	Proportion of the population living below poverty line at current prices (per cent)					
	Madhya Pradesh			India		
	Combined	Rural	Urban	Combined	Rural	Urban
1973-74	61.78	62.66	57.65	54.88	55.72	47.96
1977-78	61.78	62.52	58.66	51.32	50.6	40.5
1983	49.78	48.9	53.06	44.48	45.31	35.65
1987-88	43.07	41.92	47.09	38.86	39.6	35.65
1993-94	42.52	40.64	48.38	35.97	37.3	32.4
1999-2000	37.43	37.06	38.44	26.1	27.2	23.7
2004-05	38.3	36.9	42.1	27.5	28.3	25.7

Source: Planning Commission

Table 4.2

Social class differentials in poverty in Madhya Pradesh, 1999-2000

Period	Poverty indexes					
	Madhya Pradesh			India		
	HCR	PG	SPG	HCR	PG	SPG
Residence						
Rural	37.25	7.69	2.33	26.98	5.26	1.55
Urban	38.48	9.52	3.31	23.44	5.15	1.65
Caste						
Scheduled Castes	41.21	8.45	2.5	35.89	7.22	2.15
Scheduled Tribes	57.14	12.53	4.02	45.82	10.59	3.49
Backward Classes	32.32	6.4	1.87	26.96	4.93	1.38
Others	11.7	1.9	0.46	14.98	2.6	0.71
Employment Status						
Self-employed (Agriculture)	27.11	na	na	20.09	na	na
Self-employed (Non-agriculture)	30.18	na	na	23.82	na	na
Labour (Agriculture)	53.58	na	na	39.83	na	na
Labour (Non-agriculture)	56.54	na	na	27.52	na	na
Others	15.22	na	na	15.07	na	na
Land holdings						
< 1.0 ha	45.29	na	na	30.03	na	na
1-2 ha	34.91	na	na	22.59	na	na
2-4 ha	30.28	na	na	17.32	na	na
> 4 ha	18.66	na	na	10.62	na	na

Source: Panda (2003)

Table 4.3

Inter-district and social class variations in the proportion of asset less households in Madhya Pradesh, 2001

Total population

State/District	Proportion (Per cent) of asset less households				Coefficient of variation
	Total	Scheduled Castes	Scheduled Tribes	Non Scheduled Castes/ Tribes	
Madhya Pradesh	42.15	47.11	65.68	32.81	0.314
Sheopur	59.13	67.11	71.87	51.77	0.152
Morena	41.31	47.86	66.08	38.89	0.113
Bhind	35.80	44.02	40.78	33.15	0.130
Gwalior	21.94	29.17	56.52	17.77	0.405
Datia	40.17	48.74	53.31	36.45	0.144
Shivpuri	45.91	52.42	74.09	38.09	0.273
Guna	49.39	58.66	71.96	42.09	0.224
Tikamgarh	37.67	42.46	63.66	33.73	0.196
Chhatarpur	35.62	42.82	59.05	31.28	0.202
Panna	46.64	53.40	67.75	38.90	0.233
Sagar	50.55	57.55	77.22	44.37	0.203
Damoh	53.04	61.42	74.72	45.90	0.198
Satna	35.76	41.29	62.08	28.37	0.338
Rewa	33.55	42.71	55.86	26.64	0.325
Umaria	44.24	42.03	56.35	31.91	0.265
Shahdol	40.67	37.26	55.13	26.32	0.340
Sidhi	46.99	49.85	65.45	36.22	0.279
Neemuch	26.16	31.46	50.02	22.09	0.324
Mandsaur	31.75	43.06	48.26	28.13	0.209
Ratlam	35.10	37.42	65.51	20.59	0.548
Ujjain	30.77	44.20	44.22	24.90	0.289
Shajapur	40.27	53.66	52.10	35.07	0.206
Dewas	38.53	49.90	62.30	29.17	0.339
Jhabua	66.18	58.32	72.77	20.65	0.253
Dhar	46.08	46.48	61.95	25.40	0.377
Indore	14.44	21.59	37.43	10.11	0.563
W Nimar	51.72	57.40	69.11	39.28	0.265
Barwani	59.01	59.60	70.24	33.53	0.276

State/District	Proportion (Per cent) of asset less households				Coefficient of variation
	Total	Scheduled Castes	Scheduled Tribes	Non Scheduled Castes/ Tribes	
E Nimar	52.23	55.25	74.77	40.40	0.290
Rajgarh	47.96	57.35	59.53	44.88	0.114
Vidisha	51.01	63.40	73.51	45.55	0.179
Bhopal	21.94	31.98	31.48	19.21	0.237
Sehore	44.43	54.76	67.19	37.37	0.238
Raisen	52.09	60.87	71.22	45.43	0.191
Betul	49.00	46.81	68.80	35.06	0.319
Harda	47.38	55.16	71.24	34.25	0.335
Hoshangabad	38.90	46.87	58.53	32.32	0.256
Katni	43.31	47.35	62.30	34.67	0.273
Jabalpur	31.66	35.48	59.85	23.65	0.427
Narsinghpur	50.62	58.58	72.09	44.36	0.198
Dindori	73.46	67.66	78.37	64.21	0.089
Mandla	63.15	53.07	73.34	49.18	0.186
Chhindwara	50.35	46.51	69.95	38.73	0.284
Seoni	49.76	47.84	64.97	39.17	0.241
Balaghat	40.44	39.51	57.11	35.07	0.224
Coefficient of variation	0.275	0.217	0.128	0.298	

Source: Author's calculations

Table 4.4

Inter-district and social class variations in the proportion of asset less households in Madhya Pradesh, 2001

Rural Population

State/District	Proportion (Per cent) of asset less households				Coefficient of variation
	Total	Scheduled Castes	Scheduled Tribes	Non Scheduled Castes/ Tribes	
Madhya Pradesh	50.46	53.38	68.09	41.38	0.225
Sheopur	64.87	72.48	72.53	58.76	0.105
Morena	46.40	50.11	76.17	44.70	0.087
Bhind	39.53	46.17	53.65	37.24	0.100
Gwalior	39.84	42.42	71.06	35.03	0.249
Datia	44.76	51.39	55.33	41.52	0.106
Shivpuri	51.04	56.01	74.89	43.49	0.224
Guna	56.88	63.63	73.38	50.36	0.159
Tikamgarh	40.43	43.89	65.44	36.79	0.175
Chhatarpur	39.81	44.60	60.19	36.06	0.156
Panna	49.83	54.85	68.01	42.74	0.194
Sagar	59.87	64.84	79.04	54.48	0.139
Damoh	58.93	65.53	75.76	52.57	0.150
Satna	39.31	42.54	62.36	32.06	0.289
Rewa	35.59	42.76	56.10	28.90	0.288
Umaria	47.30	44.91	57.05	35.75	0.216
Shahdol	47.49	41.58	56.57	34.74	0.219
Sidhi	51.93	53.86	66.65	41.94	0.217
Neemuch	30.39	35.82	52.50	25.89	0.284
Mandsaur	35.14	44.76	50.36	31.56	0.175
Ratlam	44.51	43.16	68.00	27.60	0.410
Ujjain	41.74	52.21	54.58	35.69	0.193
Shajapur	44.23	55.53	54.38	39.18	0.170
Dewas	47.36	56.93	65.67	37.87	0.247
Jhabua	70.73	65.04	73.83	28.80	0.155
Dhar	50.55	49.80	62.66	28.40	0.310
Indore	29.80	36.99	54.31	21.62	0.400
W Nimar	56.59	60.26	70.02	44.86	0.206
Barwani	64.62	63.84	70.97	41.98	0.178

State/District	Proportion (Per cent) of asset less households				Coefficient of variation
	Total	Scheduled Castes	Scheduled Tribes	Non Scheduled Castes/ Tribes	
E Nimar	61.57	61.85	76.19	50.61	0.191
Rajgarh	52.23	59.82	61.67	49.56	0.088
Vidisha	58.06	68.09	76.28	52.98	0.137
Bhopal	52.49	60.33	67.51	48.49	0.121
Sehore	49.99	58.56	69.49	43.11	0.193
Raisen	57.36	64.70	73.10	50.93	0.155
Betul	56.88	57.23	70.53	43.31	0.225
Harda	54.44	60.15	72.76	41.22	0.258
Hoshangabad	48.68	56.73	62.53	42.02	0.180
Katni	49.00	50.78	63.45	41.42	0.198
Jabalpur	52.17	52.82	69.62	43.61	0.216
Narsinghpur	55.05	60.82	74.00	49.28	0.164
Dindori	75.16	69.05	78.79	68.05	0.067
Mandla	67.26	58.06	74.12	55.97	0.129
Chhindwara	57.98	53.04	72.36	46.41	0.212
Seoni	52.58	49.79	65.64	42.30	0.209
Balaghat	42.74	42.02	58.74	37.29	0.209
Coefficient of variation	0.191	0.161	0.100	0.205	

Source: Author's calculations

Table 4.5

Inter-district and social class variations in the proportion of asset less households in Madhya Pradesh, 2001

Urban Population

State/District	Proportion (Per cent) of asset less households				Coefficient of variation
	Total	Scheduled Castes	Scheduled Tribes	Non Scheduled Castes/ Tribes	
Madhya Pradesh	17.99	26.61	36.19	14.84	0.351
Sheopur	28.22	35.36	51.39	25.40	0.223
Morena	22.32	37.40	31.13	18.46	0.339
Bhind	23.50	35.62	25.87	20.19	0.267
Gwalior	10.31	17.88	20.32	8.26	0.390
Datia	22.25	32.18	40.67	19.64	0.240
Shivpuri	19.35	28.93	53.75	16.00	0.406
Guna	22.39	36.10	44.71	18.83	0.334
Tikamgarh	23.07	32.73	46.94	19.33	0.305
Chhatarpur	19.23	32.32	40.03	15.82	0.357
Panna	23.02	40.00	60.79	16.68	0.537
Sagar	24.19	37.01	45.78	19.66	0.327
Damoh	23.69	39.65	43.81	18.76	0.381
Satna	21.17	35.34	57.97	16.09	0.513
Rewa	21.58	42.31	52.76	15.55	0.573
Umaria	27.13	30.79	48.58	17.86	0.485
Shahdol	18.64	25.97	39.53	12.93	0.543
Sidhi	18.79	27.11	44.99	13.41	0.556
Neemuch	14.13	17.66	34.26	12.29	0.354
Mandsaur	16.65	26.82	27.83	15.25	0.228
Ratlam	12.28	16.99	25.24	10.80	0.297
Ujjain	13.49	22.05	24.20	11.09	0.343
Shajapur	22.50	36.10	30.86	20.22	0.244
Dewas	15.63	24.53	36.74	12.05	0.459
Jhabua	22.35	29.78	41.01	12.87	0.571
Dhar	25.05	31.89	48.94	19.41	0.431
Indore	8.11	13.39	18.44	6.24	0.448
W Nimar	24.96	36.53	46.87	21.11	0.328
Barwani	28.67	44.96	52.53	20.81	0.451

State/District	Proportion (Per cent) of asset less households				Coefficient of variation
	Total	Scheduled Castes	Scheduled Tribes	Non Scheduled Castes/ Tribes	
E Nimar	24.09	31.20	39.25	22.33	0.179
Rajgarh	27.44	41.92	37.98	24.30	0.243
Vidisha	25.13	38.18	35.63	22.36	0.237
Bhopal	14.93	20.78	22.78	13.33	0.217
Sehore	18.99	28.35	32.89	16.51	0.268
Raisen	28.20	36.41	43.35	25.86	0.180
Betul	16.52	18.70	28.46	14.79	0.228
Harda	21.48	32.41	41.52	17.89	0.334
Hoshangabad	17.00	23.81	26.94	14.76	0.245
Katni	19.39	31.97	49.12	13.33	0.613
Jabalpur	13.06	20.35	28.10	10.10	0.436
Narsinghpur	26.50	43.79	46.96	21.63	0.356
Dindori	38.26	33.80	53.81	33.48	0.225
Mandla	23.73	25.01	34.37	21.97	0.168
Chhindwara	27.07	31.04	42.45	23.91	0.222
Seoni	24.54	31.29	36.79	22.17	0.195
Balaghat	24.15	24.82	40.3	20.49	0.298
Coefficient of variation	0.338	0.332	0.312	0.363	

Source: Author's calculations

Table 4.6

Human poverty index (HPI) in Madhya Pradesh, 2001

	Total	Scheduled Castes	Scheduled Tribes	Non Scheduled Castes/Tribes
		Madhya Pradesh		
Total	38.916	43.228	56.321	32.963
Rural	44.174	47.830	57.899	40.030
Urban	22.682	33.474	45.141	19.066
		Inter-district variations		
		Total		
Minimum	27.807	31.011	41.032	19.949
Q_1	36.264	38.438	51.285	29.260
Median	40.172	44.561	55.445	34.549
Q_3	47.353	47.610	58.814	42.076
Maximum	58.575	60.335	68.677	51.201
		Inter-district variations		
		Rural		
Minimum	31.800	36.277	42.481	29.034
Q_1	42.239	44.657	55.037	36.325
Median	46.118	47.943	58.114	40.865
Q_3	50.505	51.903	60.902	45.954
Maximum	60.102	62.924	70.099	56.656
		Inter-district variations		
		Urban		
Minimum	14.781	21.629	25.283	12.85
Q_1	19.560	28.699	35.764	16.877
Median	22.274	31.491	40.705	19.385
Q_3	25.570	36.694	46.291	22.387
Maximum	36.126	49.659	56.558	32.852

Source: Author's calculations

Table 4.7

Human poverty index (HPI) in Madhya Pradesh, 2001

Total Population

State/District	Proportion (Per cent) of asset less households				Coefficient of variation
	Total	Scheduled Castes	Scheduled Tribes	Non Scheduled Castes/ Tribes	
Madhya Pradesh	38.916	43.228	56.321	32.963	0.280
Sheopur	47.231	53.010	61.644	42.762	0.198
Morena	44.055	39.826	55.364	43.409	0.158
Bhind	41.958	46.379	55.783	37.433	0.209
Gwalior	30.704	35.675	48.877	27.022	0.361
Datia	39.872	39.743	49.405	35.971	0.149
Shivpuri	42.203	47.610	58.720	39.127	0.241
Guna	47.353	53.290	63.618	43.090	0.217
Tikamgarh	35.249	34.799	52.977	29.038	0.308
Chhatarpur	40.067	45.406	48.384	38.204	0.145
Panna	41.808	47.823	57.475	37.173	0.240
Sagar	47.748	43.835	62.083	38.671	0.211
Damoh	37.438	45.259	58.269	32.693	0.351
Satna	43.415	48.953	60.037	40.336	0.237
Rewa	49.200	45.084	56.657	42.309	0.129
Umaria	37.110	37.805	49.663	32.964	0.206
Shahdol	29.205	34.682	41.032	21.534	0.299
Sidhi	32.621	35.646	46.340	26.094	0.274
Neemuch	40.172	44.491	52.539	38.787	0.189
Mandsaur	47.282	54.940	58.814	45.740	0.170
Ratlam	28.264	32.611	51.054	19.949	0.503
Ujjain	36.264	43.840	51.285	32.781	0.274
Shajapur	36.917	46.758	55.003	33.153	0.327
Dewas	38.417	45.388	54.478	33.413	0.274
Jhabua	58.575	58.003	64.832	50.079	0.104
Dhar	50.312	47.400	60.727	42.076	0.156
Indore	27.807	31.011	44.074	24.907	0.349
W Nimar	54.405	60.335	66.593	50.611	0.149
Barwani	47.397	51.410	55.445	38.839	0.151
E Nimar	40.740	42.306	58.029	35.148	0.258

State/District	Proportion (Per cent) of asset less households				Coefficient of variation
	Total	Scheduled Castes	Scheduled Tribes	Non Scheduled Castes/ Tribes	
Rajgarh	47.644	53.707	54.912	45.585	0.117
Vidisha	52.694	56.403	65.692	45.316	0.169
Bhopal	34.564	32.251	47.619	28.344	0.245
Sehore	35.613	42.730	49.925	31.891	0.266
Raisen	36.529	44.561	50.199	31.896	0.261
Betul	36.041	36.272	54.326	26.136	0.333
Harda	39.650	45.826	55.436	34.549	0.258
Hoshangabad	36.859	43.223	56.857	31.143	0.341
Katni	30.642	37.367	53.320	24.630	0.460
Jabalpur	33.463	38.438	56.290	29.596	0.409
Narsinghpur	56.201	60.295	68.677	51.201	0.144
Dindori	49.735	47.302	60.208	42.340	0.151
Mandla	53.006	46.930	59.992	31.869	0.251
Chhindwara	42.623	41.243	57.676	29.260	0.273
Seoni	37.766	38.174	53.439	28.361	0.280
Balaghat	44.354	41.950	56.580	27.572	0.272
Coefficient of variation	0.183	0.165	0.106	0.218	

Source: Author’s calculations

Table 4.8

Human poverty index (HPI) in Madhya Pradesh, 2001

Rural Population.

State/District	Proportion (Per cent) of asset less households				Coefficient of variation
	Total	Scheduled Castes	Scheduled Tribes	Non Scheduled Castes/ Tribes	
Madhya Pradesh	44.174	47.830	57.899	40.030	0.193
Sheopur	57.549	62.924	64.949	55.783	0.093
Morena	47.028	49.691	60.902	46.782	0.173
Bhind	38.115	39.864	50.606	37.761	0.191
Gwalior	48.018	50.202	62.981	46.673	0.183
Datia	56.111	57.614	60.513	55.816	0.048
Shivpuri	60.102	62.029	70.099	56.656	0.103
Guna	48.598	52.187	63.373	45.954	0.183
Tikamgarh	45.475	47.853	58.560	44.382	0.169
Chhatarpur	39.321	44.389	56.834	36.404	0.271
Panna	47.663	50.467	57.688	45.543	0.129
Sagar	56.534	56.045	66.443	52.112	0.111
Damoh	45.965	50.522	57.393	42.856	0.159
Satna	45.320	47.080	60.478	40.786	0.203
Rewa	55.620	59.043	64.020	54.518	0.095
Umaria	38.394	37.101	50.606	29.252	0.230
Shahdol	47.750	47.943	57.985	43.793	0.133
Sidhi	50.396	53.173	57.149	47.597	0.090
Neemuch	31.800	37.068	42.481	29.041	0.222
Mandsaur	42.239	45.209	52.746	39.007	0.156
Ratlam	57.744	57.097	64.929	53.643	0.083
Ujjain	48.263	53.257	59.602	44.849	0.154
Shajapur	46.102	43.402	52.347	45.151	0.086
Dewas	37.959	43.595	49.646	33.929	0.207
Jhabua	52.036	51.062	62.483	34.720	0.225
Dhar	50.505	47.291	58.619	29.034	0.265
Indore	39.494	36.277	52.320	33.816	0.210
W Nimar	53.575	52.713	59.623	31.086	0.251
Barwani	46.986	46.106	57.364	32.179	0.222
E Nimar	49.648	51.903	61.384	44.196	0.153

State/District	Proportion (Per cent) of asset less households				Coefficient of variation
	Total	Scheduled Castes	Scheduled Tribes	Non Scheduled Castes/ Tribes	
Rajgarh	45.578	47.348	55.037	35.754	0.174
Vidisha	47.369	48.989	58.323	43.727	0.142
Bhopal	43.193	43.755	55.101	37.428	0.177
Sehore	41.898	48.425	60.413	36.325	0.281
Raisen	45.256	47.390	57.691	43.170	0.163
Betul	51.950	45.567	60.045	42.163	0.158
Harda	40.970	43.670	56.513	30.017	0.271
Hoshangabad	40.936	44.657	52.685	37.377	0.181
Katni	43.824	48.473	58.114	39.847	0.205
Jabalpur	53.535	48.250	60.978	47.217	0.120
Narsinghpur	42.224	46.382	56.109	37.924	0.207
Dindori	56.049	55.534	60.337	52.407	0.058
Mandla	44.166	39.774	50.858	37.054	0.140
Chhindwara	46.118	48.276	61.683	40.286	0.210
Seoni	40.860	40.982	53.295	33.540	0.204
Balaghat	43.612	45.663	53.863	40.865	0.143
Coefficient of variation	0.132	0.126	0.088	0.183	

Source: Author’s calculations

Table 4.9

Human poverty index (HPI) in Madhya Pradesh, 2001

Urban Population

State/District	Proportion (Per cent) of asset less households				Coefficient of variation
	Total	Scheduled Castes	Scheduled Tribes	Non Scheduled Castes/ Tribes	
Madhya Pradesh	22.682	33.474	45.141	19.066	0.641
Sheopur	22.632	28.149	51.007	20.321	0.740
Morena	22.274	33.915	43.251	20.310	0.624
Bhind	18.722	27.403	34.616	16.439	0.563
Gwalior	28.051	40.843	47.974	23.806	0.495
Datia	19.791	28.699	39.528	17.057	0.637
Shivpuri	16.708	26.970	42.586	13.871	0.967
Guna	22.774	33.162	46.291	17.661	0.665
Tikamgarh	18.792	28.800	38.393	15.905	0.682
Chhatarpur	21.352	33.153	35.764	18.682	0.509
Panna	18.639	30.486	42.391	13.069	0.840
Sagar	21.885	33.383	40.705	17.331	0.594
Damoh	22.908	33.524	41.572	19.948	0.546
Satna	29.530	46.018	56.558	25.010	0.625
Rewa	27.447	38.226	49.589	23.060	0.526
Umaria	20.961	24.508	39.370	16.158	0.533
Shahdol	36.126	49.659	54.202	32.852	0.365
Sidhi	19.390	28.431	39.917	16.877	0.672
Neemuch	18.424	25.679	37.802	15.991	0.653
Mandsaur	34.745	45.348	52.657	31.553	0.350
Ratlam	28.588	29.914	48.496	22.387	0.422
Ujjain	14.781	21.629	25.378	12.850	0.499
Shajapur	22.719	34.512	40.924	20.210	0.555
Dewas	24.377	37.362	36.011	21.909	0.417
Jhabua	19.171	31.171	41.742	13.491	0.789
Dhar	24.369	34.543	50.572	20.828	0.671
Indore	26.223	45.669	52.295	21.787	0.723
W Nimar	20.087	30.269	37.026	16.934	0.575
Barwani	23.619	35.214	40.752	19.620	0.515
E Nimar	20.721	31.491	38.210	18.615	0.575

State/District	Proportion (Per cent) of asset less households				Coefficient of variation
	Total	Scheduled Castes	Scheduled Tribes	Non Scheduled Castes/ Tribes	
Rajgarh	19.552	30.757	30.669	17.113	0.472
Vidisha	19.648	31.149	31.321	17.167	0.487
Bhopal	24.357	41.166	47.383	20.598	0.682
Sehore	25.187	29.010	33.963	22.928	0.225
Raisen	25.570	36.870	37.914	22.699	0.383
Betul	16.696	26.403	25.877	14.804	0.467
Harda	18.299	23.715	30.089	16.476	0.413
Hoshangabad	20.345	32.006	25.283	17.511	0.368
Katni	31.725	42.347	44.956	28.838	0.313
Jabalpur	19.560	24.300	33.848	16.874	0.451
Narsinghpur	27.029	40.937	48.551	23.185	0.553
Dindori	29.830	36.694	46.006	25.765	0.349
Mandla	20.225	25.235	30.773	18.322	0.338
Chhindwara	22.378	30.812	39.368	19.385	0.495
Seoni	22.001	32.823	31.565	20.039	0.382
Balaghat	31.530	29.836	41.863	29.873	0.194
Coefficient of variation	0.207	0.195	0.191	0.231	

Source: Author’s calculations

CONCERNS ABOUT ECONOMIC GROWTH

The importance of economic growth in poverty reduction and human development lies in the fact that despite multi-dimensional nature of human development and poverty, economic growth remains the main engine for all poverty reduction efforts and human development activities. Evidence from all over the world indicates that domestic policies have important effect on sustained economic growth including prudent macroeconomic management. Macroeconomic stability provides an important precondition for higher economic growth and helps in preventing the resurgence of inflation and scarcity of resources which are serious impediments to poverty reduction. High inflation can also stifle expansion of the economy thereby limiting the opportunity of the people at large to participate in the economic and social production processes. Expansion of the economy and improving the productivity of the economic and social production system directly affects income per capita which is one of the three elements of the conventional human development index that is now used to measure levels, trends and differentials in human development across the world.

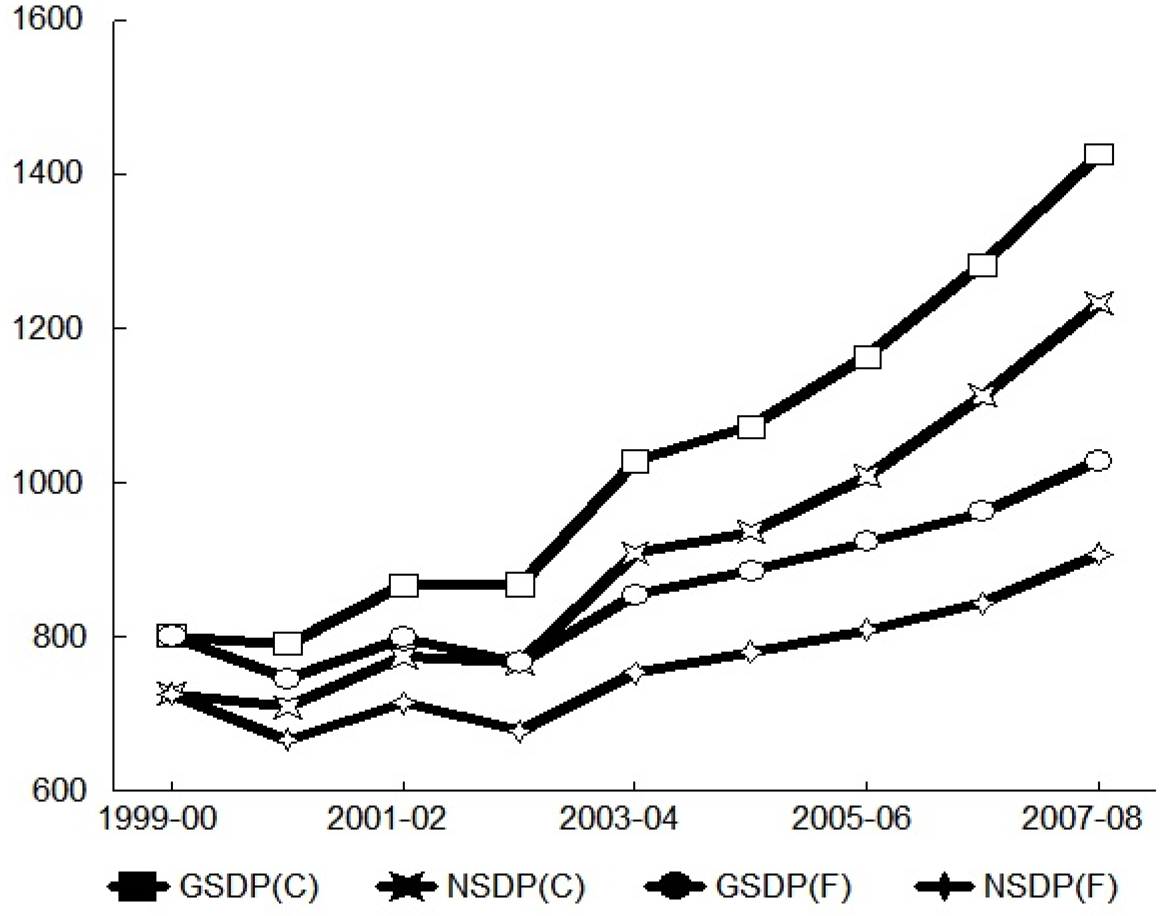
The most commonly used approach to analyse the growth and expansion of the economy is the analysis of the domestic product which reflects the output and the productivity of the social and economic development system. The domestic product can be measured either in gross terms or in net terms. The difference in gross and net domestic product reflects the depreciation in the capital stock. If a country or a state is not able to replace the capital stock lost through depreciation, the gross domestic product will fall. A growing gap between gross and net domestic product indicates increasing obsolescence of capital goods while a narrowing gap indicates that the condition of the capital stock is improving. It is in this context, it is argued that there should be less emphasis on the gross domestic product as the main yardstick of economic growth and more emphasis on the net domestic product. The investment to account for depreciation in the capital stock is necessary to maintain the level of capital stock. It does not increase the capacity of the economy but it is essential to compensate for the depreciation in the capital stock as productivity and output of the social and economic production system is contingent upon both human resources and the capital stock.

Economic Growth in Madhya Pradesh

Traditionally, economic growth is measured in terms of the growth of the gross domestic product which is measured at current prices as well as at fixed prices to eliminate the effect of inflation while measuring change over time. Estimates of gross domestic product are regularly prepared by the Government of Madhya Pradesh and published by the Central Statistical Organisation of the Government of India. These estimates are available for the period 1999-2000 through 2006-07 at current prices as well as at 1999-2000 prices. According to these estimates, the gross domestic product at current prices in Madhya Pradesh increased from around 801 billion rupees in 1999-2000 to around 1282 billion rupees in 2006-07. This means that, at current prices, the economy of the state increased at a rate of 7.573 per cent per year during the period under reference. The situation, however, appears to be radically different when the effect of inflation is removed by considering fixed prices in place of current prices. At the 1999-2000 prices, the gross domestic product in the state increased at the rate of only 3.458 per cent per year between 1999-2000 and 2006-07.

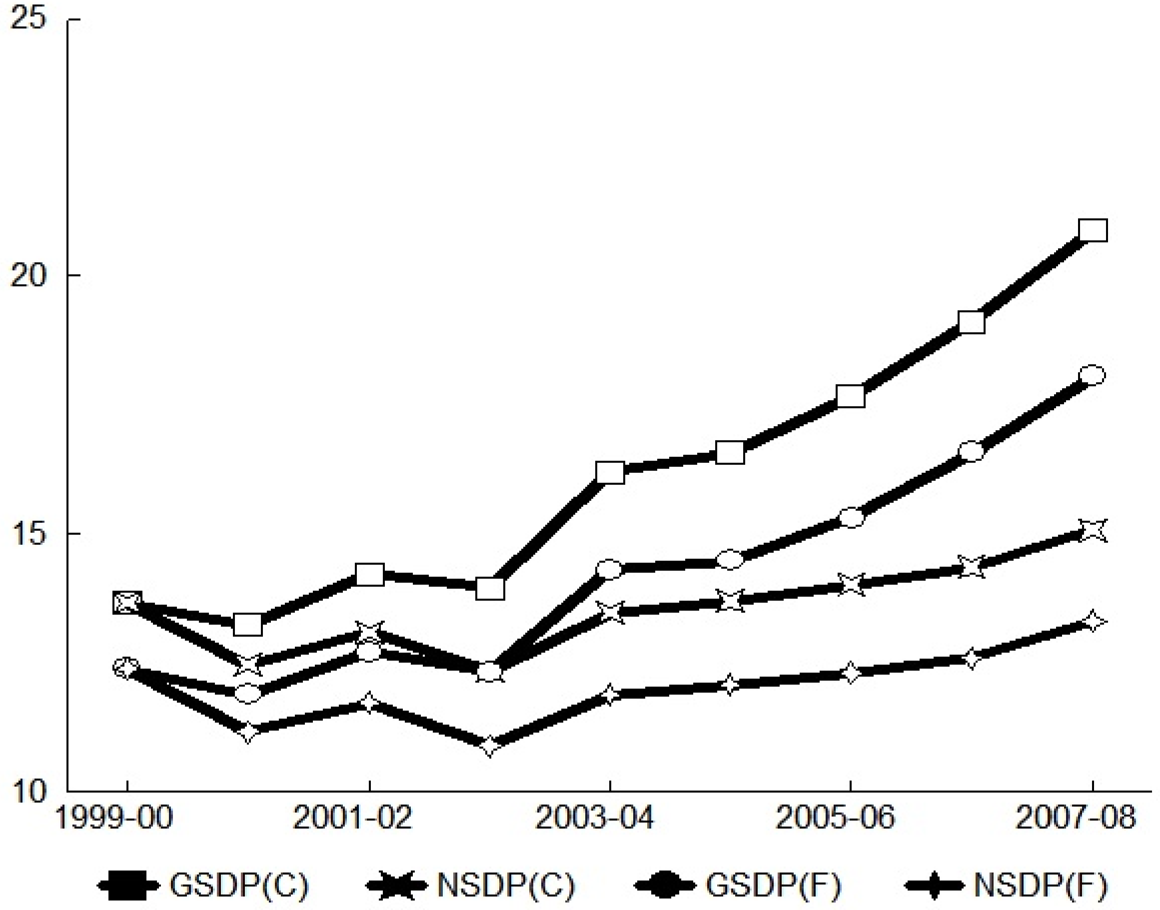
In terms of the net domestic product the growth of the state economy has been even slower during the period under reference. The net domestic product of the state at current prices increased at a rate of 6.930 per cent per year while, at 1999-2000 prices, it increased at a rate of just 2.840 per cent per year. This shows that a substantial proportion of the growth in the gross domestic product of the state has been accounted for the depreciation in the capital stock of the economic and social production system. These growth rates, measured either in gross terms or in net terms, clearly suggest that the economy of the state grew, at best, at a slow pace during the period under reference and it has yet to pick up the momentum. These growth rates also suggest that the contribution of the growth and expansion of the state economy in terms of the increase in average individual income has essentially been marginal because of the rapidly growing population. It is estimated that the population of the state increased at a rate of around 1.91 per cent per year during this period - from around 57.85 million rupees during 1999-2000 to around 67.40 million rupees during 2006-07. As a result, the per capita income at current prices

Figure 5.1
Gross domestic product in Madhya Pradesh
(Billion Rupees)



increased from around 12.57 thousand rupees during 1999-2000 to around 16.80 thousand rupees during 2006-07, recording an average annual growth of around 4.6 per cent per year. In real terms, however, there has been virtually no increase in the per capita income in the state as the per capita net domestic product at 1999-2000 prices increased from around 12.83 thousand rupees during 1999-2000 to just around 12.88 thousand rupees during the period 2006-07. Obviously, economic growth in the state during the period under reference has contributed little to increasing endowments of average individual in real terms. Whatever increase in the net domestic product has been there in the state, it has been consumed by rising population and rising inflation. Another disturbing feature of economic growth in the state is that nearly all the increase in the state domestic product during the period under reference has been confined to the service sector of the economy (Figure 5.3). In real terms, the gross domestic product in the state increased by about 161 billion rupees between 1999-2000 and 2006-07 and more than 70 per cent

Figure 5.2
Per capita gross domestic product in Madhya Pradesh
(Thousand Rupees)

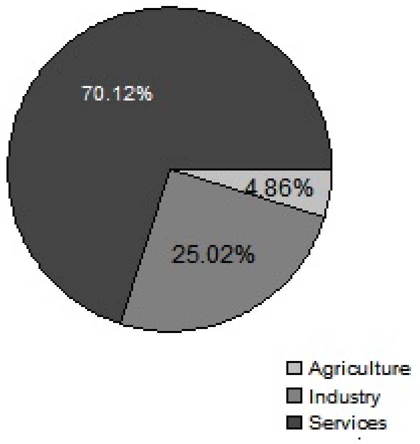


of this increase was confined to the service sector. Similarly, the net domestic product, in real terms, increased by about 117 billion rupees during the period under reference and almost 83 per cent of this increase was confined to the service sector. By contrast, contribution of the agriculture and allied sector which provides livelihood to more than 75 per cent of the state population, to the increase in the real gross domestic product of the state was less than 5 per cent and only about 2 per cent in case of the increase in the net domestic product in real terms. The contribution of the manufacturing sector, on the other hand, was around 25 per cent and 15 per cent respectively. The very fact, that most of the expansion in the economy of the state has been confined to the service sector implies that the dividends of the economic growth in the state have been confined to a particular section of the community and majority of the state population which subsists on the primary sector of the economy appears to have largely been devoid of the expansion of the social and economic production system.

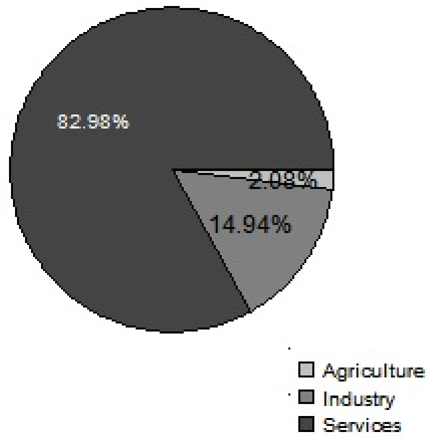
Figure 5.3

Contribution to the Increase in Domestic Product

Real GDP



Real NDP

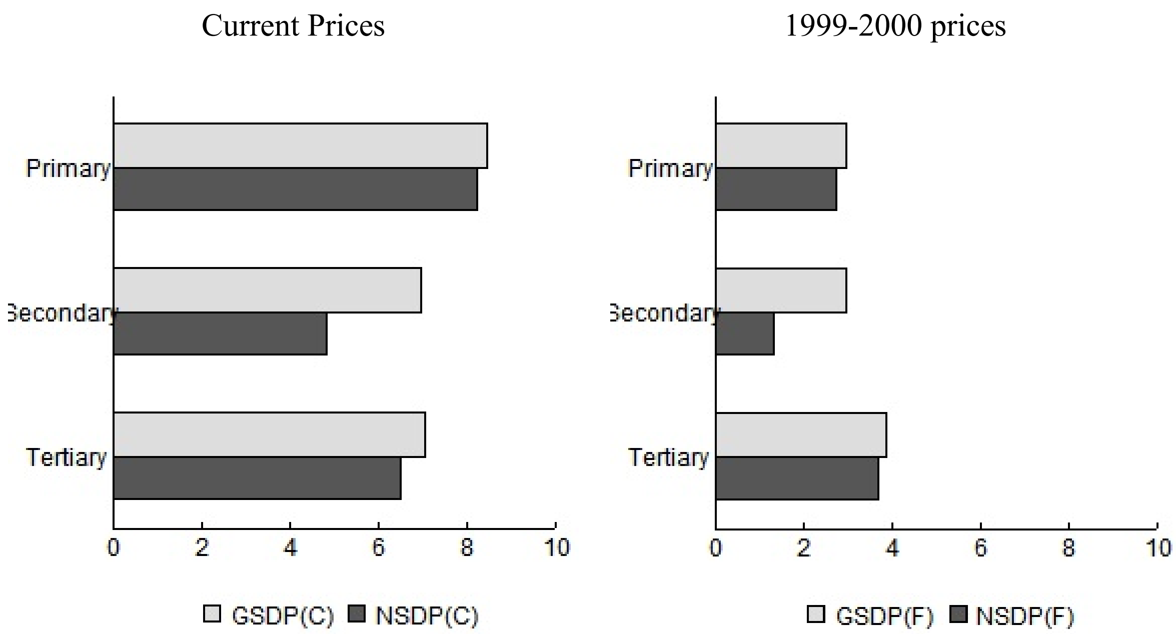


The slow to very slow economic growth in the state is also reflected in terms of the growth of different sectors of the economy. The average annual growth rate of sector specific gross and net domestic product at the 1999-2000 prices has never been more than 4 per cent per year in any sector of the economy of the state (Figure 5.4). The growth appears to have been the slowest in the manufacturing sector of the economy where the net domestic product, at 1999-2000 prices, increased at a rate of just around 1.8 and 1.3 per cent per year respectively in the organised and unorganised sector. Growth of real net domestic product has been the fastest in the tertiary sector but, here too, the average annual growth rate has been only around 3.5 per cent per year during the period under reference.

Another, very discerning, feature of the economic growth in Madhya Pradesh is the increasing gap between the gross domestic product and the net domestic product. At the current prices, this gap has increased from almost 75 billion rupees in 1999-2000 to 170 billion rupees in the year 2006-07. More than 45 per cent of the increase in this gap was accounted by the secondary sector while 15 per cent by the primary sector. This shows that a very substantial proportion of the growth in the state economy has been subsumed by the depreciation on the capital stock and this proportion is gaining alarming proportions. This increasing gap implies that the capital stock of in the state is getting older at a rapid pace.

Figure 5.4

Sector specific growth rates in Madhya Pradesh



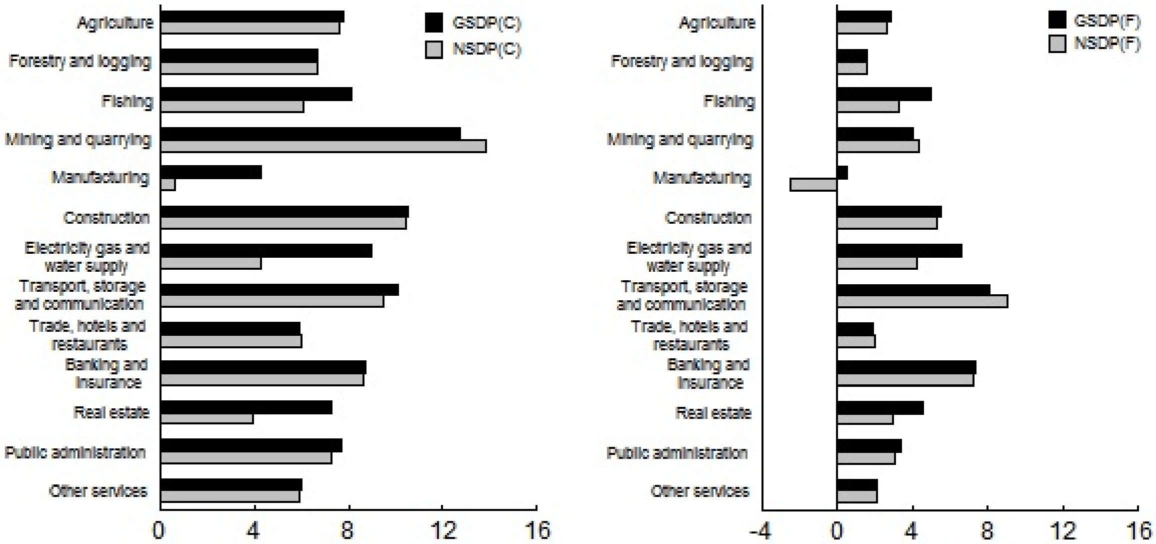
A very significant depreciation on the capital stock of the state economy appears to be the result of the deteriorating situation of the manufacturing sector. At current prices, the growth rate of the gross product of the manufacturing sector in the state was more than 4 per cent per year during the period under reference. However, the growth rate of the net product of the manufacturing sector was only about 0.6 per cent per year indicating that most of the growth in this sector of the economy was subsumed by the depreciation on the capital stock. On the other hand, the trend growth rate in the net product in this sector at 1999-2000 prices has been negative (Figure 5.5). This suggests that the manufacturing sector in the state appears to be in a poor shape and there has been little new input into this sector in real terms in recent years. Revival of the manufacturing sector appears to be crucial in accelerating economic growth in the state.

The poor growth and expansion of the manufacturing sector in the state appears to be the result of the poor performance of the organised manufacturing sector. A segregation of the output of the manufacturing sector into organised and unorganised manufacturing sector suggests that the organised manufacturing sector has faltered seriously in terms of performance or output during the period under reference. At the 1999-2000 prices, the gross product of the organised manufacturing sector decreased, increased, at an average annual rate of around 0.8 per cent per year. Adjusting for the depreciation in the capital stock during this period, the net product of the organised manufacturing sector decreased at an alarming rate of more than 5 per cent per year. The negative growth of the gross product of the organised manufacturing sector could however be compensated by the increase in the gross product of the unorganised manufacturing sector but this could not happen in case of net product because of very high cost of depreciation on the capital stock in the organised manufacturing sector.

Figure 5.5

Sector specific growth rates in Madhya Pradesh

Current Prices 1999-2000 Prices



The foregoing discussions clearly suggest that economic growth in Madhya Pradesh has best been skewed. Most of the economic growth in the state has been confined to the service sector of the economy while the growth of primary and secondary sectors appears to have faltered. Interestingly, this pattern of economic growth has taken place when the economy of the state remains primarily agrarian and there has been little increase in per capita income. At the same time, there appears little shift in the structure of the labour force. As such, the service-sector led economic growth in the state appears puzzling. It appears that the output of the service sector in the state has been over estimated because of at least three reasons (Nagraj, 2009):

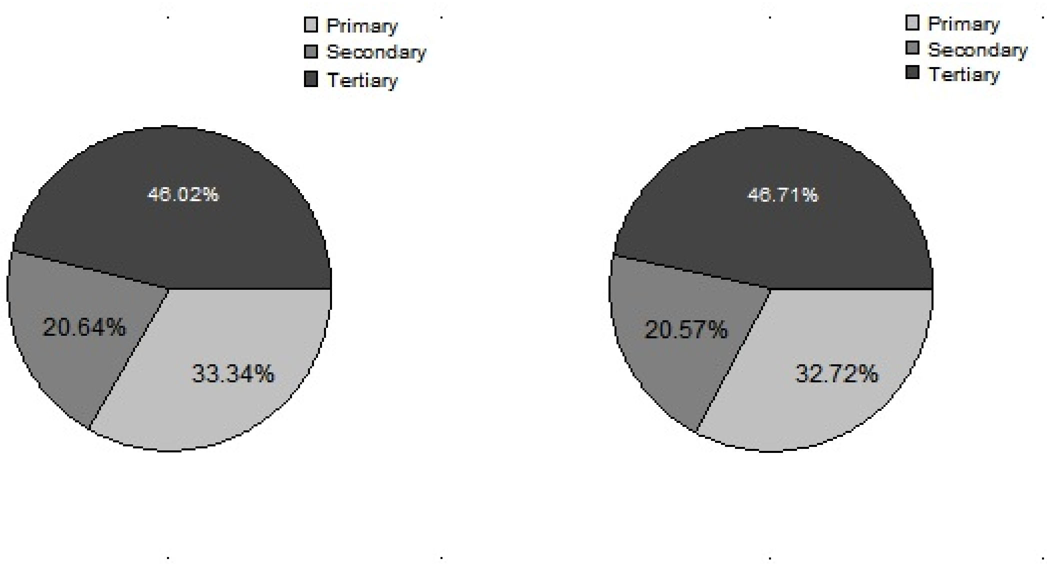
1. The growth of the private corporate sector has been inflated.
2. There has been a slower rise in the services deflator.
3. The decrease in the cost of communication services has been overestimated.

The exceptional growth of the services sector of the economy has been widely attributed to technological changes in the social and economic production system and economic reforms (Kochhar, et. al, 2006). There has however been very little transition in the economy of the state. The share of the primary sector has decreased only marginally whereas the share of the secondary sector has remained more or less unchanged during the period under reference. In terms of the net domestic product, the share of the secondary sector has somewhat declined while that of primary and tertiary sectors has increased only marginally. Obviously, transition in the economy has been too slow to lead to any significant restructuring of the social and economic production system which is usually associated with the technological change and economic reforms. The economy of the state appears to have virtually remained stagnant. The grossly unsatisfactory growth of the economy of the state reflects this lack of vibrancy in the social and economic production system.

Figure 5.6

Composition of gross domestic product at current prices

1999-2000 2006-2007



Any discussion about the growth and expansion of the economy must also consider growth of the rural economy separately from the growth of the urban economy as the social and economic production system in the rural areas is radically different from that in the urban areas. Unfortunately, available data do not make such a comparison possible. However, some remarks can definitely be made on the basis of growth in different sectors of the economy. The very fact that the growth of the primary sector has remained stagnant, if not shrunk, makes us believe that the rural economy of the state is not expanding and appears to have stagnated. On the other hand, more than average growth in such sectors of the economy as transport, banking and insurance, real estate and even public administration indicates that an increasing proportion of the economic growth in the state is getting concentrated in the urban areas. This trend suggests that economic growth in the state is fast resulting into the impoverishment of the rural population at the cost of concentration of employment and livelihood opportunities and accumulation of wealth in the urban areas. Clearly, patterns and trends of economic growth in the state do not appear to be favourable to nearly two third of the state population living in the rural and remote areas. Rather, majority of the dividends of economic growth and expansion in the economy appear to have been accrued by a small proportion of population living in urban areas.

Inter-district Variations

Inter-district variations in economic growth in Madhya Pradesh highlight the fact that the growth of the economy is largely confined to certain pockets and the concentration of social and economic production activities have more or less remained unchanged over time. During 1999-2000, more than 27 per cent of the state gross domestic product at current prices was confined to just five districts - Indore, Bhopal, Jabalpur, Ujjain, Sidhi and Gwalior with district Indore, alone, accounting for more than 9.2 per cent of the state gross state domestic product. During the period 2006-07, these five districts accounted for almost 29 per cent of the state gross domestic product with the contribution of district Indore increasing to more than 9.5 per cent. By contrast, 18 poorest districts of the state accounted for less than one fourth of the state gross domestic product during the period 1999-2000. This number increased to 20 during the period 2006-07.

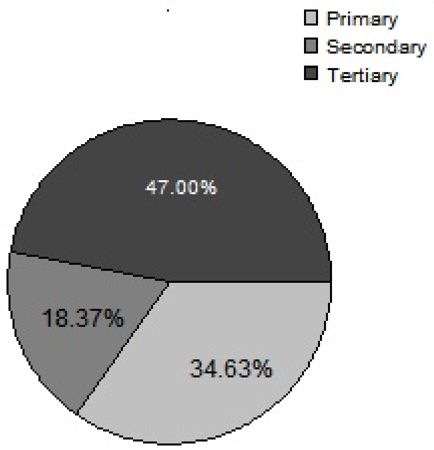
The growth of district domestic product has also varied widely across districts. The growth of the economy has been the fastest in district Bhopal but the slowest in district Tikamgarh during the period under reference. In district Bhopal, the economy grew at a rate very close to 10 per cent per year whereas the growth of the economy in district Tikamgarh was just around 5 per cent per year. In three districts of the state - Tikamgarh, Dindori and Shivpuri - the growth of the economy is estimated to be less than 6 per cent per year in terms of gross district domestic product at current prices.

Highly unequal economic development across the districts of the state gets reflected in terms of per capita income. At current prices, the per capita net domestic product was the highest in district Indore (Rs 38451) which was more than four times the per capita net domestic product in district Dindori (Rs 8756) which was the lowest in the state. In terms of 1999-2000 prices, this gap was even wider. In 30 districts of the state, the per capita net domestic product at 1999-2000 prices was less than Rs 12000 or less than Rs 1000 per month, on average indicating a very high degree of inter-district inequality.

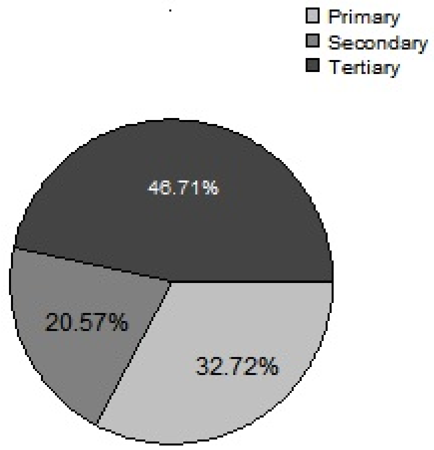
Figure 5.7

Composition of net domestic product at current prices

1999-2000

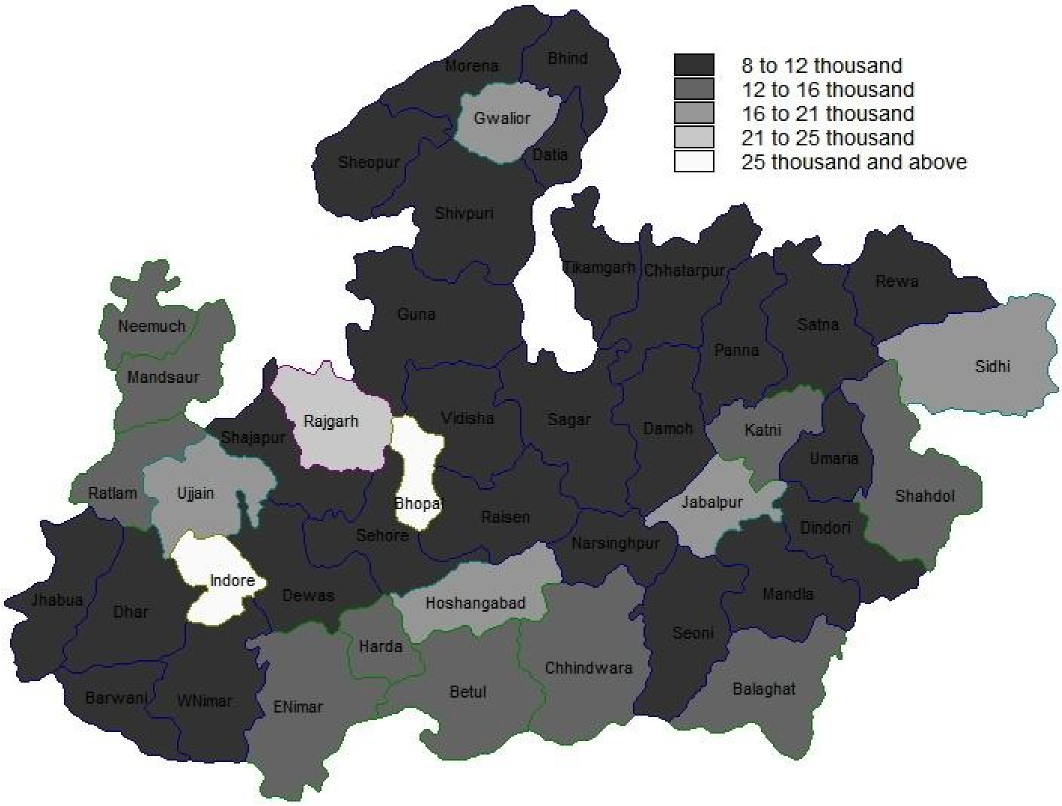


2006-2007



What is even more problematic is the trend in net domestic product per capita at fixed (1999-2000) prices across in the districts of the state. There are five districts - Tikamgarh, Rewa, Chhatarpur, Shivpuri, Shajapur and Raisen - where the growth of net domestic product per capita at fixed (1999-2000) prices or the real per capita income has been negative during the period under reference. On the other hand, in two districts - Dewas and Sheopur - there has been virtually no increase in the real per capita income according to the estimates prepared by the Government of Madhya Pradesh. Besides these seven districts, there are 20 other districts in the state where there has been virtually no increase in the real per capita income during the period under reference. In these districts, the growth of per capita net domestic product at 1999-2000 prices was less than 1 per cent per year which reflects the stagnation in the economy of these districts. In fact, there are only four districts in the state - Mandla, Betul, Jabalpur and Harda - where the growth in the real income per capita is estimated to be more than 2 per cent per year during the period under reference.

Figure 5.8
Per capita income in districts of Madhya Pradesh
1999-2000 prices



Conclusions

The poor status of the economy of the state is well reflected in the foregoing analysis of the economic growth and there are areas of concern. First, growth of the economy of the state has been very slow in real terms. Moreover, a very substantial proportion of this growth in the economy has been subsumed by the growth in population so that there has been hardly any increase in the per capita income. Such a growth implies low levels of surplus and hence inadequate funds for investment and low capacity of the economy to grow at its own. A near static per capita domestic product implies inadequate capacity of the poor households to break out of their unsatisfactory economic equilibrium by leveraging external funds and/or investments to change their situation. Such economic growth also implies low growth of employment leading to increasing levels of underemployment and casualisation of labour which affects the poor the most as they cannot remain unemployed. Obviously, such a growth in the economy contributes little to poverty reduction.

Second, growth in the economy of the state has been highly skewed. There is every evidence to suggest that rural economy of the state, which caters most of the subsistence needs of nearly two third of the state population, has failed to grow during the period under reference. Most of the growth of the economy, in real terms, has been confined to such components of the economy as communication, transport including railways and banking and insurance. Growth of manufacturing sector in the state appears to have been negative in real terms while that of agriculture has been almost stagnant. Obviously, most of the state population remains devoid of the benefits of economic growth.

Economic growth is widely recognised as the engine for poverty reduction. In this context, it is obvious from the foregoing analysis that the engine for poverty reduction efforts has faltered in Madhya Pradesh in the recent past and has not been able to lead poverty reduction efforts. The implications of poor economic growth are well reflected in other dimensions of poverty such as poor employment opportunities, unacceptable state of health and high mortality and low levels of education.

State initiatives in accelerating the growth of the economy appear to be without clear direction and somewhat inadequate. One of the goals of the XI Five-year Development Plan (2007-2012) of the state is to achieve average annual growth of around 7.6 per cent in the gross state domestic period at current prices during the plan period. To achieve this growth rate, the state aims at an average annual growth of 5 per cent in the primary sector; 10 per cent in the secondary sector and 8 per cent in the tertiary sector of the economy (Government of Madhya Pradesh, 2007). Recognising the fact that the population of the state is projected to be growing at around 1.6 per cent per year during the XI Plan period, the increase in the per capita gross domestic product at current prices during the plan period is expected to be around 5 per cent. It is obvious, the goals set in the XI Five-year Development Plan of the state, even if achieved, will lead to only a marginal increase in the per capita income in real terms. Such an increase is excepted to contribute little towards reducing poverty. It appears that goals and objectives set out in the XI Five-year Development Plan of the state is out of context of the development needs of the people of the state, especially in the context of poverty reduction and equitable distribution of the dividends of the social and economic production system. In order to put the poverty reduction engine at full steam, Madhya Pradesh is required to do much more to accelerate economic growth through vertical and horizontal expansion of its social and economic production system. At the same time, strategies are needed to reduce the distribution inequality across social groups that is so pervasive in the state. Unfortunately, the XI Five-year Development Plan is conspicuously silent on these important issues.

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Table 5.1

Trends in domestic product and per capita domestic product in Madhya Pradesh

Particulars	1999-2000	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007
				Current Prices				
GDP (billion Rs)	801.32	792.03	867.45	868.32	1028.39	1072.82	1163.22	1282.02
NDP (billion Rs)	726.55	710.11	775.22	766.62	908.71	936.90	1008.67	1112.25
Per capita GDP (thousand Rs)	13.66	13.23	14.21	13.94	16.19	16.58	17.65	19.11
Per capita NDP (thousand Rs)	13.66	12.46	13.09	12.32	13.47	13.69	14.02	14.35
				1999-2000 Prices				
GDP (billion Rs)	801.32	745.82	798.91	767.66	855.31	886.23	923.71	962.54
NDP (billion Rs)	726.55	667.50	715.25	677.95	754.00	781.01	810.06	843.80
Per capita GDP (thousand Rs)	12.38	11.86	12.70	12.30	14.31	14.48	15.30	16.58
Per capita NDP (thousand Rs)	12.38	11.15	11.72	10.88	11.87	12.07	12.29	12.58

Source: Government of India (2008)

Table 5.2
Growth of the economy of Madhya Pradesh
(1999-2000 through 2006-2007)

Particulars	Trend growth rate (per cent)	
	Current prices	1999-2000 prices
GDP	7.466	3.355
Primary	8.437	2.942
Secondary	6.930	2.942
Tertiary	7.037	3.873
Per capita GDP	5.338	1.410
NDP	6.716	2.840
Primary	8.220	2.737
Secondary	4.812	1.308
Tertiary	6.503	3.666
Per capita NDP	4.707	0.904

Source: Author's calculations

Table 5.3

Sector specific growth rates in Madhya Pradesh

(1999-2000 through 2006-2007)

		Current prices		1999-2000 prices	
		GDP	NDP	GDP	NDP
1	Agriculture	7.788	7.573	2.84	2.634
2	Forestry & logging	6.716	6.716	1.613	1.613
3	Fishing	8.112	6.078	5.022	3.252
4	Mining & quarrying	12.75	13.883	4.081	4.394
5	Manufacturing	4.289	0.602	0.501	-2.469
5.1	Manufacturing-Registered	2.942	-0.797	-2.371	-5.446
5.2	Manufacturing-Unregistered	7.144	3.355	5.548	2.429
6	Construction	10.517	10.407	5.548	5.338
7	Electricity, gas and Water supply	8.981	4.289	6.609	4.289
8	Transport, storage & communication	10.076	9.527	8.112	9.09
8.1	Railways	7.896	5.338	6.29	7.896
8.2	Transport by other means	10.186	5.971	10.407	6.078
8.3	Storage				
8.4	Communication	13.542	15.488	11.851	17.468
9	Trade, hotels and restaurants	5.866	5.971	1.918	2.02
10	Banking & Insurance	8.763	8.654	7.358	7.251
11	Real estate, ownership, and business	7.251	3.977	4.603	2.942
12	Public administration	7.681	7.251	3.355	3.045
13	Other services	5.971	5.866	2.122	2.122

Source: Author's calculations

Table 5.4

Contribution of different sectors to economic growth in Madhya Pradesh during 1999-2000 through 2006-07

		Absolute increase (Billion rupees)				Proportional increase (Per cent)			
		GDP		NDP		GDP		NDP	
		Current prices	Fixed prices	Current prices	Fixed prices	Current prices	Fixed prices	Current prices	Fixed prices
1	Agriculture	112.893	5.454	101.374	0.373	23.49	3.38	26.28	0.32
2	Forestry & logging	7.742	1.763	7.535	1.746	1.61	1.09	1.95	1.49
3	Fishing	1.443	0.621	0.962	0.323	0.30	0.39	0.25	0.28
4	Mining & quarrying	29.324	6.447	25.966	5.443	6.10	4.00	6.73	4.64
5	Manufacturing	33.454	2.484	4.128	-12.199	6.96	1.54	1.07	-10.41
5.1	Manufacturing-Registered	18.149	-2.775	-4.979	-14.738	3.78	-1.72	-1.29	-12.57
5.2	Manufacturing-Unregistered	15.305	5.259	9.107	2.539	3.18	3.26	2.36	2.17
6	Construction	42.684	19.795	40.959	18.788	8.88	12.28	10.62	16.03
7	Electricity, gas and Water supply	21.639	11.612	9.215	5.479	4.50	7.20	2.39	4.67
8	Transport, storage & communication	43.274	33.201	33.554	31.112	9.00	20.59	8.70	26.54
8.1	Railways	9.694	8.318	5.016	7.963	2.02	5.16	1.30	6.79
8.2	Transport by other means	20.517	9.942	20.106	9.768	4.27	6.17	5.21	8.33
8.3	Storage	0	0	0	0	0.00	0.00	0.00	0.00
8.4	Communication	13.063	14.941	8.433	13.381	2.72	9.27	2.19	11.41
9	Trade, hotels and restaurants	63.038	18.98	62.934	19.067	13.11	11.77	16.32	16.26
10	Banking & Insurance	21.556	17.837	20.613	16.776	4.48	11.06	5.34	14.31
11	Real estate, ownership and business	35.515	20.337	16.398	10.374	7.39	12.61	4.25	8.85
12	Public administration	25.647	9.761	20.032	7.199	5.34	6.05	5.19	6.14
13	Other services	42.487	12.93	42.024	12.763	8.84	8.02	10.90	10.89
All sectors		480.695	161.22	385.694	117.242	100.00	100.00	100.00	100.00

Source: Author's calculations

Table 5.5

Transition in the structure of the economy of Madhya Pradesh

		GDP (Current prices)							
		1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
1	Agriculture	28.00	22.76	25.51	22.52	28.26	25.12	25.55	26.31
2	Forestry & logging	1.51	1.70	1.87	1.80	1.65	1.60	1.64	1.55
3	Fishing	0.24	0.26	0.24	0.21	0.21	0.26	0.24	0.26
4	Mining & quarrying	3.59	3.45	4.01	3.86	4.40	5.05	4.76	4.53
5	Manufacturing	12.29	12.57	11.47	10.78	9.68	10.62	10.46	10.29
5.1	Manufacturing-Registered	8.55	8.92	8.08	7.32	6.37	6.90	6.84	6.76
5.2	Manufacturing-Unregistered	3.74	3.65	3.39	3.45	3.31	3.72	3.62	3.53
6	Construction	5.80	6.37	6.03	6.68	6.58	7.19	7.20	6.95
7	Electricity, gas and Water supply	2.56	3.39	3.11	3.53	3.16	3.08	3.15	3.29
8	Transport, storage & communication	5.98	6.24	6.46	6.77	6.43	6.88	7.11	7.11
8.1	Railways	2.16	2.15	2.28	2.41	2.23	2.38	2.26	2.11
8.2	Transport by other means	2.68	2.89	2.88	3.03	2.88	3.08	3.28	3.27
8.3	Storage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8.4	Communication	1.14	1.19	1.30	1.33	1.32	1.43	1.58	1.73
9	Trade, hotels and restaurants	15.01	16.30	15.37	15.96	14.80	14.46	14.45	14.30
10	Banking & Insurance	3.42	3.79	3.89	4.67	4.31	4.02	3.96	3.82
11	Real estate, ownership and business	6.81	7.47	7.51	8.04	7.23	7.26	7.20	7.03
12	Public administration	4.74	4.88	4.62	4.85	3.95	4.89	4.79	4.96
13	Other services	10.06	10.82	9.91	10.33	9.33	9.58	9.50	9.60
All sectors		100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Author’s calculations

Table 5.6

Transition in the structure of the economy of Madhya Pradesh

		GDP (1999-2000 prices)							
		1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
1	Agriculture	28.00	21.58	25.04	20.94	26.34	24.22	24.21	23.88
2	Forestry & logging	1.51	1.74	1.92	1.88	1.70	1.62	1.58	1.44
3	Fishing	0.24	0.25	0.23	0.21	0.23	0.27	0.25	0.26
4	Mining & quarrying	3.59	3.50	3.44	3.72	3.62	3.81	3.64	3.66
5	Manufacturing	12.29	12.76	11.67	11.09	10.18	10.81	10.66	10.49
5.1	Manufacturing-Registered	8.55	8.95	8.08	7.41	6.61	6.93	6.90	6.83
5.2	Manufacturing-Unregistered	3.74	3.81	3.59	3.68	3.57	3.88	3.76	3.66
6	Construction	5.80	6.58	6.21	7.04	6.84	6.82	6.95	6.88
7	Electricity, gas and Water supply	2.56	2.95	3.06	3.31	3.15	3.24	3.33	3.33
8	Transport, storage & communication	5.98	6.60	6.75	7.36	7.32	7.70	8.09	8.43
8.1	Railways	2.16	2.34	2.43	2.58	2.46	2.51	2.59	2.66
8.2	Transport by other means	2.68	2.89	2.84	3.02	2.94	3.05	3.18	3.26
8.3	Storage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8.4	Communication	1.14	1.37	1.49	1.77	1.91	2.14	2.31	2.50
9	Trade, hotels and restaurants	15.01	16.48	15.75	16.35	14.91	14.61	14.72	14.46
10	Banking & Insurance	3.42	3.95	3.82	4.59	4.13	4.37	4.54	4.70
11	Real estate, ownership and business	6.81	7.68	7.46	8.08	7.59	7.74	7.78	7.78
12	Public administration	4.74	4.93	4.60	4.84	4.07	4.85	4.64	4.96
13	Other services	10.06	11.01	10.07	10.58	9.92	9.95	9.60	9.72
All sectors		100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Author's calculations

Table 5.7

Transition in the structure of the economy of Madhya Pradesh

		NDP (Current prices)							
		1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
1	Agriculture	29.65	24.03	27.12	23.88	30.45	27.05	27.68	28.48
2	Forestry & logging	1.60	1.83	2.02	1.97	1.80	1.76	1.82	1.73
3	Fishing	0.23	0.26	0.24	0.20	0.20	0.25	0.22	0.24
4	Mining & quarrying	3.14	3.08	3.57	3.66	4.15	4.92	4.61	4.39
5	Manufacturing	10.46	10.43	9.16	8.18	7.16	7.84	7.33	7.20
5.1	Manufacturing-Registered	6.92	7.03	6.05	5.03	4.16	4.46	4.12	4.07
5.2	Manufacturing-Unregistered	3.54	3.39	3.11	3.15	2.99	3.38	3.21	3.13
6	Construction	6.22	6.90	6.52	7.31	7.20	7.97	8.02	7.74
7	Electricity, gas and Water supply	1.69	2.44	2.29	2.31	1.50	1.70	1.78	1.93
8	Transport, storage & communication	5.36	5.67	5.96	6.29	5.94	6.31	6.55	6.52
8.1	Railways	1.60	1.58	1.77	1.94	1.72	1.78	1.65	1.49
8.2	Transport by other means	2.85	3.10	3.11	3.31	3.16	3.43	3.67	3.67
8.3	Storage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8.4	Communication	0.91	0.99	1.07	1.04	1.05	1.10	1.23	1.35
9	Trade, hotels and restaurants	16.47	18.09	17.13	18.01	16.70	16.50	16.61	16.42
10	Banking & Insurance	3.66	4.09	4.22	5.14	4.74	4.45	4.41	4.24
11	Real estate, ownership and business	6.14	6.69	6.54	6.91	6.02	5.78	5.62	5.49
12	Public administration	4.34	4.52	4.23	4.51	3.65	4.58	4.48	4.64
13	Other services	11.03	11.98	11.02	11.62	10.49	10.90	10.87	10.98
All sectors		100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Author’s calculations

Table 5.8

Transition in the structure of the economy of Madhya Pradesh

		NDP (1999-2000 prices)							
		1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
1	Agriculture	29.65	22.69	26.52	22.05	28.26	25.84	25.92	25.57
2	Forestry & logging	1.60	1.87	2.07	2.06	1.86	1.77	1.74	1.59
3	Fishing	0.23	0.25	0.22	0.20	0.22	0.25	0.23	0.24
4	Mining & quarrying	3.14	3.11	2.93	3.50	3.25	3.50	3.33	3.35
5	Manufacturing	10.46	10.63	9.43	8.51	7.61	8.10	7.69	7.56
5.1	Manufacturing-Registered	6.92	7.06	6.09	5.10	4.31	4.50	4.25	4.21
5.2	Manufacturing-Unregistered	3.54	3.57	3.34	3.41	3.30	3.60	3.44	3.35
6	Construction	6.22	7.15	6.71	7.71	7.49	7.48	7.65	7.58
7	Electricity, gas and Water supply	1.69	1.92	2.24	2.05	1.42	1.94	2.08	2.11
8	Transport, storage & communication	5.36	6.05	6.26	6.95	7.02	7.46	7.92	8.30
8.1	Railways	1.60	1.77	1.90	2.09	2.03	2.10	2.22	2.32
8.2	Transport by other means	2.85	3.09	3.06	3.29	3.23	3.37	3.52	3.61
8.3	Storage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8.4	Communication	0.91	1.18	1.30	1.57	1.76	1.99	2.18	2.37
9	Trade, hotels and restaurants	16.47	18.33	17.53	18.46	16.85	16.52	16.73	16.44
10	Banking & Insurance	3.66	4.34	4.20	5.13	4.62	4.89	5.03	5.14
11	Real estate, ownership and business	6.14	6.90	6.53	7.00	6.45	6.51	6.51	6.52
12	Public administration	4.34	4.55	4.19	4.48	3.76	4.53	4.30	4.59
13	Other services	11.03	12.21	11.17	11.91	11.18	11.22	10.87	11.01
All sectors		100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Author’s calculations

Table 5.9

Domestic product of Madhya Pradesh. (Billion rupees)

		GDP (Current prices)							
		1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
1	Agriculture	224.388	180.282	221.320	195.552	290.661	269.458	297.219	337.281
2	Forestry & logging	12.117	13.483	16.188	15.624	16.974	17.158	19.029	19.860
3	Fishing	1.886	2.053	2.092	1.807	2.191	2.784	2.773	3.329
4	Mining & quarrying	28.794	27.354	34.798	33.510	45.223	54.226	55.317	58.118
5	Manufacturing	98.461	99.560	99.497	93.572	99.525	113.965	121.642	131.915
5.1	Manufacturing-Registered	68.497	70.648	70.091	63.587	65.532	74.069	79.527	86.646
5.2	Manufacturing-Unregistered	29.965	28.912	29.406	29.985	33.993	39.896	42.115	45.269
6	Construction	46.459	50.422	52.296	58.029	67.714	77.103	83.730	89.142
7	Electricity, gas and Water supply	20.479	26.840	26.973	30.640	32.472	32.992	36.609	42.118
8	Transport, storage & communication	47.917	49.425	56.037	58.828	66.135	73.841	82.761	91.191
8.1	Railways	17.332	17.048	19.792	20.923	22.888	25.484	26.255	27.026
8.2	Transport by other means	21.469	22.926	25.010	26.349	29.646	33.001	38.130	41.986
8.3	Storage	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8.4	Communication	9.116	9.451	11.235	11.556	13.601	15.356	18.376	22.179
9	Trade, hotels and restaurants	120.251	129.063	133.306	138.567	152.240	155.094	168.127	183.289
10	Banking & Insurance	27.390	30.038	33.743	40.580	44.296	43.084	46.015	48.946
11	Real estate, ownership and business	54.596	59.166	65.165	69.824	74.326	77.865	83.777	90.11
12	Public administration	37.959	38.636	40.083	42.111	40.657	52.424	55.745	63.605
13	Other services	80.625	85.713	85.953	89.676	95.974	102.827	110.479	123.112
All sectors		801.321	792.034	867.450	868.319	1028.386	1072.819	1163.222	1282.016

Source: Government of India (2008)

Table 5.10

Domestic product of Madhya Pradesh. (Billion rupees)

		GDP (1999-2000 prices)							
		1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
1	Agriculture	224.388	180.282	221.320	195.552	290.661	269.458	297.219	337.281
2	Forestry & logging	12.117	13.483	16.188	15.624	16.974	17.158	19.029	19.860
3	Fishing	1.886	2.053	2.092	1.807	2.191	2.784	2.773	3.329
4	Mining & quarrying	28.794	27.354	34.798	33.510	45.223	54.226	55.317	58.118
5	Manufacturing	98.461	99.560	99.497	93.572	99.525	113.965	121.642	131.915
5.1	Manufacturing-Registered	68.497	70.648	70.091	63.587	65.532	74.069	79.527	86.646
5.2	Manufacturing-Unregistered	29.965	28.912	29.406	29.985	33.993	39.896	42.115	45.269
6	Construction	46.459	50.422	52.296	58.029	67.714	77.103	83.730	89.142
7	Electricity, gas and Water supply	20.479	26.840	26.973	30.640	32.472	32.992	36.609	42.118
8	Transport, storage & communication	47.917	49.425	56.037	58.828	66.135	73.841	82.761	91.191
8.1	Railways	17.332	17.048	19.792	20.923	22.888	25.484	26.255	27.026
8.2	Transport by other means	21.469	22.926	25.010	26.349	29.646	33.001	38.130	41.986
8.3	Storage	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8.4	Communication	9.116	9.451	11.235	11.556	13.601	15.356	18.376	22.179
9	Trade, hotels and restaurants	120.251	129.063	133.306	138.567	152.240	155.094	168.127	183.289
10	Banking & Insurance	27.390	30.038	33.743	40.580	44.296	43.084	46.015	48.946
11	Real estate, ownership and business	54.596	59.166	65.165	69.824	74.326	77.865	83.777	90.110
12	Public administration	37.959	38.636	40.083	42.111	40.657	52.424	55.745	63.605
13	Other services	80.625	85.713	85.953	89.676	95.974	102.827	110.479	123.112
All sectors		801.321	792.034	867.45	868.319	1028.386	1072.819	1163.222	1282.016

Source: Government of India (2008)

Table 5.11

Domestic product of Madhya Pradesh. (Billion rupees)

		NDP (Current prices)							
		1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
1	Agriculture	224.388	180.282	221.320	195.552	290.661	269.458	297.219	337.281
2	Forestry & logging	12.117	13.483	16.188	15.624	16.974	17.158	19.029	19.860
3	Fishing	1.886	2.053	2.092	1.807	2.191	2.784	2.773	3.329
4	Mining & quarrying	28.794	27.354	34.798	33.510	45.223	54.226	55.317	58.118
5	Manufacturing	98.461	99.560	99.497	93.572	99.525	113.965	121.642	131.915
5.1	Manufacturing-Registered	68.497	70.648	70.091	63.587	65.532	74.069	79.527	86.646
5.2	Manufacturing-Unregistered	29.965	28.912	29.406	29.985	33.993	39.896	42.115	45.269
6	Construction	46.459	50.422	52.296	58.029	67.714	77.103	83.730	89.142
7	Electricity, gas and Water supply	20.479	26.840	26.973	30.640	32.472	32.992	36.609	42.118
8	Transport, storage & communication	47.917	49.425	56.037	58.828	66.135	73.841	82.761	91.191
8.1	Railways	17.332	17.048	19.792	20.923	22.888	25.484	26.255	27.026
8.2	Transport by other means	21.469	22.926	25.010	26.349	29.646	33.001	38.130	41.986
8.3	Storage	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8.4	Communication	9.116	9.451	11.235	11.556	13.601	15.356	18.376	22.179
9	Trade, hotels and restaurants	120.251	129.063	133.306	138.567	152.240	155.094	168.127	183.289
10	Banking & Insurance	27.390	30.038	33.743	40.580	44.296	43.084	46.015	48.946
11	Real estate, ownership and business	54.596	59.166	65.165	69.824	74.326	77.865	83.777	90.110
12	Public administration	37.959	38.636	40.083	42.111	40.657	52.424	55.745	63.605
13	Other services	80.625	85.713	85.953	89.676	95.974	102.827	110.479	123.112
All sectors		801.321	792.034	867.45	868.319	1028.386	1072.819	1163.222	1282.016

Source: Government of India (2008)

Table 5.12

Domestic product of Madhya Pradesh. (Billion rupees)

		NDP (1999-2000 prices)							
		1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
1	Agriculture	224.388	180.282	221.320	195.552	290.661	269.458	297.219	337.281
2	Forestry & logging	12.117	13.483	16.188	15.624	16.974	17.158	19.029	19.860
3	Fishing	1.886	2.053	2.092	1.807	2.191	2.784	2.773	3.329
4	Mining & quarrying	28.794	27.354	34.798	33.510	45.223	54.226	55.317	58.118
5	Manufacturing	98.461	99.560	99.497	93.572	99.525	113.965	121.642	131.915
5.1	Manufacturing-Registered	68.497	70.648	70.091	63.587	65.532	74.069	79.527	86.646
5.2	Manufacturing-Unregistered	29.965	28.912	29.406	29.985	33.993	39.896	42.115	45.269
6	Construction	46.459	50.422	52.296	58.029	67.714	77.103	83.730	89.142
7	Electricity, gas and Water supply	20.479	26.840	26.973	30.640	32.472	32.992	36.609	42.118
8	Transport, storage & communication	47.917	49.425	56.037	58.828	66.135	73.841	82.761	91.191
8.1	Railways	17.332	17.048	19.792	20.923	22.888	25.484	26.255	27.026
8.2	Transport by other means	21.469	22.926	25.010	26.349	29.646	33.001	38.130	41.986
8.3	Storage	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8.4	Communication	9.116	9.451	11.235	11.556	13.601	15.356	18.376	22.179
9	Trade, hotels and restaurants	120.251	129.063	133.306	138.567	152.240	155.094	168.127	183.289
10	Banking & Insurance	27.390	30.038	33.743	40.580	44.296	43.084	46.015	48.946
11	Real estate, ownership and business	54.596	59.166	65.165	69.824	74.326	77.865	83.777	90.110
12	Public administration	37.959	38.636	40.083	42.111	40.657	52.424	55.745	63.605
13	Other services	80.625	85.713	85.953	89.676	95.974	102.827	110.479	123.112
All sectors		801.321	792.034	867.450	868.319	1028.386	1072.819	1163.222	1282.016

Source: Government of India (2008)

Table 5.13

Domestic product of districts of Madhya Pradesh

District	Current prices (Thousand Rupees)		1999-2000 prices (Thousand Rupees)		Per capita income (Rupees)	
	Gross	Net	Gross	Net	Current prices	1999-2000 prices
Sheopur	83906	76588	60734	55652	12030	8742
Morena	238576	213896	179995	162867	12010	9145
Bhind	192907	170686	144335	128697	11017	8307
Gwalior	495511	418226	380430	318835	24619	18768
Datia	114625	102921	85843	77618	14978	11295
Shivpuri	211576	191103	154846	140718	11383	8382
Guna	300115	267696	218863	196156	13948	10220
Tikamgarh	163134	145490	122219	109843	10725	8097
Chhatarpur	221806	200176	170474	154140	11651	8972
Panna	125748	112981	95447	86143	11711	8929
Sagar	364558	322742	269460	240720	14304	10669
Damoh	196984	174721	144716	129292	14665	10852
Satna	334182	287631	257638	225118	13716	10735
Rewa	293164	256649	225062	179928	11427	8011
Umaria	80219	68813	62432	54712	12080	9605
Shahdol	348326	297893	264056	228666	17213	13213
Sidhi	562787	446155	423371	344551	21007	16223
Neemuch	165654	147132	123423	110102	18516	13856
Mandsaur	286507	248206	209983	184436	18853	14009
Ratlam	315629	274594	237028	208816	20724	15760
Ujjain	504979	424098	376045	320256	22410	16923
Shajapur	243351	221899	173800	143379	15359	9924
Dewas	269195	235799	191896	168897	15802	11318
Jhabua	174930	159041	133651	122508	9961	7673
Dhar	335210	293535	248081	218929	14581	10875
Indore	1242555	1028144	954982	808965	38451	30254
W Nimar	246813	216911	178402	168314	12467	9674
Barwani	138707	124779	106634	96623	9575	7414
E Nimar	303262	268724	228031	203391	14249	10785
Rajgarh	215549	192836	156361	140827	13494	9855
Vidisha	239832	218148	174118	159222	16016	11690
Bhopal	803205	680738	634399	441499	32720	21221
Sehore	198552	178025	145834	131964	14572	10802
Raisen	209440	184597	149977	132632	14465	10393
Betul	292264	241635	223991	190747	15872	12530
Harda	117976	107467	93458	74842	20088	13989
Hoshangabad	301576	261084	224428	197307	21412	16181

District	Current prices (Thousand Rupees)		1999-2000 prices (Thousand Rupees)		Per capita income (Rupees)	
	Gross	Net	Gross	Net	Current prices	1999-2000 prices
Katni	225889	192345	173848	151782	16205	12788
Jabalpur	632351	537245	488444	425402	22924	18152
Narsimhapur	184808	167180	136128	124011	15602	11573
Dindori	60027	54563	45761	41727	8756	6696
Mandla	125449	113605	95956	87522	11891	9161
Chhindwara	444001	393590	326630	291676	19377	14360
Seoni	194206	175477	144999	132027	13952	10497
Balaghat	257087	226392	190324	177264	14181	11104

Source: Author's calculations

Table 5.14

Growth rates of district domestic products in Madhya Pradesh

District	Gross district domestic product (Per cent per year)		Net district domestic product (Per cent per year)		Per capita income (Per cent per year)	
	Current prices	1999-2000 prices	Current prices	1999-2000 prices	Current prices	1999-2000 prices
Sheopur	7.681	3.045	8.004	2.532	5.338	0.000
Morena	6.503	2.840	6.503	2.532	4.185	0.300
Bhind	6.716	2.634	8.329	2.122	6.716	0.501
Gwalior	7.681	3.666	6.184	2.634	4.707	1.207
Datia	6.396	2.532	5.971	2.122	4.081	0.300
Shivpuri	5.971	1.816	5.971	2.327	3.045	-0.499
Guna	7.573	3.458	7.681	3.045	4.812	0.300
Tikamgarh	5.232	0.904	4.707	0.904	2.224	-1.390
Chhatarpur	6.184	2.634	5.760	2.224	2.840	-0.698
Panna	8.112	4.394	7.681	4.081	5.232	1.715
Sagar	7.144	3.045	6.823	2.840	4.498	0.702
Damoh	7.251	3.355	6.823	3.045	4.812	1.106
Satna	6.503	3.045	5.866	2.942	3.458	0.602
Rewa	6.290	2.737	5.654	1.410	3.045	-1.094
Umaria	7.573	4.081	6.930	3.873	4.812	1.715
Shahdol	8.004	3.666	7.573	3.666	5.548	1.715
Sidhi	8.872	4.498	8.220	4.185	5.127	1.207
Neemuch	7.358	3.045	6.930	2.634	5.022	0.904
Mandsaur	7.037	2.634	6.290	2.327	4.081	0.200
Ratlam	7.466	3.355	6.930	3.355	5.022	1.511
Ujjain	7.788	3.252	6.609	2.429	4.498	0.401
Shajapur	7.573	2.942	7.144	1.715	4.812	-0.499
Dewas	7.896	3.149	6.823	2.634	4.185	0.000
Jhabua	8.220	4.498	7.788	4.185	5.127	1.613
Dhar	8.437	1.207	8.654	3.562	5.760	0.803
Indore	7.681	3.977	6.396	3.252	4.289	1.308
W Nimar	8.220	3.873	7.466	3.355	4.917	0.904
Barwani	8.220	4.289	7.681	5.022	4.289	1.715
E Nimar	6.290	2.942	6.609	2.429	4.603	0.501
Rajgarh	8.329	3.666	4.081	3.252	1.511	0.803
Vidisha	7.144	2.840	6.716	2.532	4.394	0.401
Bhopal	9.527	5.971	8.872	3.562	6.184	1.005
Sehore	7.896	3.562	7.358	3.252	4.812	0.803
Raisen	6.823	2.634	6.290	2.122	3.666	-0.399
Betul	7.681	4.289	6.716	4.289	4.707	2.327
Harda	7.681	6.290	9.527	5.443	7.037	3.045

District	Gross district domestic product (Per cent per year)		Net district domestic product (Per cent per year)		Per capita income (Per cent per year)	
	Current prices	1999-2000 prices	Current prices	1999-2000 prices	Current prices	1999-2000 prices
Hoshangabad	7.251	3.252	6.609	3.149	4.289	0.803
Katni	6.503	2.737	5.866	2.942	3.666	0.803
Jabalpur	8.329	4.603	7.466	4.185	5.654	2.532
Narsimhapur	6.503	2.429	6.078	2.224	3.873	0.100
Dindori	5.971	2.224	5.443	1.918	3.977	0.401
Mandla	7.466	3.769	7.144	3.562	5.548	2.020
Chhindwara	8.220	4.081	8.004	3.458	5.971	1.511
Seoni	8.220	3.873	7.466	3.562	5.760	1.918
Balaghat	7.358	2.122	6.184	2.737	4.917	1.410

Source: Author's calculations

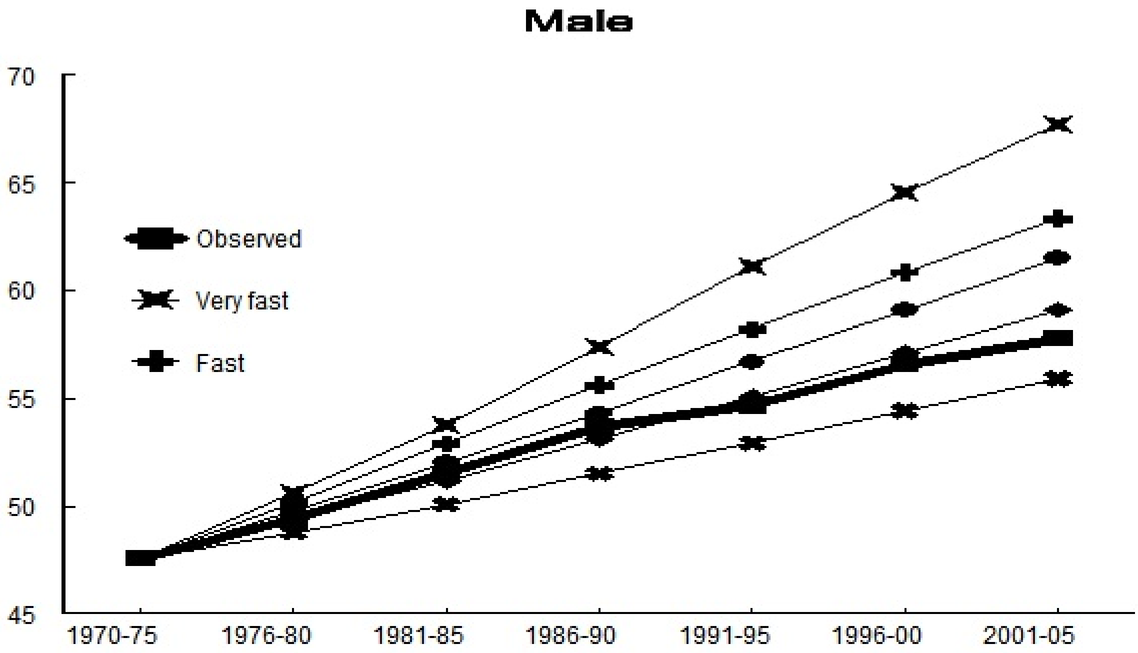
The Challenge of Health and Longevity

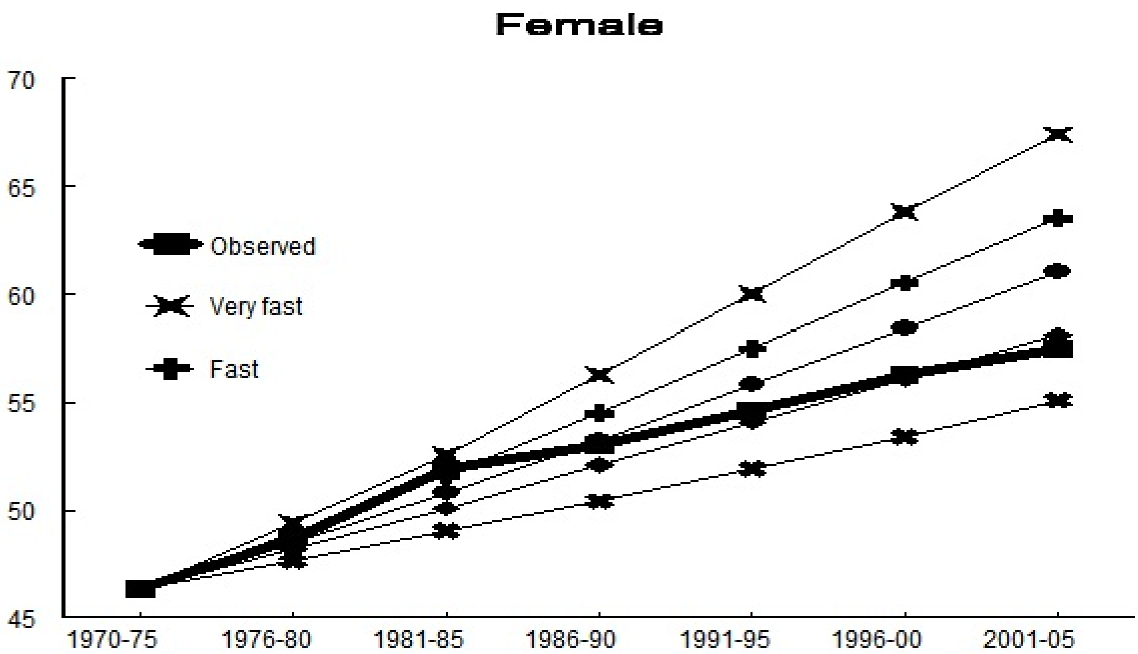
Human capacity is one of the three key dimensions of human development and multi-dimensional poverty - the other two are endowments and social opportunity. Reduction in poverty requires not only increasing endowments but also enhancing individual capacity and creating opportunities. Health and longevity is now universally recognised as the proxy for human capacity. One of the basic determinants of the productivity of an individual is his or her health which has direct implication for the longevity. Traditionally, health has been measured in terms of mortality. Transition in mortality reflects improvements in the quality of life through improvements in health and nutritional status of the people. Transition in mortality is a necessary requirement for improvements in the standards of living (United Nations, 1973). Transition in mortality also contributes to the evolution of the health policy. Ideally, there should be a congruence between the transition in mortality and evolution of the health policy as health policy has a direct reflection on the levels and trends in mortality. On the other hand, evolution of the health policy should essentially be a response to the health status of the people as reflected in terms of changes in mortality.

The most widely used indicator for analysing the transition in mortality is the period expectation of life at birth (Pollard, 1982) which is defined as the average number of years a new born is expected to survive when exposed to the prevailing levels of age specific death rates. The period expectation of life at birth is essentially a synthetic measure of mortality. It takes into consideration the mortality experience of different cohorts. The period expectation of life at birth is different from the cohort expectation of life at birth which takes into consideration, the mortality experience of a single cohort.

Figure 6.1

Increase in the expectation of life at birth in Madhya Pradesh compared to model mortality schedule of United Nations



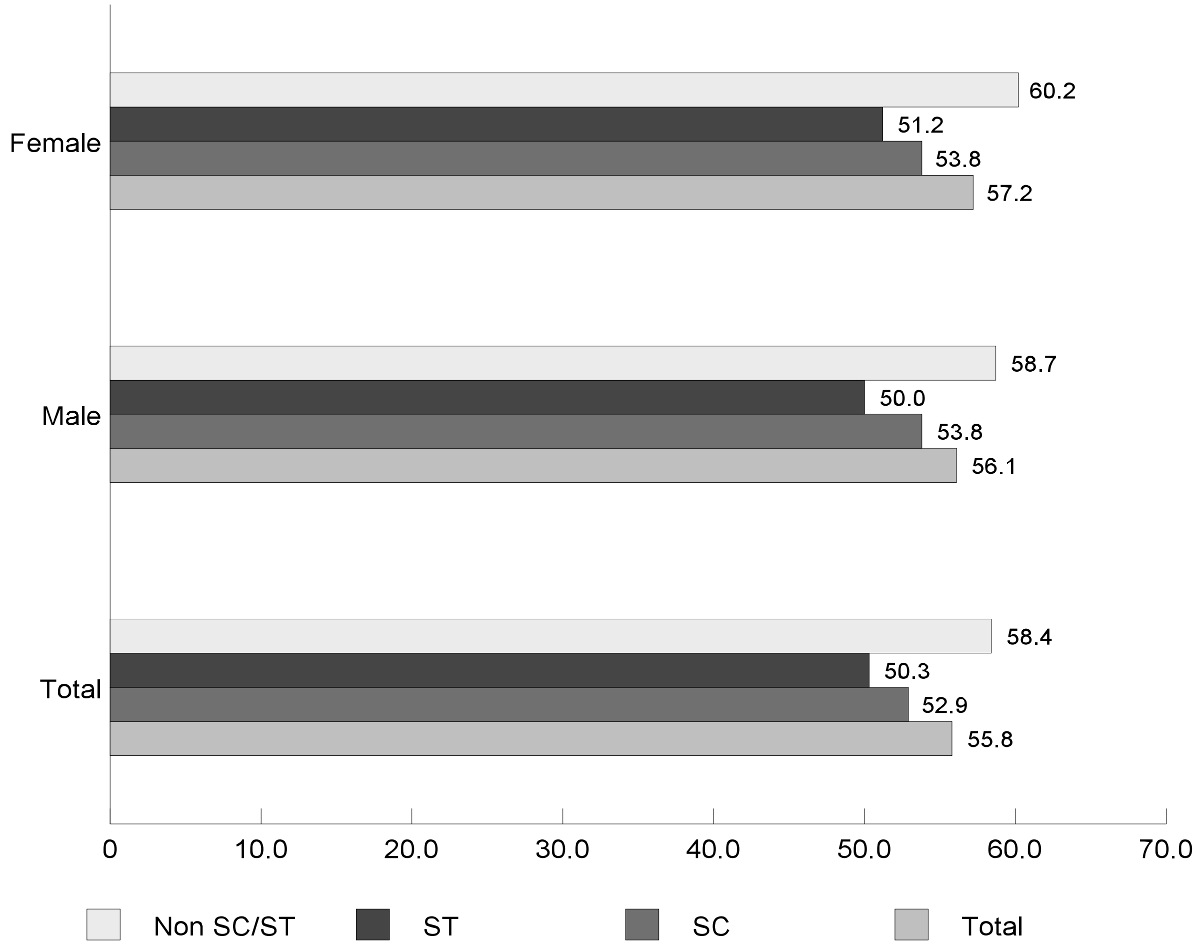


Madhya Pradesh has the dubious distinction of having the lowest expectation of life at birth in India which indicates that the health of the people of Madhya Pradesh is amongst the poorest in the country. According to the sample registration system, the expectation of life at birth in Madhya Pradesh was around 58 years during the period 2002-06 which was about 5.5 years less than the expectation of life at birth for India as a whole (Government of India, 2008). The situation was radically different about 30 years ago, during 1971-75, when the expectation of life at birth in Madhya Pradesh was 47.6 years which was higher than the expectation of life at birth in Assam, Orissa and Uttar Pradesh (Government of India, 1984). If the trend in the expectation of life at birth is a reflection of the progress in health and well-being of the people, then the increase in the expectation of life at birth suggests that improvements in health and well-being of the people of Madhya Pradesh have been the slowest amongst the major states of India during the last 35 years. The persistence of poor health and well-being, incidentally, has important implications for other dimensions of poverty and hence for poverty reduction efforts.

The increase in the expectation of life at birth in Madhya Pradesh can be examined by comparing the actual increase in the state with the global model schedules of improvement in mortality developed by the United Nations (2004). United Nations has developed five model mortality improvement schedules on the basis of the empirical evidence about the increase in the expectation of life at birth during the period 1950 to 2005 in countries where the expectation of life at birth ranged between 50 to 85 years. These model mortality improvement schedules represent the average experience of improvement in mortality and are grouped according to 90th percentile (very fast increase), 75th percentile (fast increase), the arithmetic mean (medium increase), 25th percentile (slow increase), and 10th percentile (very slow increase). The model mortality schedules so obtained have then been extended to cover the expectation of life at birth ranging from 40 years to 92.5 years by fitting the Lee-Carter mortality model (United Nations, 2004a).

Figure 6.1 compares the increase in the expectation of life at birth in Madhya Pradesh with the model mortality schedules developed by the United Nations. It may be seen from the figure that, compared to global trends, the trend in the expectation of life at birth in Madhya Pradesh has been slow to very slow in both sexes during the 30 years between 1971-75 through 2001-05. Improvement in mortality appeared to be somewhat satisfactory up to 1986-90 in males and 1981-85 in females but during the 1990s, there is a clear evidence of faltering in the improvement in mortality in the state. The increase in the male expectation of life at birth in the state followed a trajectory between the medium and slow model mortality improvement schedules till 1986-90 but after 1986-90, the pace of improvement in male expectation of life at birth decelerated so that

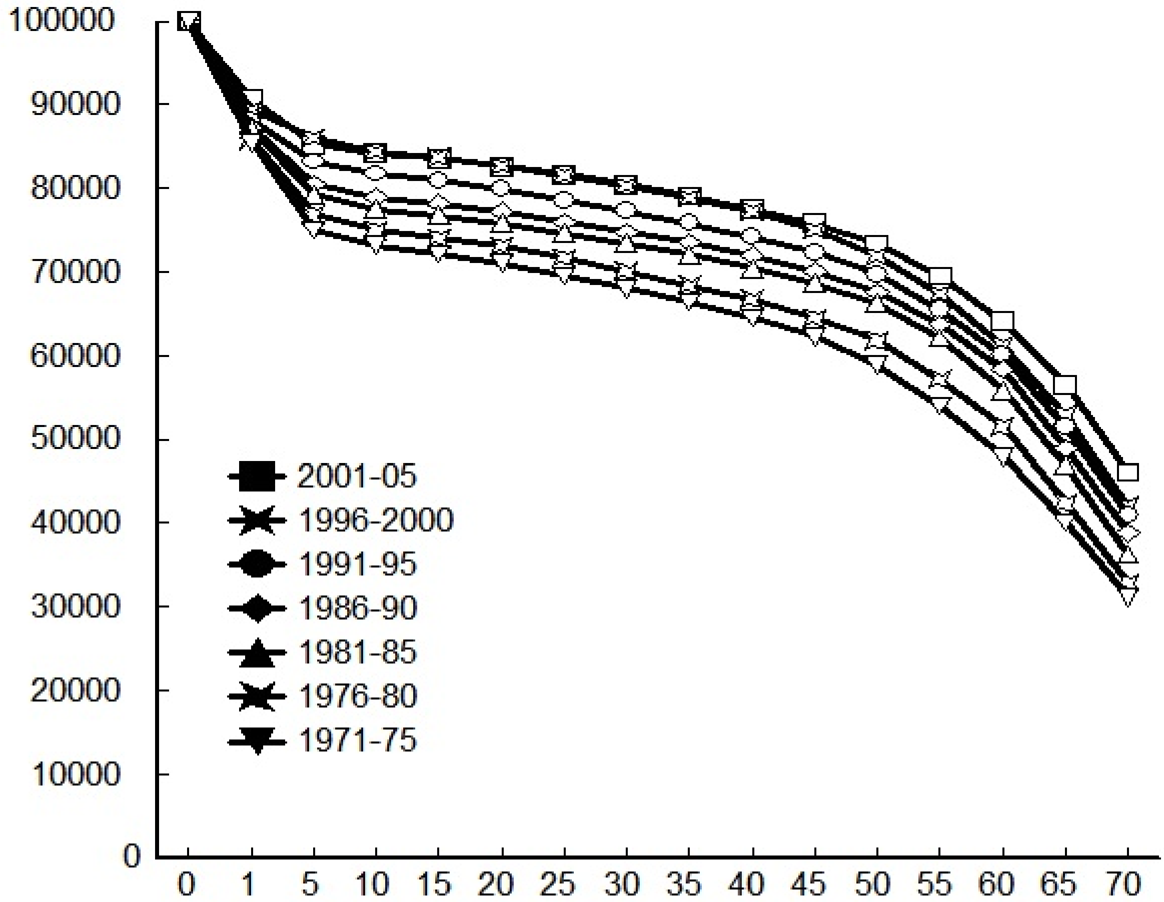
Figure 6.2
Expectation of life at birth by social class, 2001



by the year 2001-05, the total increase in the male expectation of life at birth was less than the increase according to the slow model mortality schedules. Similarly, the increase in the female expectation of life at birth in the state followed the fast model mortality schedule till 1981-85 but the increase faltered after 1981-85 so that the total gain in the female expectation of life at birth during the period 1971-75 through 2001-05 was less than the increase resulting from the slow model mortality schedule.

There is a wide gap in the expectation of life at birth in the rural and urban areas of the state. During the period 2002-06, an individual living in the urban areas of the state was expected to live around 8.5 years more, on average, than an individual living in the rural areas. This difference was around 7.5 years for males but a whopping 9.7 years for females which reflects the fact that females in the rural areas of the state are particularly at the receiving end in terms of health and longevity. Poor health and longevity of women in the rural areas of the state may

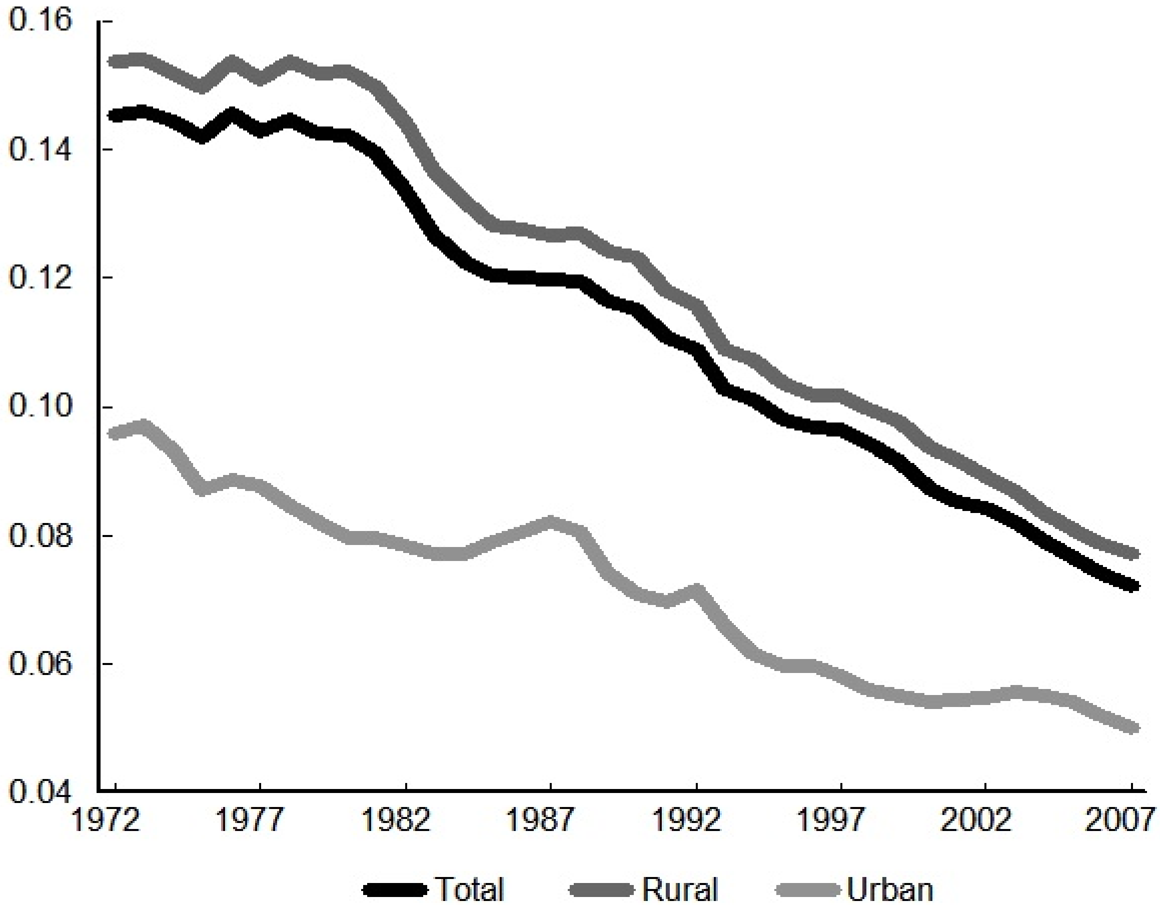
Figure 6.3
Changes in survival probability in Madhya Pradesh
2001-05



also be judged from the sex differentials in the expectation of life at birth. For the combined population, the male-female gap in the expectation of life at birth was just about 0.2 years during the period 2002-06 according to the sample registration system with male expectation of life at birth being higher than the female expectation of life at birth. However, in the rural areas of the state, the male expectation of life at birth exceeded the female expectation of life at birth by about 0.4 years during this period. In the urban areas of the state, on the other hand, the female expectation of life at birth is higher than the male expectation of life at birth by around 1.8 years. This observation again confirms that the health status of the females in the rural areas of the state is extremely poor.

Social class disparities in the expectation of life at birth in the state are also revealing. Estimates of the expectation of life at birth for Scheduled Castes, Scheduled Tribes and non-Scheduled

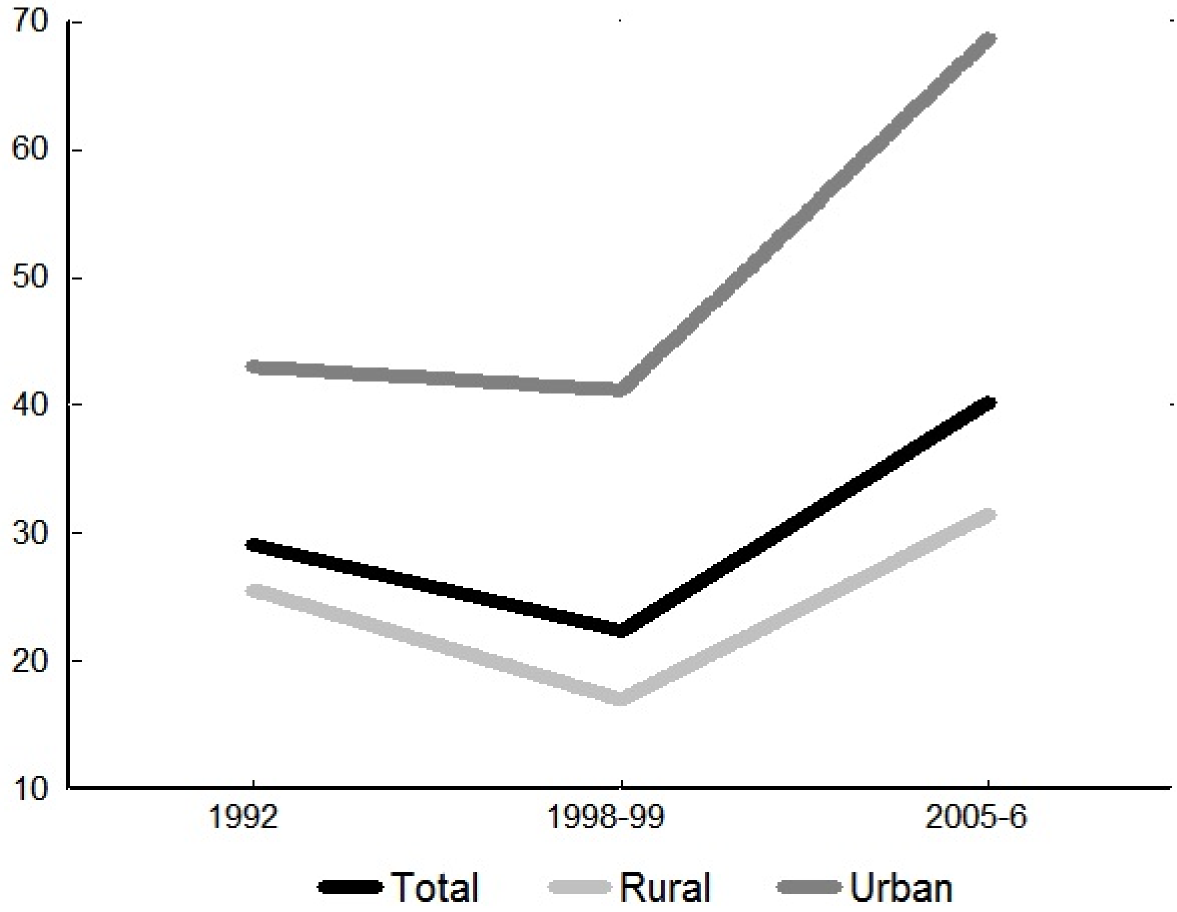
Figure 6.4
Probability of death in the first year of life in Madhya Pradesh



Castes/Tribes have been obtained from the information available from the 2001 population census using the method proposed by Pathak and Singh (1992). These estimates suggest that the expectation of life at birth is the lowest in Scheduled Tribes which constituted more than one fifth of the population of the state at the 2001 population census (Figure 6.2). Expectation of life at birth has also been found to be quite low in Scheduled Castes which constituted more than 15 per cent of the population at the 2001 population census. In other words, in more than 35 per cent population of the state, the health status remains extremely poor.

The expectation of life at birth depicts the mortality experience of the entire population. It is well known that the risk of death varies by age. A better understanding of the mortality experience of the population of the state may therefore be obtained by analysing the mortality experience or, equivalently, the survival experience in different age groups. The age specific death rates for the state available through the sample registration system suggest that during the period 1971-75,

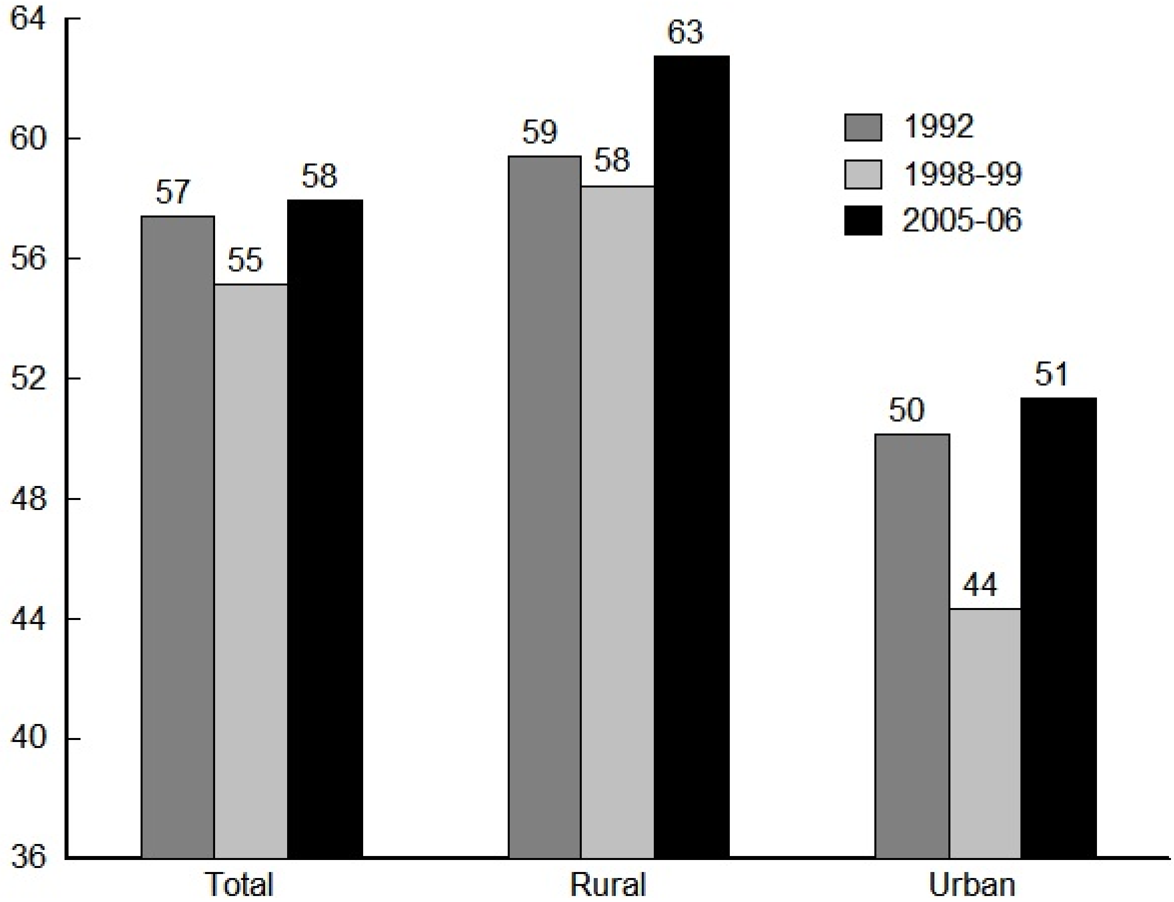
Figure 6.5
Proportion of children 12-23 months of age fully immunised



almost one fourth of the new born were expected to die in the first five years of life; another about 13 per cent were expected to die during 5-45 years of age; about 14 per cent were expected to die during 45-60 years of age while about 17 per cent were expected to die during 60-70 years of age. As the result, only about 31 per cent of the new born were expected to survive up to 70 years of age. During the period 2001-05, more than 46 per cent of the new born were expected to reach 70 years primarily as the result of improvements in mortality in the age group 0-5 years of age. It is also estimated that compared to almost one fourth of the new born dying before reaching their fifth birthday during the period 1971-75, less than 14 per cent of the new born were estimated to be dying before their fifth birth day during the period 1996-2000. However, during the period 2001-05, there was an increase in mortality in the age group 0-5 years.

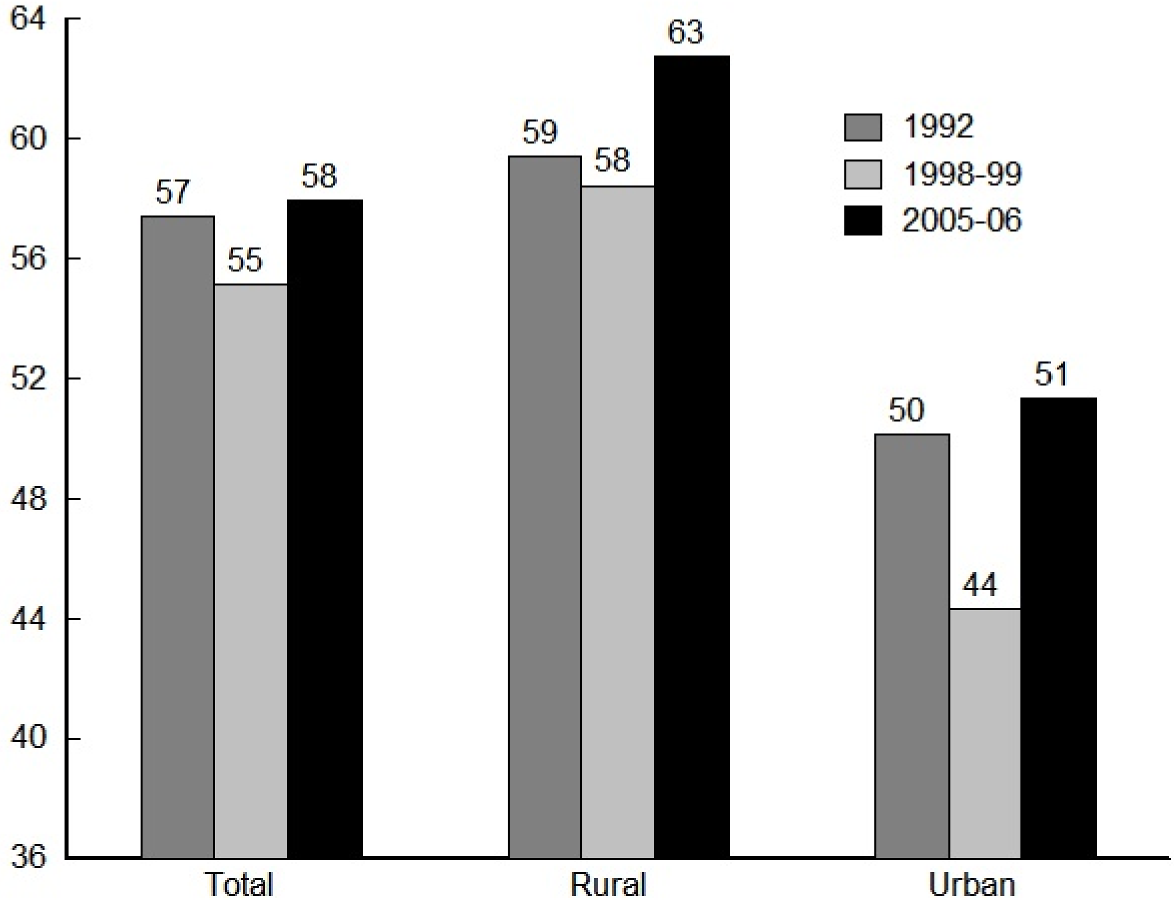
One of the reasons for exceptionally slow increase in the expectation of life at birth in the state is very high infant and child mortality. In the year 2008, the infant mortality rate in the state was

Figure 6.6
Nutritional status of children in Madhya Pradesh



70 infant deaths per 1000 live births which was the highest in the country (Government of India, 2009). Similarly, according to the National Family Health Survey 2005-06, the risk of death during the first five years of life in the state was estimated to be the second highest in the country. Persistence of high to very high risk of death during infancy and early childhood may be judged from the fact that Madhya Pradesh has always ranked among the poorest five states of India in terms of infant and child mortality over the last 35 years. Although, both infant and child mortality decreased during the period, yet the decrease has not been large enough to improve the rank of the state vis-a-vis other states of India. In recent years, there has also been an increase in the probability of death in 1-4 years of age. This reversing of the trend suggests a worsening health status of children 1-4 years of age. As a result, almost 30 per cent of all deaths in the state are still confined to first five years of life (Government of India, 2008). This is in quite contrast to India as a whole where deaths in the age group 0-4 years accounted for only about 20 per cent of all deaths. Moreover, despite reduction in the risk of death during infancy and early childhood,

Figure 6.6
Nutritional status of children in Madhya Pradesh



there has been very little change in the distribution of deaths by age which indicates very little transition in mortality in the state. Obviously, an accelerated reduction in the risk of death during infancy and early childhood is necessary for an accelerated improvement in the health and longevity of the people in the state.

The underlying factors of unacceptably high infant and child mortality in the state are poor efficiency of public health care services and rampant under-nutrition among children. The poor efficiency of public health care services is reflected from the fact that around 40 per cent of children 12-23 months of age were found to be fully immunised according to the National Family Health Survey 2005-06 while less than 30 per cent of children below three years of age having diarrhoea during two weeks prior to the survey were found to have received oral rehydration salt to prevent deaths from dehydration. Immunisation against vaccine preventable diseases and oral rehydration therapy during diarrhoea, it may be pointed out, are the low cost appropriate technologies known for their effectiveness in preventing deaths during infancy and early childhood even in diverse and difficult social, economic and cultural settings. However, universal adoption of these technologies in Madhya Pradesh still remains a distant dream.

Nutritional status of children is another factor that plays a very important role in determining the risk of death during infancy and early childhood. Poor nutritional status has been argued to be the single biggest contributor to mortality in children and has implications to health and productivity even beyond the childhood period. Inadequate and imbalanced diet and chronic illnesses are commonly found to be associated with the poor nutritional status of children. In turn, poor nutritional status of children is one of the most serious health problems in children and the biggest contributor to childhood mortality. Under nutrition saps the growth potential of the child and its capacity to fight the environmental health hazards. Poor nutritional status of a child combined with repeated bouts of common illnesses such as acute respiratory infections, diarrhoea, measles, etc. constitutes a vicious circle that hampers the normal growth and development of children and gradually push them to premature death. Breaking this vicious circle is the key to accelerated reduction in infant and child mortality.

Poor nutritional status of children of Madhya Pradesh may be judged from the fact that an estimated 58 per cent of children were low weight for age (IIPS and Macro International, 2007). It also appears that this proportion has increased in recent years which indicates worsening of the nutrition situation. Low weight for age reflects both long term nutritional imbalance and under-nutrition, as well as current under-nutrition and is the result of protein-calorie deficiency. The increase in the proportion of children low weight-for-age have important implications not only for the survival of children but also for the health and longevity of the population.

Like infant and child mortality, maternal mortality in the state is also amongst the highest in the country. The Registrar General of India has estimated a maternal mortality ratio of 379 maternal deaths for every 100 thousand live births in the state during the period 2001-03 which was well above the national average of 301 maternal deaths for every 100 thousand live births (Government of India, 2006). On the other hand, based on the information available through the National Family Health Survey, 2005-06 and using an indirect approach, Ranjan (2008) has estimated a maternal mortality ratio of 411 maternal deaths per 100 thousand live births compared to the national average of 289 maternal deaths per 100 thousand live births. Because of high fertility, one in every 65 women in Madhya Pradesh face life time risk of a maternal death compared to one in every 108 women in India. The life time risk of a maternal deaths in Madhya Pradesh is the fourth highest in the country.

Inter-district Disparities in Health and Longevity

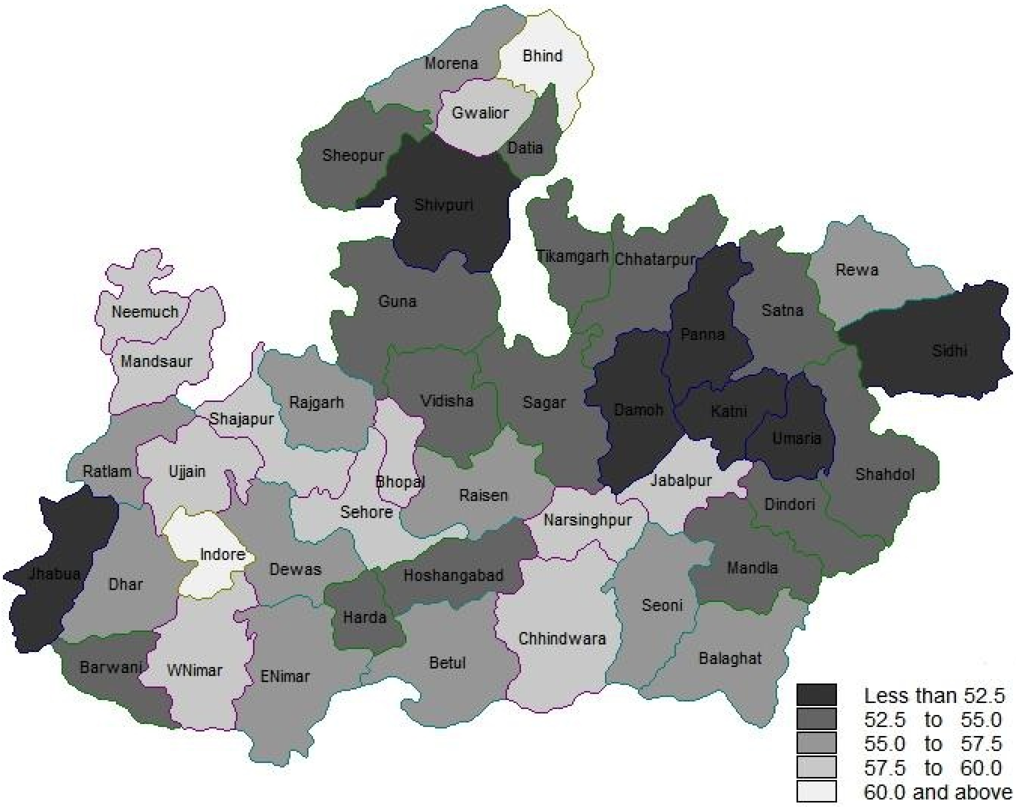
Inter-district disparities in health and longevity in the state are also revealing. They have persisted over time despite all improvements in the health situation. The expectation of life at birth across the districts of the state varies from more than 63 years in district Indore to less than 49 years in district Katni according to the 2001 population census. District Indore is the only district which had an expectation of life at birth more than 60 years while Katni was the only district with an expectation of life at birth of less than 50 years. In most of the districts in the northern and north-eastern parts of the state, the expectation of life at birth has been estimated to be low to very low whereas in districts located in the southern and western parts, the expectation of life at birth is generally on the higher side. The regional pattern in the expectation of life at birth suggests that the health status of the people in the northern and north-eastern parts of the state is poorer than that in its southern and western part. In fact, four of the six districts having the lowest expectation of life at birth are located in the north-eastern part of the state. Very low level of expectation of life at birth in this part of the state indicates that the health of the people of this part of the state is a major development concern.

The state of health also varies widely across the districts as may be seen from summary measures of inter-district variations in selected indicators of health and longevity compiled in table 6.2 along with the coefficient of variation reflect the disparity or inequality in the health status of the people across the districts of the state. Inter-district disparity or inter-district inequality in the health status has been found to be the highest in case of life time risk of a maternal death closely followed by the proportion of children 12-23 months of age fully immunised and the use of oral rehydration solution in children with diarrhoea. The risk of the life time risk of a maternal death varies from a low of 1:163 to a high of 1:25 and is the result of both inter-district variations in the risk of death due to complications of pregnancy and delivery and inter-district variations in fertility. On the other hand, the proportion of children fully immunised varies from a low of around 11 per cent to a high of more than 75 per cent. Similarly, the use of oral rehydration solution in children with diarrhoea varies from a low of just around 4 per cent to almost 60 per cent. By comparison, the inter-district inequality is relatively small in case of proportion of under-nourished children below 5 years of age and the lowest in case of the expectation of life at birth.

The Challenge

The foregoing discussions reflect an unacceptable state of health of the people of Madhya Pradesh. It appears that efforts directed towards meeting the health needs of the people have

Figure 6.7
Expectation of life at birth in districts of Madhya Pradesh, 2001



somewhere fallen short of what is needed. Information available from different sources clearly reveals that a large proportion of the population of the state is still devoid of even the basic minimum health care facilities and services and an acceptable level of nutritional status necessary for being in a state of social, mental and physical well being and not just freedom from disease or infirmity. The situation appears to be compounded by mass illiteracy, especially among women; rampant poverty; and low to very low levels of social and economic development.

The state response to addressing issues of health and longevity is articulated in the state health policy 2000 which still remains a draft. The vision of the draft state health policy is that all people living in the state of Madhya Pradesh will have the knowledge and skills required to keep themselves healthy, and have equity in access to effective and affordable health care services, as close to the family as possible, which enhances their quality of life, and enables them to lead a healthy and productive life (Government of Madhya Pradesh, 2000). In order to realise the aforesaid vision, the draft state health policy aims at:

1. Ensuring geographic and economic access to primary and secondary quality health care and family welfare services to all people of Madhya Pradesh within a span of five to seven years.
2. Prevention of disaster, to the extent possible, and preparedness for disaster management as and when necessary.
3. Reducing the MMR to 220 by 2011 from the level of 498 (1997 level).
4. Reducing the IMR to 62 by 2011 from the level of 97 (1997 level).
5. Total Fertility Rate to reach replacement level fertility (TFR of 2.1) by the year 2011.
6. Stabilise the prevalence of HIV/AIDS at low level (present level) and further decrease it.
7. Address problems related to mental health and initiate action to create information base and preventive intervention for improved mental health in the state.

The current levels and past trends in different indicators related to health and longevity, however, indicate that it is extremely difficult to achieve the goals of the state health policy until and unless concerted multidimensional efforts are made. It is in this context that the following key policy initiatives need to be undertaken:

1. *Promote local level collective health action*
    - Evolve people's based health service delivery network either at the village level or at the Gram Panchayat level.
    - Build up the capacity of local level people's organisations such as Gram Panchayat or Gram Sabha for grass roots level health planning.
    - Build up the capacity of the community to initiate and sustain local health action.
    - Develop community skills in obstetric care service delivery through a university based graduate programme in obstetric care.
    - Establish health communication networks at the village level to build up community awareness about pertinent health issues and to promote the use of low cost appropriate technology to address identified health issues.
    - Develop simple and easy to interpret indicators of monitoring health of the community at the local level that can be used by the people and their organisations.
    - Develop and introduce healthy life education programme with the help of people's representatives to ensure a change in the health seeking behaviour of the people.
    - Evolve a people's based environmental sanitation programme based on low-cost appropriate technology to address factors affecting the people.
2. *Build and sustain community partnerships for health care delivery*
    - Evolve and institutionalise a systematic approach to health improvement. Goals and objectives of the state health policy cannot ensure improvements in health status of the

people. They need to be recognised as part of a larger, systematic approach to health improvement.

- Identify health related priorities that reflect major public health concerns to the state. Relate health priorities to health policy goals and objectives.
- Mobilize individuals and organizations that care for the health of the people and for the health of the community into a coalition.
- Assess the strength and weaknesses of the coalition in meeting the health needs of the people and health needs of the community.
- Identify opportunities in the community that can strengthen the coalition to meet people's health needs.
- Identify community level threats that may come across the coalition in meeting people's health needs.
- Enhance the capacity of the coalition in meeting the health needs of the people by developing and institutionalizing a capacity building programme through:
  - Building the programme on coalition strength.
  - En-cashing opportunities for capacity building.
  - Avoiding threats to community partnerships.
  - Toning down weaknesses of the coalition.
- Develop vision for the coalition directed towards improving the health of the community. Add strategies and action steps that may help the coalition in achieving the vision.
- Facilitate the coalition to implement the action steps. Develop community level and coalition level mechanisms for trekking the progress of implementation.

3. *Improve availability and affordability of quality specialized health care services to support local level collective health action*.
   - Revamp public health care delivery system.
     a. Decentralize the public health care delivery system by delegating administrative and financial powers to grass roots level administrative units.
     b. Prioritise government responsibilities. The government should bear the responsibility of delivery of primary health care services only.
     c. The secondary and tertiary level health care delivery institutions within the public sector should be made autonomous.
     d. The development block should be made the basic unit of planning for health services and for the delivery of health services.
     e. Create the cadre of Block Medical Officer.

f. Build up the capacity of Block Medical Officer and Chief Medical and Health Officer in the critical areas of health planning and monitoring of the delivery of health care.
g. Revamp the Rogi Kalyan Samiti model of granting functional autonomy to public hospitals. Give a professional orientation to Rogi Kalyan Samiti.
h. Reorganise the Directorate of Health Services to make it a professional, competitive organization.
i. Develop performance management system for the public health care delivery network.
j. Promote health systems research to make public health services more efficient and effective.
k. Revamp human resources development programme to improve the knowledge and skills of health services providers.
l. Increase government budgetary allocation for health and sanitation.
m. Enhance capacity of the government in terms of health policy formulation, strategy development, policy level monitoring and impact assessment.
n. Establish continuous quality improvement programme.

- Reorient the private health care delivery system.
  a. Promote public-private partnerships in health care service delivery.
  b. Establish performance management system.
  c. Involve private health care delivery system in human resources development.

4. *Develop policies and institutional capacity for regulation and enforcement*
   - Establish Health Regulatory Authority to regulate both public and private health care delivery system.
   - Establish an accrediting system for rating both public and private health care delivery institutions.
   - Establish system for the development, monitoring and evaluation of policy for promoting health through a participatory process consistent with the political and economic context.
5. *Establish determinants of health research programme*
   - Establish an apex level organization to plan, coordinate and monitor determinants of health research.
   - Create a network of research academic institutions for promoting health determinants research and for impact assessment of on going health programmes and activities.
   - Develop and implement innovative solutions in health care services delivery whose impact can be measured and assessed.

6. *Create health disaster management network*
    - Identify areas exposed to different kinds of health hazards with the support of expertise institutions and determine the vulnerability of key health institutions.
    - Develop guidelines for protecting health infrastructure and water and food distribution systems in the event of disaster.
    - Develop disaster mitigation programme as one of the integral component of public and private health care delivery system.
    - Inform, sensitize and training those who are involved in planning, administration, operation, maintenance and use of facilities about disaster mitigation.
    - Include disaster mitigation in the curricula of professional education and training.
    - Carry out vulnerability analysis at regular intervals to identify weaknesses in the system.
8. *Revamp and expand human resources development system*
    - Establish norms for human resources necessary for meeting the health needs of the people.
    - Make projections of human resources requirements of public and private health care delivery systems.
    - Expand the health related education and training facilities to meet the projected requirements of human resources.
    - Revamp the in-service human resources development network of public health care delivery system.
    - Establish in-service human resources development programme for the private health care delivery system.
    - Establish human resources development monitoring and evaluation system.
9. *Strengthen monitoring, evaluation and analysis of health status*
    - Institutionalise a system of regular evaluation of the health situation and trends.
    - Develop technology, expertise and methodologies for management, analysis and communication of information to key players in health services delivery.
    - Develop a programme of management of vital statistics.
    - Create and maintain database for assessing the performance of health care services.
    - Develop capacity to conduct research and surveillance of epidemic outbreaks, patterns of communicable and non-communicable diseases, etc. especially at the local level.

The agenda prescribed above for meeting the health needs of the people is a very tall order. It requires strong and sustained political will and continued bureaucratic commitment. It also requires massive additional investments, especially in the public health care delivery system. A beginning to this direction is made by the Government of India through the launch of National Rural Health Mission in the year 2005 (Government of India, 2005). The Mission aims at architectural corrections in the health care delivery system with a view to make it an accountable, accessible and affordable system of quality health care services. It envisions, among others

- provision of effective health care to the rural population.
- raising public spending on health from 0.9 per cent of the GDP to 2-3 per cent of the GDP.
- architectural corrections in the health system to enable it to effectively handle increased allocations through strengthening of public health management.
- effective integration of health concerns through decentralized management with determinants of health like sanitation and hygiene, safe drinking water, nutrition, gender and social concerns.
- improvements in accessibility, equity, affordability, accountability and effectiveness of primary health care.

In the context of meeting the health needs of the people, especially the poor and the deprived, it is important that the concept of health is promoted in a substantive and not in a formal context as has been the tradition so far. In the formal context, the concept of health is primarily linked to institution-based care. In the substantive context, health is linked to the interaction between the man and his environment. Formal health care has strong underpinnings in medical technology whereas substantive health care has its roots in individual, family and social behaviour. There is a need to strike a balance between the two. Health needs of the people cannot be met by just focussing upon the formal health care. Moreover, the cost of formal health care may be very high, beyond the reach of the poor and the marginalised sections of the community simply because formal health care is institution-based and medical technology driven. Strengthening the formal health care system is directly related to creating, strengthening and expanding health care institutions. In the absence of substantive health care, these institutions may remain unaccepted by the people at large and hence under utilised. Unfortunately, the National Rural Health Mission also focusses on the formal health care but pays little attention to substantive health care.

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Table 6.1

Social class differentials in selected indicators of population health in Madhya Pradesh

SN	Indicator	Scheduled Castes	Scheduled Tribes	Other Backward Classes	Others
1	Expectation of life at birth, 2001	52.9	50.3		58.4
2	Infant mortality rate, 2005-06	81.9	95.6	79.0	66.8
3	Under-five mortality rate, 2005-06	110.1	140.7	97.6	79.9
4	Maternal mortality ratio, 2005-06	390.0	700.0	353.0	na
5	Life time risk of maternal death, 2005-06	1:67		1:75	na
6	Children 12-23 months fully immunised, 2005-06	40.5	22.3	41.0	62.4
7	Children with diarrhoea given ORS, 2005-06	29.1	26.7	26.9	40.5
8	Proportion of children low weight-for-age, 2005-06	62.6	71.4	57.8	45.3
9	Children 6-59 months anaemic, 2005-06	75.6	82.5	70.6	68.5
10	Women 15-49 years anaemic, 2005-06	56.5	73.9	51.1	46.3

Table 6.2

Inter-district variations in selected indicators of health and longevity in Madhya Pradesh

State/District	E_0	IMR	U5MR	MMR	LTR	IMM	ORS	CUW
Madhya Pradesh	55.76	94	141	549	1:39	30.40	26.40	46.47
Sheopur	52.77	101	154	628	1:30	20.60	13.60	57.69
Morena	55.67	93	138	501	1:36	34.90	16.10	47.03
Bhind	60.29	76	109	488	1:41	37.80	17.90	41.72
Gwalior	59.33	71	101	335	1:71	37.50	31.40	43.89
Datia	54.06	102	156	625	1:31	17.20	33.90	49.52
Shivpuri	51.91	106	162	683	1:26	17.70	15.50	50.86
Guna	52.50	110	170	634	1:30	24.00	18.10	52.51
Tikamgarh	53.32	99	149	679	1:26	14.10	9.60	52.36
Chhatarpur	53.53	100	152	693	1:26	31.10	12.10	50.97
Panna	49.86	118	185	786	1:25	29.30	24.40	56.36
Sagar	54.47	98	148	613	1:33	37.20	31.50	47.15
Damoh	52.40	105	161	632	1:31	11.40	27.10	55.21
Satna	52.68	111	171	754	1:26	25.60	43.30	52.56
Rewa	56.47	97	146	656	1:30	39.70	32.80	51.27
Umaria	51.49	109	168	530	1:39	17.40	35.00	52.53
Shahdol	53.60	102	155	701	1:33	35.20	28.30	60.96
Sidhi	51.91	109	168	669	1:28	20.20	4.30	58.77
Neemuch	59.59	79	115	382	1:62	53.70	31.40	48.65
Mandsaur	58.53	83	121	470	1:48	38.00	24.70	54.34
Ratlam	55.45	101	153	616	1:36	55.60	28.40	47.36
Ujjain	59.28	85	125	489	1:46	74.00	46.80	47.81
Shajapur	59.32	81	118	423	1:49	51.50	27.00	47.42
Dewas	56.47	96	144	525	1:38	42.70	32.50	35.60
Jhabua	51.36	101	153	707	1:28	20.90	32.20	51.08
Dhar	56.72	81	118	479	1:43	39.00	23.20	56.17
Indore	63.81	56	76	166	1:163	71.00	59.90	44.97
West Nimar	58.01	82	120	550	1:37	50.50	47.50	57.90
Barwani	52.92	99	150	659	1:27	19.30	38.80	54.58
East Nimar	55.99	94	140	561	1:39	45.90	39.10	55.26
Rajgarh	57.07	95	142	500	1:44	26.40	23.60	46.50
Vidisha	52.85	112	174	695	1:28	26.90	22.70	48.32
Bhopal	59.83	71	101	339	1:77	70.10	59.90	39.93
Sehore	57.50	92	137	549	1:37	60.10	27.20	48.60
Raisen	57.45	87	128	551	1:38	39.20	34.40	46.92
Betul	57.36	91	136	561	1:43	54.80	31.30	54.08
Harda	53.70	108	166	664	1:30	38.30	44.70	55.28
Hoshangabad	54.99	107	165	640	1:35	54.00	22.10	44.45
Katni	48.95	123	195	829	1:26	50.30	22.20	52.97
Jabalpur	57.86	87	128	469	1:57	36.80	44.00	51.34

State/District	E_0	IMR	U5MR	MMR	LTR	IMM	ORS	CUW
Narsimhapur	58.80	86	127	498	1:47	40.50	34.80	49.66
Dindori	54.53	104	159	763	1:32	22.90	26.40	54.62
Mandla	52.96	107	165	771	1:32	30.50	33.00	55.21
Chhindwara	57.85	89	131	545	1:44	48.50	35.30	47.24
Seoni	57.20	84	122	520	1:46	34.10	39.90	47.75
Balaghat	56.75	93	139	536	1:52	75.10	34.70	51.57
Summary Measures								
Minimum	48.95	56	76	166	1:16	11.40	4.30	35.60
Median	55.67	97	146	561	1:36	37.50	31.40	51.08
Maximum	63.81	123	195	829	1:25	75.10	59.90	60.96
IQR	5.22	17	30	171		17.90	10.97	7.38
CV	0.06	0.140	0.166	0.225	0.529	0.426	0.385	0.100

E0 Expectation of life at birth
IMR Infant mortality rate (per 1000 live births)
U5MR Under 5 mortality rate (per 1000 live births
MMR Maternal mortality ratio (per 100000 live births)
LTR Life time risk of a maternal death
IMM Proportion of children 12-23 months of age fully immunised (Per cent)
ORS Proportion of children having diarrhoea received ORS (Per cent)
CUW Children below five years of age underweight

UNIVERSALISING ELEMENTARY EDUCATION

Background

Education plays an important role in the development of the personality and building of the capacity of a child necessary to become a responsible parent and a productive adult. It is the basic yet the most important intervention through the processes of learning, knowledge accumulation and skills development. It is in this context that universalisation of child education is one of the cherished goals of all social, economic and human development efforts. It may however, be pointed out that although, universalisation of child education is a key component of any social, economic and human development process, yet education to all children is not the explicit objective of the XI Five-year Development Plan of Madhya Pradesh. The XI Five-year Development Plan of Madhya Pradesh aims at achieving a literacy rate of 84 per cent by the year 2012 (Government of Madhya Pradesh, 2007). It may be argued that in order to achieve a literacy rate of 84 per cent, universalisation of education of children is a necessary prerequisite. Without ensuring education to all children of the state, it is not possible to achieve a literacy rate of 84 per cent.

Against the above background, this chapter examines the status of education of children in Madhya Pradesh. The focus is on children 7-14 years of age as this period is the most important period in the life of every child. During this period, the child enters into an era of learning, knowledge accumulation and skills development along with socialization with the rest of the world. Achievements of the child, during this period, contribute significantly in its recognition as a worthy citizen and a responsible parent later in the life. The knowledge gained and skills mastered during this period decide the course of the remaining life of the child and its contribution to the family and the society to which the child belongs.

The discussion that follows focusses on the two important aspects of child education. The first is the level of literacy while the second is the extent of schooling. Although, schooling is not a necessary condition for literacy which means ability to read and write with understanding, yet schooling is the main intervention to achieve the goal of universal education. It may however be stressed that universal literacy may be different from universal schooling. It is in this context that the chapter also elaborates upon the learning environment that prevails in the state.

Two sources of information are available for measuring the progress towards universalisation of child education. The first is the decennial population census which provides information about the level of education of every individual in addition to information related to schooling by the age of the individual. The second source of information about child education is the District Information System for Education (DISE) which has been developed by the National University of Educational Planning and Administration (NUEPA) as part of the District Primary Education Programme launched by the Government of India in 1994. It was comprehensively reviewed and updated in the year 2000-01. DISE is an school-based system of reporting educational statistics as school statistics constitutes the core of educational statistics. It is operational in only those districts of India where the District Primary Education Programme is being implemented.

Information available from either the population census or DISE has, however, some limitations. The major limitation of the information available through the population census is that census is conducted at an interval of ten years. The last population census in India was carried out in 2001 and so the information available from the census is somewhat outdated for analysing and discussing the state of child education in the year 2009. On the other hand, information available through DISE is essentially the provider-based information and so this information is associated with the provider bias, although, it is claimed that the authenticity of the information available through DISE is verified through specially designed random checks. Another limitation of DISE is that it does not include information related to out of school learning and education activities. A third problem with DISE is that the system is limited to only those schools which are covered under the District Primary Education Programme. By contrast, information available through the population census cover all programmes, interventions and activities directed towards educating children including public interventions, private initiatives as well as school based activities and informal learning in out of school programmes and activities. Because of these limitations, the information available from the population census and from DISE are not comparable.

Literacy in Children 7-14 years

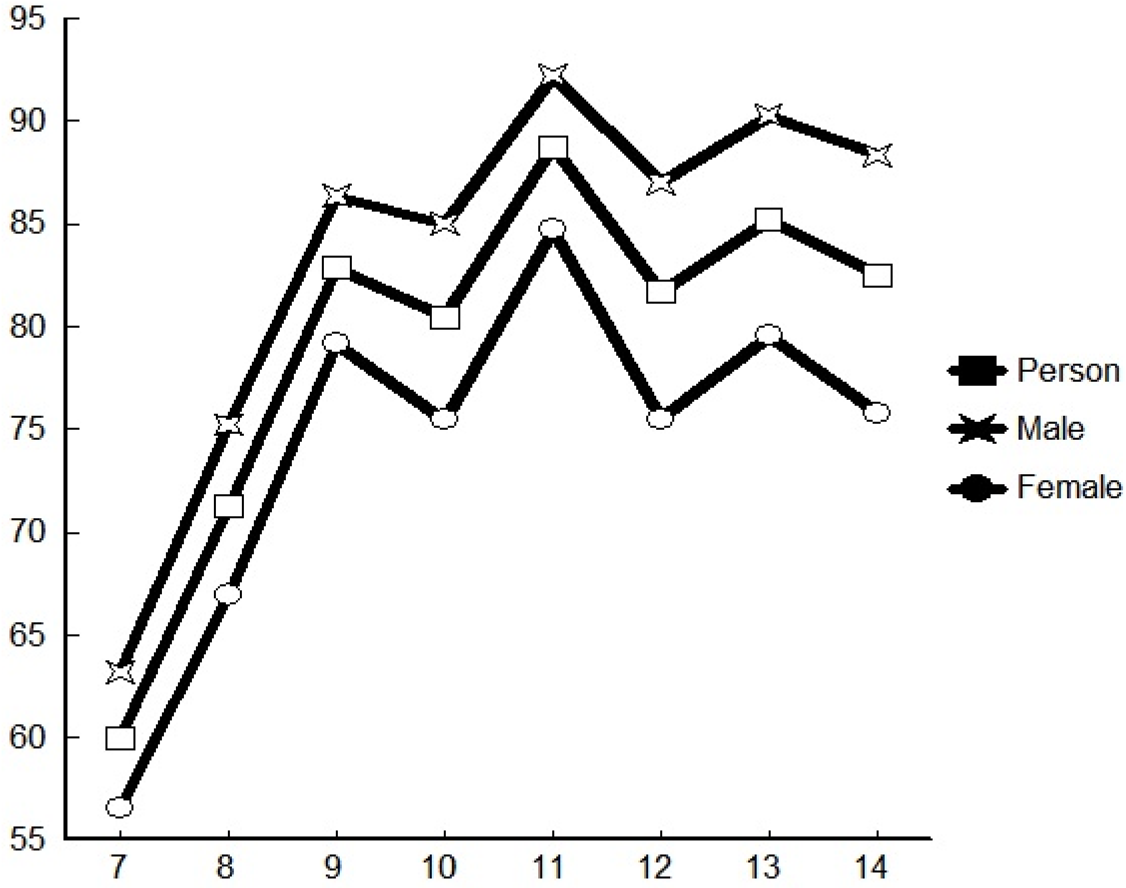
Information available through the 2001 population census suggests that very close to 80 per cent of children 7-14 years of age in the state were literate in the year 2001 in the sense that they were able to read and write with understanding. This implies that more than one fifth of the children 7-14 years of age in the state were illiterate at the beginning of the present century. There is every likelihood that this proportion has decreased since 2001. In any case, reaching and educating these illiterate children is critical to achieving the goal of universal child education and a literacy rate of 84 per cent by the year 2012 as specified in the XI Five-year Development Plan of Madhya Pradesh.

Social class differentials in literacy among children 7-14 years of age are remarkable for their strength. Moreover, they appear to have persisted over time. First and the foremost, literacy rate is higher in male children (83.1 per cent) compared to female children (73.6 per cent). Although the gender gap appears to have narrowed down over time, yet it is still very close to 10 percentage points which is unacceptable from all accounts. This gender gap implies that there were only about 80 female literate children for every 100 male literate children of 7-14 years of age in the state around the year 2001. Similarly, there is a wide gap in the literacy of children 7-14 years of age in rural areas (75.4 per cent) as compared to that in urban areas (88.1 per cent). Clearly, the goal of universal literacy of children aged 7-14 years still remains elusive even in the urban areas of the state.

Another important dimension of literacy of children 7-14 years of age is social class differentials which have also persisted over time. The literacy rate in Scheduled Tribes children 7-14 years of age was found to be less than 60 per cent in 2001 - just 50 per cent in female Scheduled Tribes children 7-14 years of age. This shows that wide social class disparities in literacy of children persist in the state despite persistent efforts during the last 50 years to remove these disparities. Compared to Scheduled Tribes, the level of literacy in Scheduled Castes children appears to be relatively better but still well below the level of literacy among non Scheduled Castes/Tribes children in both rural and urban areas of the state.

Persistence of social class differentials in literacy, especially very low levels of literacy in Scheduled Tribes children appears to be a major stumbling block by way of universal child education in the state and realisation of the goal of a literacy rate of 84 per cent by the year 2012 as prescribed in the XI Five-year Development Plan of Madhya Pradesh. Scheduled Tribes children, it may be recalled, account for more than one fifth of the children 7-14 years of age in

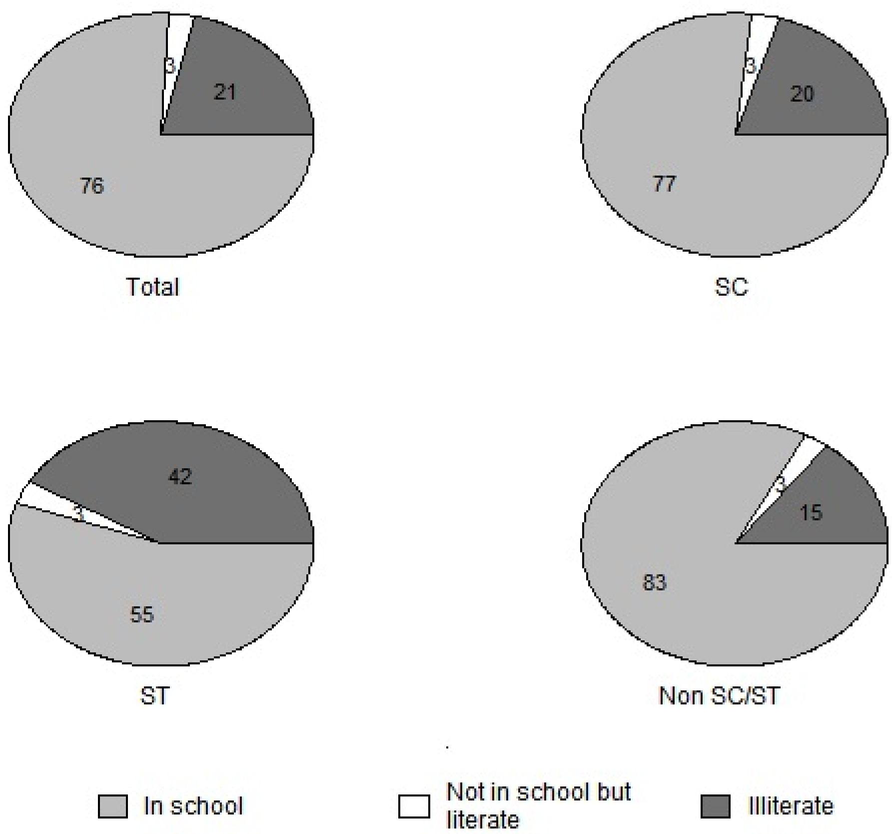
Figure 7.1
Literacy rate in children 7-14 years of age in Madhya Pradesh, 2001



the state, according to the 2001 population census. Obviously, an accelerated improvement in literacy of Scheduled Tribe children is critical to achieve the goal of universal child education and improvements in literacy in the state.

Information available through the 2001 population census also suggests that the literacy rate increases with the age of the child up to 11 years. The increase is very rapid in the younger ages and, after 9 years of age, the increase in literacy slows down considerably. After 11 years of age, the literacy rate decreases. The increase in literacy with age has however been found to be slower in female children as compared to male children so that the gap between literacy rates of male and female children increases with age. In children 7 years of age, male literacy rate was about 7 points higher than the female literacy rate in the year 2001 which increased to almost 11 points in children 13 years of age and around 13 points in children 14 years of age (Figure 7.1). In the Scheduled Tribes children, this gap has been found to increase from about 8 percentage points

Figure 7.2
Proportion (per cent) of Children 7-14 years of age not in school in Madhya Pradesh, 2001

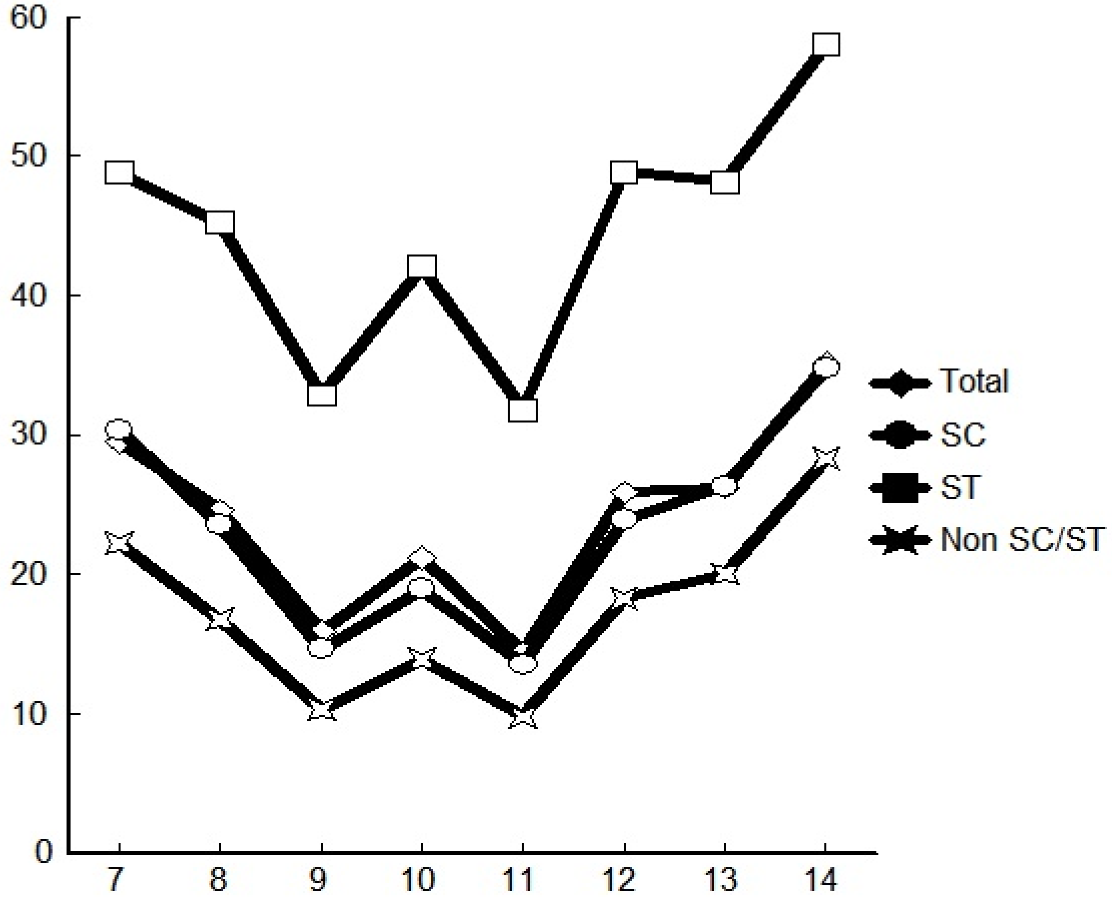


in children of 7 years of age to more than 20 percentage points in children 14 years of age. The gap in the literacy of male and female children has also been found to increase with age in the Scheduled Castes and non Scheduled Castes/Tribes children.

Children in School

The 2001 population census reveales that about 76 per cent children of 7-14 years of age in Madhya Pradesh were in school in the year 2001. This means that about one fourth children aged 7-14 years were not in school at the beginning of the current century. Out of these 24 per cent children, about 3 per cent children were literate - able to read and write with understanding whereas about 21 per cent children aged 7-14 years were illiterate (Figure 7.2) which means that around one fifth children aged 7-14 years had never gone to school. The proportion not in school was higher in female as compared to male children and in rural as compared to urban areas

Figure 7.3
Proportion (per cent) of children not in school by age



(Table 7.1). The situation appears to be particularly alarming among Scheduled Tribes children as almost 45 per cent of Scheduled Tribes children aged 7-14 years were found to be not in school at the time of 2001 population census.

It is generally argued that one of the reasons for the unsatisfactory schooling of the girl child is the apathy of the parents to send their daughters to the school for a variety of reasons ranging from security to lack of such basic facilities as dedicated toilets and urinals for girls, etc. Information available through the 2001 population census suggests that the difference in the proportion of male and female children in school or not in school was around 11 per cent (Table7. 1). In the rural areas of the state, this gap is quite substantial but it is only marginal in the urban areas, although, the proportion of female children 7-14 years of age not in school has always been higher than that of male children in all social classes as well as separately in the rural and urban areas.

Figure 7.4
Sex differences in the age pattern of the proportion of children not in school

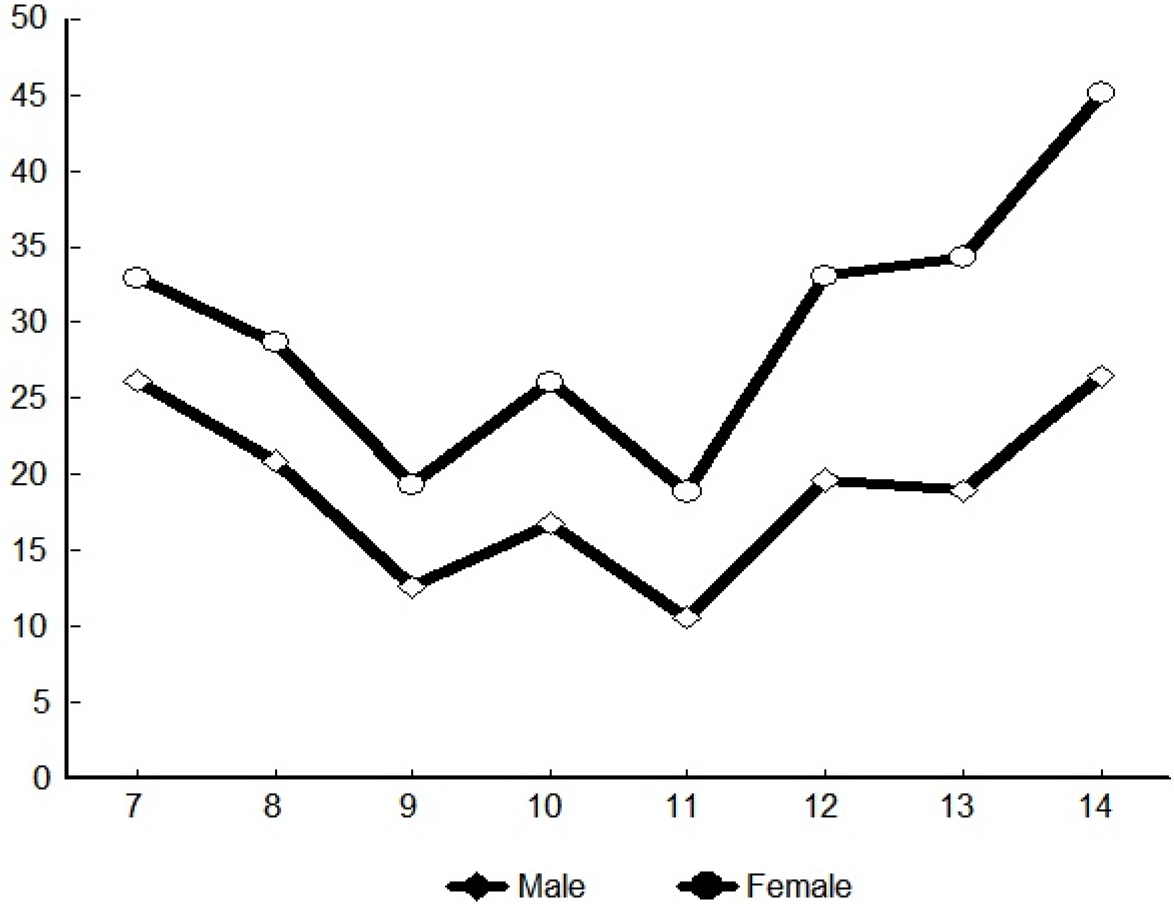


Figure 7.3 depicts the proportion of children aged 7-14 years not in school by the age of the child. At the beginning of the learning period, the proportion of children not in school appears to be very high in the state. As the age advances, this proportion decreases, rather rapidly, so as to reach a minimum during 9-11 years of age. After 11 years of age, the proportion of children not in school rises again rather steeply and increases to more than 35 per cent in case of all children combined and almost 60 per cent in case of Scheduled Tribes children. Even in the non Scheduled Castes/Tribes population, this proportion has been found to increase to very close to 30 per cent by 14 years of age. Obviously, a very substantial proportion of children 7-14 years of age in the state remain out of the school. Moreover, there is a very substantial drop out of the school after 11 years of age. The age pattern of the proportion of children not in school suggests that schooling in the state generally begins at an age older than 7 years and is at its peak in the age group 9-11 years only when only about 10 per cent of the children were found to be out of

the school. However, after 11 years of age, the proportion of children not in school increases again quite rapidly.

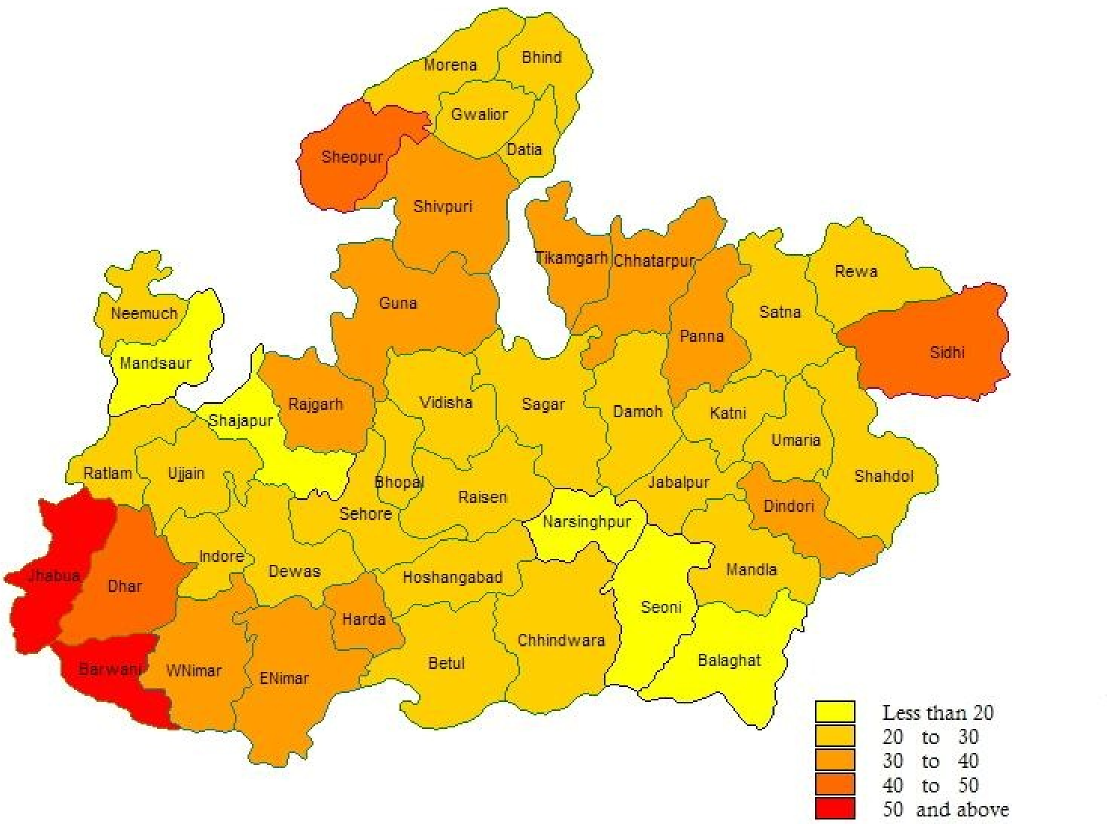
A relatively low level of schooling in the younger ages of the childhood period indicates low demand for schooling whereas a decrease in schooling in the older ages of the childhood period indicates drop out of the school system. The drop out of the school after 11 years of age is substantial in both boys and girls. The proportion of boys not in school in the state increased from around 11 per cent at 11 years of age to more than 26 per cent at 14 years of age whereas the proportion of girls not in school increased from around 19 per cent to more than 45 per cent according to the information available through the 2001 population census. Although, the information available through the 2001 population census is about 8 years old but it can safely be conjectured that there has not been any significant change in the situation. The dropping out of boys from the school after 11 years of age is also a significant factor in the decrease in schooling during the older ages of the childhood period.

A very rapid drop out of the school after 11 years of age in children aged 7-14 years in the state may be because of a number of factors including relevance of the school education to the social and economic production system and host of social and cultural factors. It is well known that schooling in India is largely out of context to the traditional social and economic production system. This may be one reason why a large proportion of boys drop out of the school and get themselves engaged in the traditional and family production system. On the other hand, security concerns related to girls, especially after they have achieved puberty, and priority to get them married appears to be a factor in dropping out of girls from the school education system. These and many other factors contributing to school drop out are exogenous to the school education system. It is however clear that universal schooling for children aged 7-14 years in the state cannot be achieved without addressing these exogenous factors. There is, however, very little initiative in this direction in the quest towards universalisation of elementary education in the state.

Inter-district Variations in Literacy

Inter-district variations in the proportion of children aged 7-14 years not in school are very significant. It is argued that reducing these variations may be a feasible yet optimal approach to achieving universal elementary schooling in the state. The disparity in child schooling across the districts of the state may be judged from the observation that in two districts of the state - Jhabua and Barwani - more than half of children 7-14 years of age were found to be not in school at the

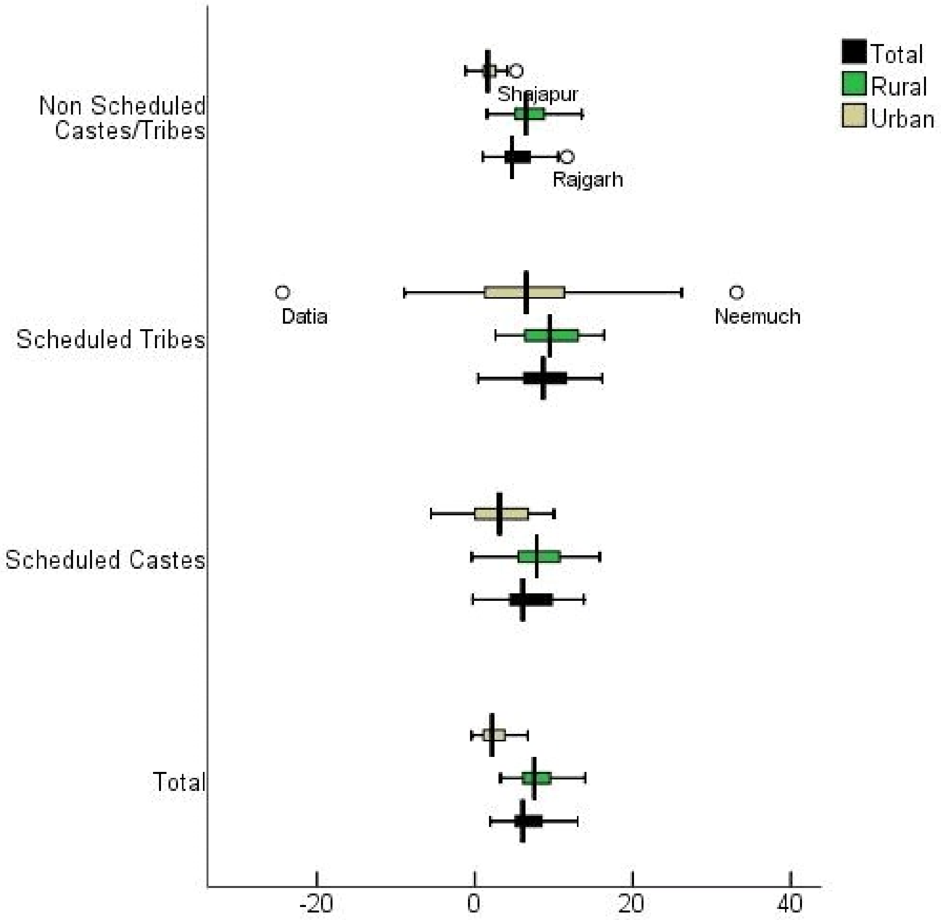
Figure 7.5
Inter-district variations in the proportion (per cent) of children 7-14 years of age not in school, 2001



time of 2001 population census with district Jhabua having the highest proportion of children out of school. District Jhabua, incidentally, has the highest proportion of Scheduled Tribes population in the state. In Sheopur, Sidhi and Dhar districts also, the proportion of children 7-14 years of age out of the school has been found to be very high - ranging between 40-50 per cent. By contrast, in five districts - Balaghat, Seoni, Narsinghpur, Shajapur and Mandsaur - less than 20 per cent of children 7-14 years of age were found to be out of the school.

In most of the districts of the state, however, the proportion of children 7-14 years of age outside the school has been found to range between 20 to 30 per cent. Although, one would expect an improvement in the situation that prevailed in 2001, yet, it appears that the goal of universal schooling of all children 7-14 years of age is still a far cry largely because in a number of districts of the state such as Jhabua and Barwani where the drop out of children aged 7-14 years is still very heavy. Unfortunately little is currently known about the reasons for this heavy drop out in these districts.

Figure 7.6
Inter-district variations in female-male gap
in the proportion of children 7-14 years of age not in school



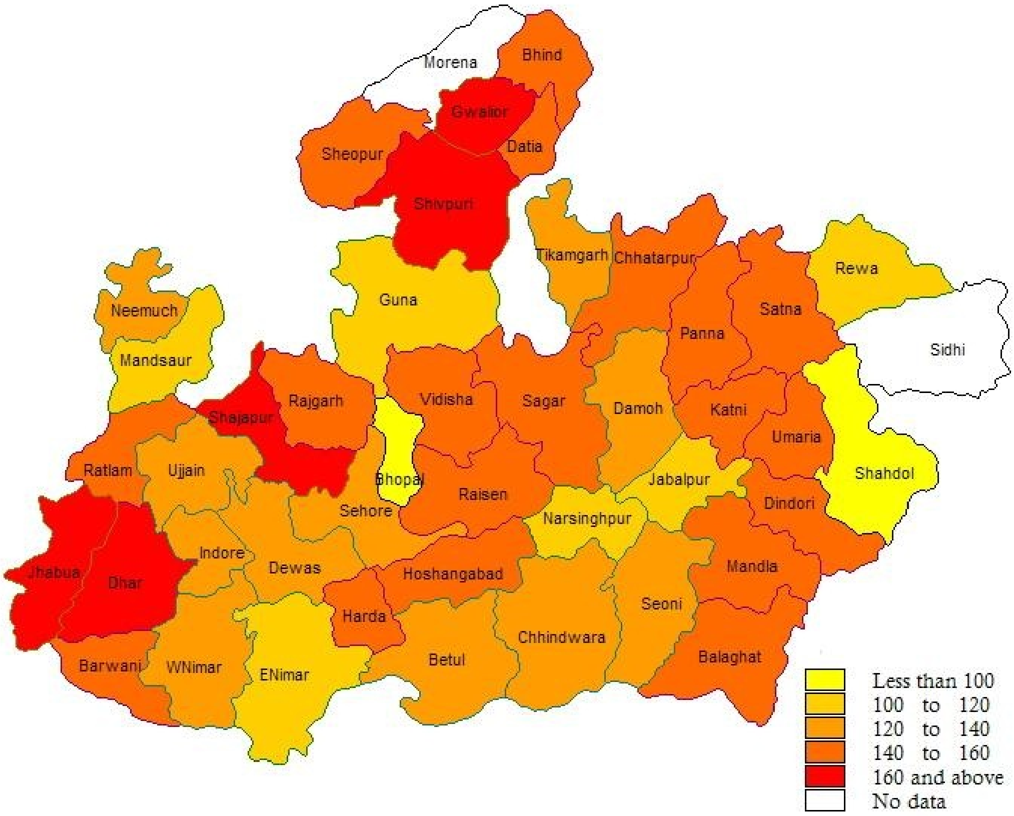
The female-male gap in the proportion of children 7-14 years of age not in school also varies across the districts (Figure 7.6). For the combined population and for all social classes, the female-male gap in the proportion of children 7-14 years of age not in school varies from just about 2 percentage points in district Jabalpur to more than 13 percentage points in district Jhabua. Moreover, in all districts of the state, the female-male gap in children 7-14 years of age not in school is positive which implies that the proportion of female children 7-14 years of age out of the school is higher than the proportion of male children 7-14 years of age out of school in all districts of the state. The female-male gap in the proportion of Scheduled Tribes children aged 7-14 years out of school is also positive in all districts of the state in case as well as in all but one districts in case of Scheduled Castes children. The only district where the female-male gap in the proportion of children aged 7-14 years not in school has been found to be negative at the 2001 population census is district Balaghat. The same pattern may also be observed in the rural areas but, in the urban areas, the pattern appears to be different in three districts - Chhindwara, Damoh and East Nimar - where the drop out rate has been found to be more in male as compared to female children. The female-male gap has been found to be negative in 11 districts in case of Scheduled Castes children, in 8 districts in case of Scheduled Tribes children and in only three districts in case of non Scheduled Castes/Tribes children.

Another observation of the figure 7.6 is that inter-district variations in the female-male gap in the proportion of children aged 7-14 years not in school is very substantial in case of Scheduled Tribes in the urban areas. In district Datia, this ratio has been found to be extremely negative which indicates that, compared to females, a very large proportion of male Scheduled Tribes children were found to be not in school in this district at the 2001 population census. On the other hand, the female-male gap has been found to be extremely positive in Neemuch, Mandsaur, Vidisha and Damoh districts which means that, compared to males, a very high proportion of female Scheduled Tribes children were found to be not in school in these district around the year 2001. Extreme differences in the female and male proportion of Scheduled Tribes children 7-14 years of age not in school in some of the districts of the state have implications for universalisation of schooling. It is also not clear at present why a very substantial proportion of Scheduled Tribes girls in these districts are dropping out of school as compared to Scheduled Tribes boys aged 7-14 years. Similarly, it is not clear why a substantial proportion of Scheduled Tribes boys are not in school in district Datia as compared to girls. It appears that there are district specific factors that influence schooling of boys and girls differently. An understanding of these factors is important in introducing remedial measures in planning for universal schooling of children aged 7-14 years.

School Enrolment

According to the 2001 population census, about 9.45 million children of 7-14 years of age in the state were in school in the year 2001. This gives a school participation rate of around 76 per cent. The school participation rate was substantially lower in rural (72 per cent) than in urban areas (86 per cent), although participation was not universal in either rural or urban areas of the state. Similarly, the school participation rate was higher in male (81 per cent) as compared to female children (70 per cent). Among different social classes, school participation rate has been estimated to be the lowest among Scheduled Tribes children (55 per cent) and the highest in the non Scheduled Castes/Tribes children (83 per cent). Schooling appears to be exceptionally poor in female Scheduled Tribes children in the rural areas of the state as less than 47 per cent of female Scheduled Tribes children of 7-14 years of age in the rural areas were found to be in

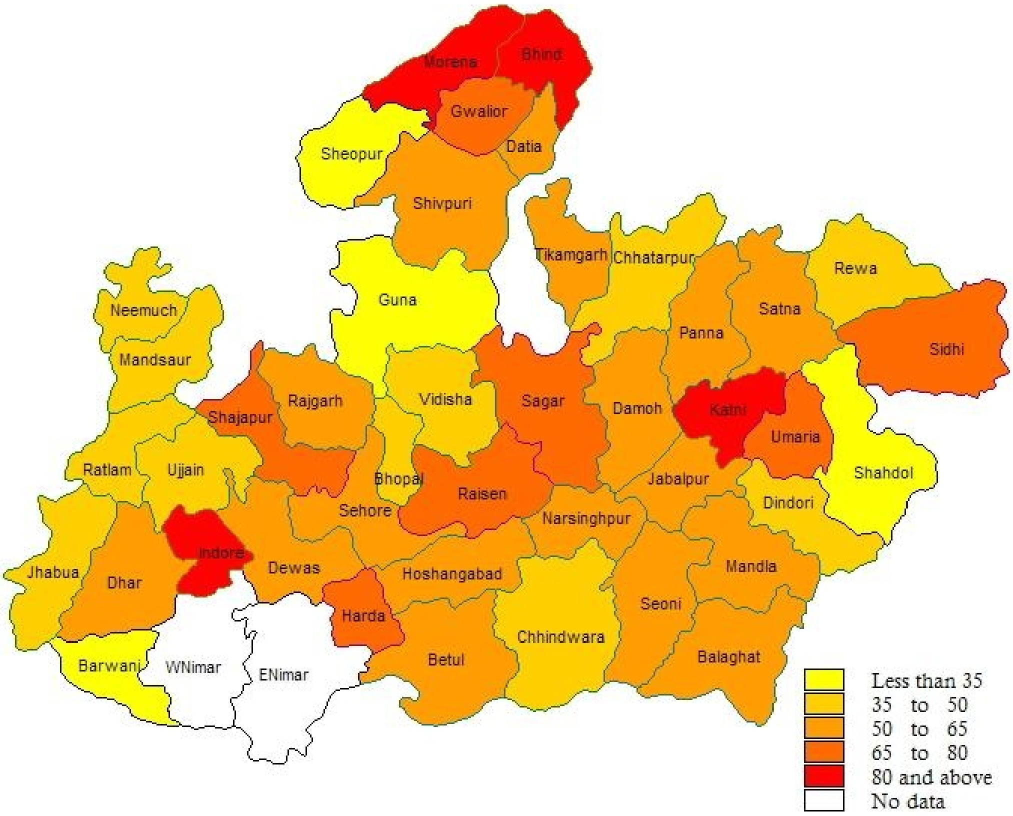
Figure 7.7
Inter-district variations in primary education gross enrolment ratio, 2006-07



school at the 2001 population census. This is in quite contrast to a participation rate of more than 89 per cent in male non Scheduled Castes/Tribes children in the urban areas. Although, the information available from the 2001 population census is outdated to some extent, yet it is clear from table 2 that social class disparities in schooling of children in the state are very wide and appear to have persisted over time. Reduction and ultimate elimination of these disparities is necessary to achieve universal the goal of schooling in Madhya Pradesh.

On the other hand, gross enrolment in schools was reported to be more than 15.18 million in the year 2006-07 (NUEPA, 2008). Gross enrolment up to the primary level was around 11.27 million while the upper primary enrolment was around 3.91 million (Table 7.3). Enrolment of girls accounted for almost 48 per cent of the total gross enrolment in the elementary education - about 49 per cent in primary and 45 per cent in upper primary education. The enrolment sex ratio was more than 95 female children for every 100 male children up to grade three, after which it decreases rather rapidly with the increase in the education grade. The school enrolment sex ratio has also been found to be higher in the primary level (95 female children for every 100 male

Figure 7.8
Inter-district variations in upper-primary education net enrolment ratio, 2006-07



children) as compared to the upper primary level (82 female children for every 100 male children). The decrease in school enrolment sex ratio suggests that the drop out from the school is not only high in girls as compared to boys. However, it also increases at a faster rate in girls than in boys.

It is possible to estimate the gross enrolment ratio in different grades of primary and elementary education on the basis of the projected population of the state by age. The National Commission on Population has projected the population of the country and its constituent states for the period 2001-2026 on the basis of the population enumerated at the 2001 population census (Government of India, 2007). According to these projections, the number of children aged 7-14 years in Madhya Pradesh were approximately 12.5 million in the year 2006 - 7.85 million in the age group 7-11 years and 4.64 million in the age group 12-14 years. On the basis of this projected population, the primary education gross enrolment ratio in the state has been estimated to be 143.6 per cent while the upper primary education gross enrolment ratio has been estimated to be

84.2 per cent around the year 2006. Among different grades, the gross enrolment ratio for Grade I has been estimated to be the highest (164 per cent) but decreases in subsequent grades. In grade VII, the enrolment ratio has been estimated to be less than 80 per cent. In all grades of the primary education, the gross enrolment ratio has been estimated to be more than 100 per cent but less than 100 per cent in all grades of upper primary education. The wide gap in enrolment ratios at the primary level as compared to the gross enrolment ratio at the upper primary level suggests that there is a very high level of drop out between primary and upper primary level of education.

The gross enrolment ratio is defined as the ratio of total enrolment in primary (upper primary) education to the primary (upper primary)school age population and is affected by under-age and over-age enrolment. It is generally found to be more than 100. A gross enrolment ratio higher than 100 implies that there is either over-aged enrolment or substantial repetition. If the number of repeaters are excluded, then the primary education gross enrolment ratio reduces to about 123 per cent. This shows that there is very substantial over-aged enrolment in primary education in the state.

Inter-district Variations in School Enrolment

Estimates of gross enrolment ratio at primary and upper primary levels for the districts of the state are available through DISE. In all but two districts, the primary gross enrolment ratio has been estimated to be more than 100 per cent in the year 2006-07 with district Jhabua topping the list with a primary education gross enrolment ratio of more than 172 per cent. The two district where the primary education gross enrolment ratio has been estimated to be less than 100 per cent are Bhopal and Shahdol. On the other hand, the upper primary gross enrolment ratio has been estimated to be less than 100 in all but 7 districts of the state. It appears that the information available through the DISE presents a distorted picture of participation of children either in primary or in upper primary education. In any case, estimates of primary gross enrolment ratio in the state and in its constituent districts suggest that one of the challenge in the universalisation of primary education in the state is to reduce over-aged enrolment and grade repetition in the primary education. It is also clear that reduction in over-aged enrolment and grade repetition in primary education will also contribute to improvement in the upper primary gross enrolment ratio.

Compared to the gross enrolment ratio, the net enrolment ratio, defined as the proportion of the population of the official age of a given grade who are enrolled in that grade, provides a more realistic picture of participation of children in school education. Ideally, the net enrolment ratio should be 100 per cent. The net enrolment ratio can never be more than 100 per cent. A low net enrolment ratio signals inadequacies in participation of children in school education.

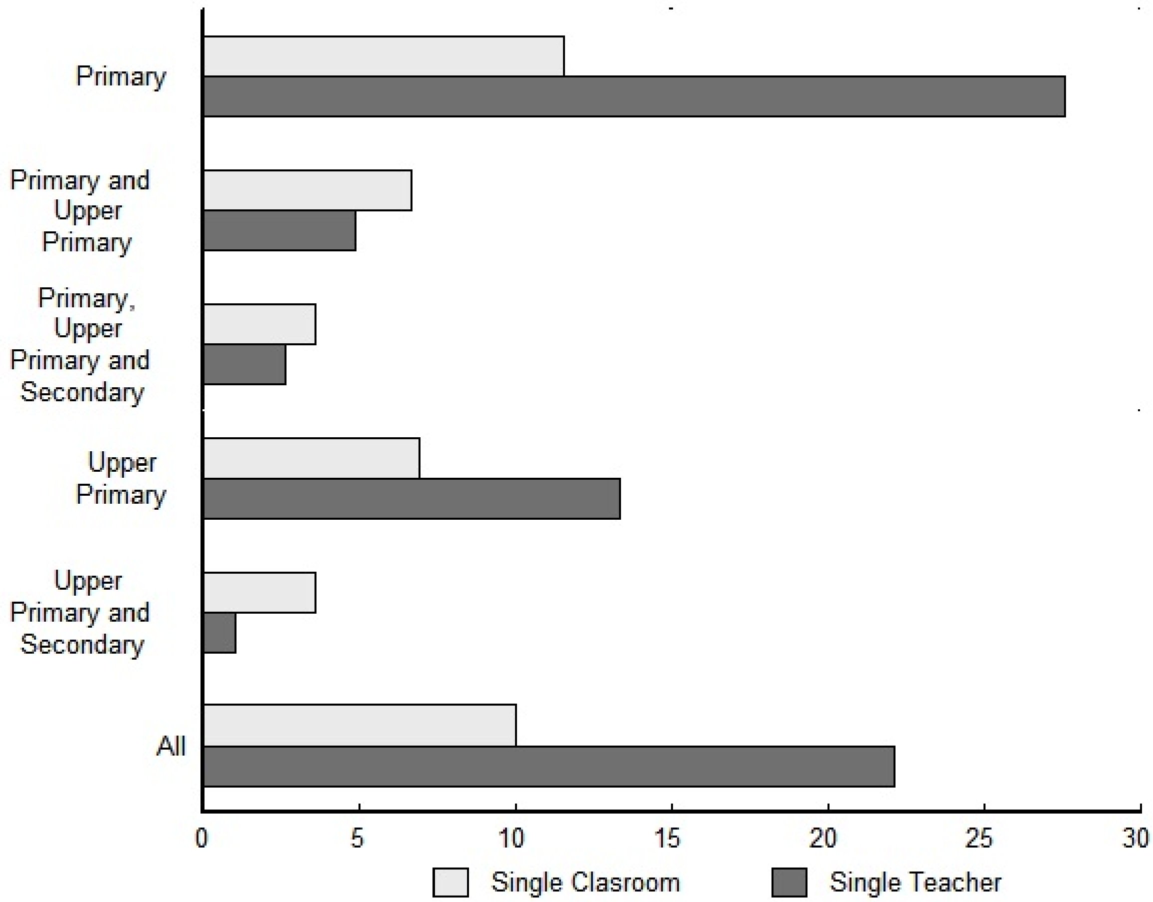
Information available through DISE suggests that in 28 of the 45 districts of the state, the net enrolment ratio is estimated to be 100 per cent whereas in Bhopal and Shahdol districts, it has been estimated to be less than 70 per cent in the year 2006-07. By contrast, the net enrolment ratio in upper primary education has been estimated to be very low. For the state as a whole, it has been estimated to be only about 60 per cent indicating gross deficiencies in the school education system in the state. For the upper primary education, the net enrolment ratio varies from just around 32 per cent in district Shahdol to more than 80 per cent in Bhind, Morena, Indore and Katni districts. Net enrolment ratio in upper primary education has also been estimated to be very high in Gwalior and Umaria districts whereas, in 15 districts of the state, the upper primary education net enrolment ratio has been found to be less than 50 per cent. This suggests that more than half of the children aged 12-14 years in these districts are out of upper primary education. They are either in the primary education or they are not in any school. Clearly, there are serious inadequacies in the school education system, especially, in these 15 districts.

The Learning Environment

Prevailing levels of literacy and schooling in children aged 7-14 years are primarily influenced by the learning environment. One of the key determinants of this environment is the access to schools, although schooling is not necessary for learning and education. Access to school includes both availability of the school and the distance at which the school is available. The Madhya Pradesh Jan Shiksha Adhiniyam that aims at universalising primary education, stipulates that there should be a primary education facility within a radius of 1 km and an upper primary education facilities within a radius of 3 kms of every habitation to ensure universal access to primary education (Government of Madhya Pradesh, 2002).

There are two dimensions that affect the learning environment in the school-based education system. The first is the quantitative dimension while the other one is the qualitative dimension. The quantitative dimension is related to the number of schools and the distance at which schools are available as well as physical infrastructure and facilities available at the school. The most commonly used measure of this dimension is the number of schools per 1000 children 7-14 years of age or number of schools per 1000 population which is also termed as the school density. On the other hand the qualitative dimension of the learning environment is related to the quality of education and the most sensitive indicator of this dimension is the availability of teachers in the

Figure 7.9
Proportion (Per cent) of single classroom and single teacher schools in Madhya Pradesh, 2006-07



school. Besides this, there are other indicators also that influence the learning environment in the school.

The learning environment for children in Madhya Pradesh consisted of approximately 1.26 million schools in both public and private sector and providing education from primary level up to the twelfth grade in both rural and urban areas during the year 2006-07(NUEPA, 2008). The learning environment in the state is dominated by the public sector as almost 84 per cent or about 1.06 million schools in the state are public sector schools. In the rural areas of the state, the number of schools in the public sector is more than 90 per cent but, in the urban areas, private sector schools out number public sector schools. The very fact that the availability of schools in the state, especially in the rural areas, is largely dependent upon the initiatives and investments of the government suggests that public sector efforts and investments in schooling for children are critical to expanding the school network in the state and building the learning environment necessary for achieving the goal of universalisation of schooling among children. Another dimension of the learning environment is the quality of education in schools. Quality of education is determined by a minimum acceptable level of teachers, school infrastructure and facilities within the school, etc. If this minimum acceptable level is lacking in schools then it is difficult to ensure education of an acceptable quality. The quality of education is relevant from the perspective of both universal enrolment and retention of children in schools.

Information about the availability of infrastructure and facilities in schools of the state is available through DISE. This information presents a relatively poor scenario of infrastructure and facilities available in the schools in the state. The very fact that the quality of learning environment in the state is not up to the mark may be judged from the observation that more than 22 per cent of the schools in the state were found to be single teacher schools while about 10 per cent were single class room schools. What is even more intriguing and astonishing is the observation that there were even single classroom schools and single teacher schools in the state which were providing education up to the higher secondary level (Figure 9). Similarly, the observation that in more than one fourth of the primary schools in the state, there is only one teacher also raises some serious concerns about the quality of learning and education environment that prevails in primary and upper primary schools in the state.

Information related to certain basic infrastructure and facilities in the schools of the state, as available through DISE is presented in the figure 7.9 which clearly shows that substantial investment in the school environment is necessary to ensure education and learning of an acceptable quality.

Education Development Index

A comprehensive assessment of the schooling environment in the state can be made on the basis of the education development index developed by the National University of Educational Planning and Administration as part of the DISE. The education development index is based on a set of 23 indicators grouped into four dimensions of the school environment - access to school, infrastructure and facilities in schools, availability of teachers and school outcomes (Box 7.1). Details regarding the construction of the index are given elsewhere (NUEPA, 2009). The index has been calculated separately for primary and upper primary education. Separate indexes have also been calculated for the four components of the education development index but not separately for primary and upper primary education.

Box 7.1
Indicators used in constructing Education Development Index

Access
1. Percentage of Habitations not Served (corrected with reference to new schools (Government) opened since 2002-03)
2. Availability of Schools per 1000 Child Population
3. Ratio of Primary to Upper Primary Schools/Sections (only at Upper Primary stage)

Infrastructure
4. Average Student-Classroom Ratio
5. Schools with Student Classroom Ratio >60
6. School with Drinking Water facility
7. School with Common Toilet
8. Schools with Girl's Toilet

Teachers
9. Percentage of Female Teachers
10. Pupil-Teacher Ratio
11. School with Pupil-Teacher Ratio >60
12. Single-Teacher Schools (in schools with more than 15 students)
13. Percentage of Schools with 3 teachers
14. Teachers without Professional Qualification

Outcomes
15. Gross Enrolment Ratio - Overall
16. Participation of Scheduled Castes Children: Percentage SC Population (2001 Census) - Percentage SC Enrolment
17. Participation of Scheduled Tribes Children: Percentage ST Population (2001 Census) - Percentage ST Enrolment
18. Gender Parity Index in Enrolment
19. Repetition Rate
20. Drop-out Rate*
21. Ratio of Exit Class over Class I Enrolment (only at Primary stage)
22. Percentage of Passed Children to Total Enrolment
23. Percentage of Appeared Children passing with 60 per cent and more marks

Table 7.5 presents estimates of educational development index for the state along with the indexes for the four components of the index. The table also gives the rank of Madhya Pradesh vis-a-vis other states and Union Territories of the country on the basis of the education development index and indexes related to its four components. The pathetic state of school education in Madhya Pradesh is very much evident from the table. The education development index for elementary education in the state is estimated to be 0.590 in the year 2006-07 and the state is ranked 26 among the 35 states and Union Territories of the country. In case of primary education, the index is estimated to be 0.572 and 0.607 in case of upper primary education. In both the cases, the state ranks 26 amongst the 35 states and Union Territories of the country. Among the four components of the education development index, Madhya Pradesh fairs relatively better in case of access index and infrastructure index. However, in case of teacher index and outcome index, the state fairs badly with respect to other states and Union Territories of the country. The outcome index in case of upper primary education is estimated to be the lowest in the country. On the other hand, in case of primary education, the situation of the state vis-a-vis other states and Union Territories of the country is marginally better but not acceptable. It appears that Madhya Pradesh has performed relatively better in terms of access and infrastructure as compared to the qualitative aspects schooling. In order to achieve the cherished goal of universal education for all children, it is imperative that quality of schooling environment in the state is improved substantially. The very fact that the outcome index in both primary education and upper primary education in the state is amongst the lowest in the country indicates that improvements in access and infrastructure in schools has contributed little to improving the quality of education and hence outcome of the elementary education. This is an area which require serious introspection in the context of universal education for all.

The foregoing discussions clearly indicate that Madhya Pradesh has still to go a long way to ensure education for all as stipulated in the National Education Policy. It is obvious that substantive additional investments are required to improve infrastructure and facilities in schools. It is also clear that the state cannot absolve itself from the responsibility of providing basic education to all children of the state as education has now been enshrined as the fundamental right in the Constitution of India.

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Table 7.1

Proportion (per cent) of children 7-14 years of age not in schools in Madhya Pradesh, 2001.

Population	Person	Male	Female	F-M
		Total Population		
Combined	24.24	19.20	29.81	10.61
Rural	27.59	21.31	34.53	13.22
Urban	14.13	12.85	15.54	2.69
		Scheduled Castes		
Combined	23.18	17.90	29.21	11.31
Rural	24.42	18.19	31.64	13.45
Urban	19.31	16.96	21.89	4.93
		Scheduled Tribes		
Combined	44.79	37.83	52.25	14.42
Rural	45.69	38.48	53.41	14.93
Urban	31.41	28.18	34.91	6.73
		Non Scheduled Castes/Tribes		
Combined	17.44	13.21	22.11	8.90
Rural	19.97	14.23	26.30	12.07
Urban	11.91	10.99	12.94	1.95

Source: Census 2001

Table 7.2

School enrolment (7-14 years) in Madhya Pradesh, 2001

Population	Combined			Rural			Urban		
	Person	Male	Female	Person	Male	Female	Person	Male	Female
				Total enrolment					
Total	9447230	5287739	4159491	6781997	3865536	2916461	2665233	1422203	1243030
SC	1519031	866287	652744	1129598	656164	473434	389433	210123	179310
ST	1483192	864293	618899	1367205	801076	566130	115987	63217	52769
Non SC/ST	6445007	3557159	2887848	4285193	2408296	1876897	2159814	1148863	1010951
				Enrolment Ratio (per cent)					
Total	75.76	80.8	70.19	72.41	78.69	65.47	85.87	87.15	84.46
SC	76.82	82.1	70.79	75.58	81.81	68.36	80.69	83.02	78.11
ST	55.21	62.17	47.75	54.31	61.52	46.59	68.59	71.82	65.09
Non SC/ST	82.56	86.79	77.89	80.03	85.77	73.7	88.09	89.01	87.06

Source: Census (2001)

Table 7.3

Educational institutions and enrolment in educational Institutions in Madhya Pradesh, 2006-07

School category	Combined			Rural			Urban		
	Total	Public	Private	Total	Public	Private	Total	Public	Private
				Number of schools					
Primary only	87728	80498	7230	81034	76086	4948	6694	4412	2282
Primary and Upper Primary	12262	2812	9450	7002	2597	4405	5260	215	5045
Primary, Upper Primary and Secondary/Higher Secondary	2327	360	1967	911	295	616	1416	65	1351
Upper Primary only	22525	21435	1090	19945	19367	578	2580	2068	512
Upper Primary and Secondary/Higher Secondary	1009	508	501	515	355	160	494	153	341
All	125851	105613	20238	109407	98700	10707	16444	6913	9531
				Structure of educational institutions					
Primary only	69.71	76.22	35.72	74.07	77.09	46.21	40.71	63.82	24.56
Primary and Upper Primary	9.74	2.66	46.69	6.40	2.63	41.14	31.99	3.11	52.93
Primary, Upper Primary and Secondary/Higher Secondary	1.85	0.34	9.72	0.83	0.30	5.75	8.61	0.94	14.17
Upper Primary only	17.90	20.30	5.39	18.23	19.62	5.40	15.69	29.91	5.37
Upper Primary and Secondary/Higher Secondary	0.80	0.48	2.48	0.47	0.36	1.49	3.00	2.21	3.58
All	100.00	83.92	16.08	100.00	90.21	9.79	100.00	42.04	57.96

School category	Combined			Rural			Urban		
	Total	Public	Private	Total	Public	Private	Total	Public	Private
				Enrolment					
Primary only	9117891	8147644	970247	8030737	7418847	611890	1087154	728797	358357
Primary and Upper Primary	2604782	479031	2125751	1359147	431980	927167	1245635	47051	1198584
Primary, Upper Primary and Secondary/Higher Secondary	737816	69620	668196	209695	46574	163121	528121	23046	505075
Upper Primary only	2492207	2273467	218740	2073854	1992624	81230	418353	280843	137510
Upper Primary and Secondary/Higher Secondary	229613	95242	134371	96021	56505	39516	133592	38737	94855
All	15182309	11065004	4117305	11769454	9946530	1822924	3412855	1118474	2294381
				Enrolment per school					
Primary only	104	101	134	99	98	124	162	165	265
Primary and Upper Primary	212	170	225	194	166	210	237	219	238
Primary, Upper Primary and Secondary/Higher Secondary	317	193	340	230	158	265	373	355	374
Upper Primary only	111	106	201	104	103	141	162	136	269
Upper Primary and Secondary/Higher Secondary	228	187	268	186	159	247	270	253	278
All	121	105	203	108	101	170	208	162	241

Source: Government of India

Table 7.4

School enrolment in Madhya Pradesh, 2006-07 based on the District Information System for Education

Grade	Estimated population 2006 (000)	Gross enrolment			Enrolment sex ratio (F/100M)	Gross enrolment ratio (per cent)
		Total	Boys	Girls		
I	1571	2579593	1318046	1261547	96	164.20
II	1567	2384735	1205162	1179573	98	152.18
III	1566	2272961	1159772	1113189	96	145.14
IV	1571	2021964	1045021	976943	93	128.71
V	1574	2012048	1048734	963314	92	127.83
VI	1568	1396016	753787	642229	85	89.03
VII	1551	1240124	681238	558886	82	79.96
VIII	1524	1272846	712652	560194	79	83.52
Primary	7849	11271301	5776735	5494566	95	143.6
Upper Primary	4643	3908986	2147677	1761309	82	84.19
Primary+Upper Primary	12492	15180287	7924412	7255875	92	121.52

Source: NUEPA (2008)

Table 7.5

Education Development Index in Madhya Pradesh, 2007-08

Index	Primary		Upper primary	
	Level	Rank	Level	Rank
Education development index	0.572	26	0.607	26
Access index	0.554	13	0.694	19
Infrastructure index	0.721	15	0.764	20
Teacher index	0.446	30	0.501	32
Outcome index	0.546	29	0.451	35

Source: NUEPA (2009)

AGE AND SEX STRUCTURE OF THE POPULATION

Introduction

The synergies between demographic growth, age distribution and population momentum, on the one hand, and economic growth and human development on the other, have long been debated amongst policy makers and the research community. The focus of this debate has been on how does high fertility affect poverty and how does poverty affect high fertility, what policies should be in place to promote development, especially, human development and ease population growth and what is the impact of population stability on economic growth and human development. In 1986, a comprehensive review by the United States National Academy of Science concluded that "slower population growth is beneficial to economic development for most developing countries" (National Research Council, 1986). Current research identifies new evidence that results in a debate between three alternative positions: does population growth restrict, promote, or is independent of economic growth (Bloom, Canning and Sevilla, 2001). Each position has the evidence to support its case. However, each of these explanations focus only on population size and growth and under-emphasize perhaps the most critical aspect of the population in the context of human development: the age structure of the population. The age structure of the population (the way in which the population is distributed across different age groups) can dramatically change as the population grows or shrinks. Notwithstanding these controversies, a significant consensus has now emerged around the idea that rapid population growth and associated young age structure exerts severe constraints on human development processes in countries and regions where the level of socioeconomic development remains low (May, *forthcoming*; Birdsall and Sinding, 2001).

People's economic behaviour changes at different stages of life. Therefore, changes in a country's age structure can have significant effects on its economic performance (Bloom, Canning and Sevilla, 2001). In the developing countries that have not yet gone through a demographic transition, high fertility and mortality indicates high child-dependency ratios and low old-age dependency ratios As the demographic transition begins to take place, mortality begins to decline causing an increase in the proportion of children in the population, which increases the dependency ratio. Fertility then begins to decline, which initiates a period of declining child-dependency ratios and declining total dependency ratios. Finally, the elderly population begins to increase and old-age dependency ratios and hence total dependency rises. At the end of the demographic transition, often the dependency ratio equals to what it was prior to the transition. However, the age composition of the population at the end of the demographic transition is enormously different than the age composition of the population at the beginning of the transition (Chu and Lee, 2000). In the middle of the demographic transition, a high proportion of a country's population falls in the working age group resulting in a low dependency ratio. In this demographic situation, the added productivity of the working group can produce a window of economic opportunity. This may also lead to higher savings rate which could contribute to economic growth and increasing life expectancy can add to this effect (Chu and Lee, 2000). The size of this window, or demographic bonus or dividend as it has become characterised, depends on the duration and pace of fertility decline and, to a lesser extent, the way in which mortality decline affects infants and children (Merrick, 2004). The recent analysis of economic change in East Asian countries has shed light on the impact of sharp fertility declines on economic performance (May, *forthcoming)*. The experience of the East Asian countries suggest that countries or populations undergoing their demographic transition have an opportunity to capitalize on the demographic bonus. However, changes in the age structure can only be exploited when they are accompanied by adequate investments and sound public policies. Further, the demographic bonus is not a permanent state, but rather an opportunity that must be seized over a relatively short period of time before population aging sets in (Bloom, Canning and Sevilla, 2001). This phenomena has shown, for the first time, that demographic conditions could also be favourable to economic growth in the developing societies (Bloom and Williamson, 1998; Cutler et al. 1990; Kelley and Schmidt, 1995, 2001; Mason and Lee, 2004).

The process of demographic transition in Madhya Pradesh appears to have started only recently. The average annual population growth rate in the state still continues to be more than 2 per cent per year. Although, Madhya Pradesh is a poor state in terms of both demography and development, yet there has been little systematic investigation of the age distribution of the population in terms of the implications of the age structure on the demographic transition as well as in terms of social and economic development. In the context of possible demographic dividend, it is important that the key features of the age structure of the population are analysed and taken into consideration during the social and economic development planning process.

Age distribution of the population has important implications to both demographic transition and social and economic development. Age distribution of the population is vitally important to understanding the fertility, mortality and migration processes. At the same time, the age and sex distribution and changes in this distribution over time have important implications for marriage patterns, labour force participation and gender relations (South and Trent, 1988; Poston et al. 1997; Hobbs 2003). As a basic demographic variable, age structure of the population is intertwined with all other demographic variables. It affects and is affected by the levels and trends in fertility, mortality and patterns of migration. Births, deaths and migration are not age independent. The risk of death varies sharply with age. Similarly, migration is highly age and sex selective and births are concentrated to women of child bearing ages only. Consequently, the number of births and deaths in any population and the level of in- and out-migration are determined not just by the size of the population and levels of fertility, mortality and migration but also by its age and sex composition.

Given the linkages between the age and sex distribution of the population and economic growth, the age and sex structure of the population enters into the decision-making process at each stage of the development planning (Mukherjee, 1976). Development planning is a step-by-step process. It first involves statement of goals and objectives to be achieved. The next step is the formulation of a strategy to achieve the stated goals and objectives. Finally, the last step is the preparation of the plan for the implementation of programmes, projects and activities to achieve the development goals and objectives in the light of the strategy formulated. In a country like India, one of the cherished goals of developing planning is the elimination of the abject poverty. One of the elements of the poverty eradication strategy is the expansion of employment opportunities. The expansion of the employment opportunities is also necessary for both wiping off the unemployment backlog and to provide employment to new entrants into the labour force. Obviously, the knowledge of the age and sex composition of the population is essential for making estimates of existing unemployment level and the present and future size of the labour force for which employment generation opportunities need to be created. Maximization of the productivity and maximization of the employment per unit of capital are often incompatible and are conflicting goals. The size of the labour force, which depends upon the age and sex composition of the population, is one of the criteria which can help in judging the relative merits of the two goals.

Data and Methodology

The analysis presented here is based on the age and sex data available through the decennial population census in India. India has the distinction of having unbroken series of decennial population census beginning 1881. The unbroken series of population census in India provides an extraordinary valuable storehouse of information for demographic analyses and demographic impact of social and economic development processes. A very useful information available from different population census is the information related to the age and sex composition of the population. The present analysis uses the age and sex data available from population census 1961 through 2001 and focusses on the changes that have taken place in this composition during the 40 years under reference.

The analysis presented here concentrates on three aspects of the age and sex composition of the population: understanding the age and sex composition; analysing changes in the age and sex composition that have taken place in the state in the forty years between 1961 and 2001; and projecting the changes in the age distribution for the first 50 years of the present century. To understand the age and sex composition of the population, the analysis employs indexes and methods described by Spiegelman (1969), Shryock and Siegel (1976) and Arriaga (1994). These indexes have also been used to project changes in the age and sex distribution of the population in the next fifty years. On the other hand, the Lorenz curve (Hainsworth, 1964) and associated indexes of dissimilarity have been used for analysing changes in the age and sex composition of the population that have taken place during the forty years between 1961 and 2001.

The Population Pyramid

The age and sex composition of the population may be analysed in a number of ways. One way is to analyse the age and sex data separately. The other way is to cross-tabulate the age data by sex. Population pyramid is the most popular method for the analysis of the age data cross tabulated by sex.

The population pyramid for Madhya Pradesh generated are depicted in figure 8.1. In 1961, the population of the state was very young as more than 41 per cent of the population was below 15 years of age. In 1971, state population turned even younger with more than 44 per cent of the population was below 15 years of age probably because of the increase in fertility between 1961 and 1971. However, after 1971, the state population turned older albeit very slowly. In between 1971 and 2001, the proportion of population below 15 years of age decreased by about 5 percentage points but in reference to 1961, this decrease was just about 2.5 percentage points -

from 41.26 per cent in 1961 to 38.69 per cent in 2001. The observed decrease in the proportion of population below 15 years of age after 1971 is a reflection of the decrease in fertility, although the rate of decrease appears to be very slow.

The decrease in the proportion of population below 15 years of age has resulted in an increase in the proportion of population of other age groups. The population aged 60 years and above increased from around 5 per cent in 1961 to more than 7 per cent in 2001 whereas the proportion of population in the age group 15-59 years increased by more than 4 percentage points between 1971 and 2001 but by less than 0.5 percentage points between 1961 and 2001. Among the working age population, the increase in the proportion was more rapid in the young working ages - 15-29 years - than the old working ages - 30-59 years.

In terms of absolute numbers, the population below 15 years of age in the state increased by more than 13.66 million or by 2.4 times from 9.59 million in 1961 to 23.25 million in 2001. Similarly, population in the age group 15-29 years increased by about 9.60 million or by 2.62 times from 5.92 million in 1961 to 15.52 million in 2001. A similar situation prevailed in the age group 30-59 years in which the population increased by more than 10 million from 6.57 million in 1961 to 17.13 million in 2001. The most rapid increase has however been recorded in the population aged 60 years and above from just about 1 million in 1961 to more than 4 million in the year 2001. In other words, between 1961 and 2001, the population of the state increased by around 37 million. Nearly 37 per cent of this increase was accounted by the increase in the population aged 0-14 years whereas population aged 15-59 years accounted for almost 55 per cent of this increase. By contrast, the increase in the population aged 60 years and above age accounted for only about 8 per cent of the total increase in the population.

Changes in the age composition of the population is well reflected in changes in the dependency ratio which is the ratio of the population measured in consuming units to the population measured in producing units (Meade, 1979). Here the population measured in consuming units is the sum of the population in different age and sex groups, each weighed by its specific needs rate. Similarly, the population measured in the producing units is the sum of the population in different age and sex groups, each weighed by its relevant specific work rate. If it is assumed that the specific needs rate and specific work rate for population of different age and sex are fixed, regardless the level of standard of living, then the dependency ratio depends solely upon the age and sex composition of the population. In this limited definition of dependency ratio, population below 15 years of age and population 60 years and above are regarded as dependents and the population aged 15-59 years, is regarded as potential supporters to the dependent population.

The dependency ratio in Madhya Pradesh increased from 861 dependents (young and old) per 1000 working age population in 1961 to 993 in 1971, primarily because of a very rapid increase in the young dependency ratio from 768 in 1961 to 878 in 1971 as a result of high fertility during this period in the state. The increase in the young dependency ratio between 1961 and 1971 again suggests a substantial increase in fertility. Since 1971, however, the young dependency ratio has shown a declining trend, decreasing to 712 in 2001 which is well below the level that prevailed in 1961.

In contrast to the young dependency ratio, the old dependency ratio has increased in the state throughout the period 1961 through 2001 which reflects improvements in mortality situation. The net increase in the old dependency ratio since 1971 has however been less than the net decrease in the young dependency ratio. As the result the combined (young and old) dependency ratio for the whole population has shown a decreasing trend since 1971 resulting in a concentration of population in working ages.

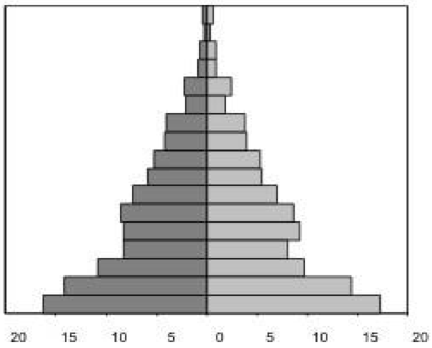
Figure 8.1 also reveals differences in the changes in the age composition of male and female population. In the population below 15 years of age, males out number females and the ratio of males to female population has increased over time. A similar situation prevails in the young working ages (15-29 years) also where the increase in the male female ratio has been quite rapid since 1961. By contrast, the ratio of males to females in the age group 30-59 years has decreased over time, although males continue to out number females. Finally, in the old population (60 years and above), the trend in the male female ratio has fluctuated over time; it has not been monotonous. This ratio increased between 1961 and 1971, remained stagnant between 1971 and 1981, increased sharply between 1981 and 1991 and decreased, again very sharply, between 1991 and 2001.

On the whole, the population pyramid of the state continues to be triangular in shape with a broad base and a thin top despite some important changes in the age and sex composition of the population during the 40 years under reference. The means that the population of the state continues to be predominantly very young. Such a population pyramid is conducive to rapid population growth despite decrease in fertility. The momentum generated as the result of the very young age structure of the population of the state has offset, to a significant extent the decrease in fertility as far as population growth is concerned. This means that despite reductions in fertility and mortality, the population of the state will continue to increase rapidly, at least, in the intermediate future primarily because of the momentum of growth generated by the very young age structure of the population.

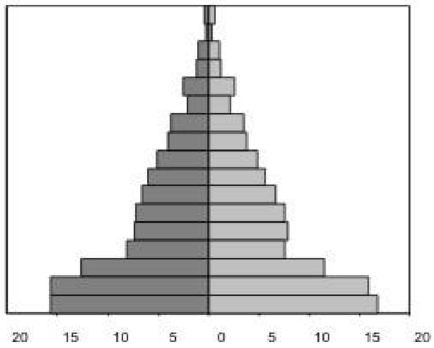
Figure 8.1

Population pyramid of Madhya Pradesh

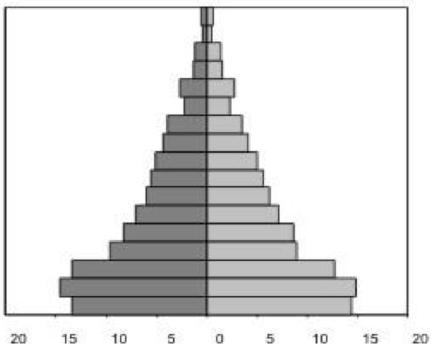
1961



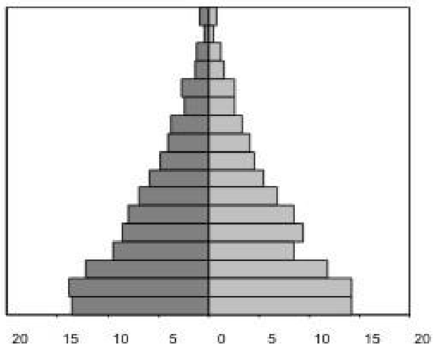
1971



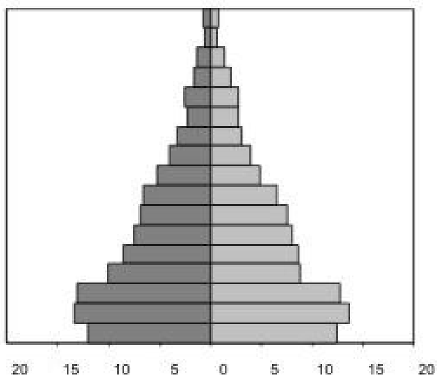
1981



1991



2001



The projection of the population of the state for the first half of the present century suggests that the shape of the population pyramid of the state will change from the triangular one characterised by a broad base and thin top, to a rectangular one in the next fifty years (Figure 8.2). This projection is based on the assumption that the state will be able to reach the replacement level fertility by the year 2021 and beyond the year 2021, the replacement level fertility will be maintained (Ranjan, 2004). Because of the decrease in fertility, the concentration of the population will shift from the younger population (population in the age group 0-14 years) to the working age population (population in the age group 15-59 years). The projection exercise suggests that proportion of the young population in the state will monotonically decrease from around 38 per cent in 2001 to just above 20 per cent by the year 2051 whereas the proportion of old population will monotonically increase from around 6 per cent to around 16 per cent. By contrast, the proportion of the working age population will first increase and then decrease. It is projected that the proportion of the working age population will increase from around 55 per cent to more than 65 per cent between 2001 and 2031. In the year 2031, two out of every three persons in the state are projected to be in the working age. Beyond the year 2031, the proportion of working age population is projected to decrease so that, by the year 2051, the proportion of the working age population will constitute around 63 per cent of the total population.

The demographic opportunity resulting out of the transition in the age structure of the population in the first half of the present century should now be clear. In the first thirty years of the present century - up to the year 2031 - the proportion of the working age population in the state is projected to increase by a massive 10 per cent. This means, that in the next 30 years, the prospective labour force in the state is projected to increase at a very rapid rate. This rapid increase in the working age population of the state provides a demographic opportunity in the sense that if the working age population is effectively utilised, the increase in the proportion of working age population shall accelerate the growth of the economy substantially. Since, economic growth is the engine of human development and poverty reduction efforts, this means that transition in the population age structure will provide a unique opportunity for an accelerated poverty reduction and rapid human development progress if appropriate policies related to the productive utilisation of the working age population are in place and a conducing working environment is created for the effective utilisation of the working age population. On the other hand, it is also clear that if this prospective labour force is not productively utilised, the changes in the age structure of the population in the years to come will result in a big demographic liability to poverty reduction efforts and human development activities in the state. It may also be stressed here that the transition in the age structure of the population is inevitable because fertility and mortality levels in the state are decreasing.

Figure 8.2

Projected population pyramid of Madhya Pradesh

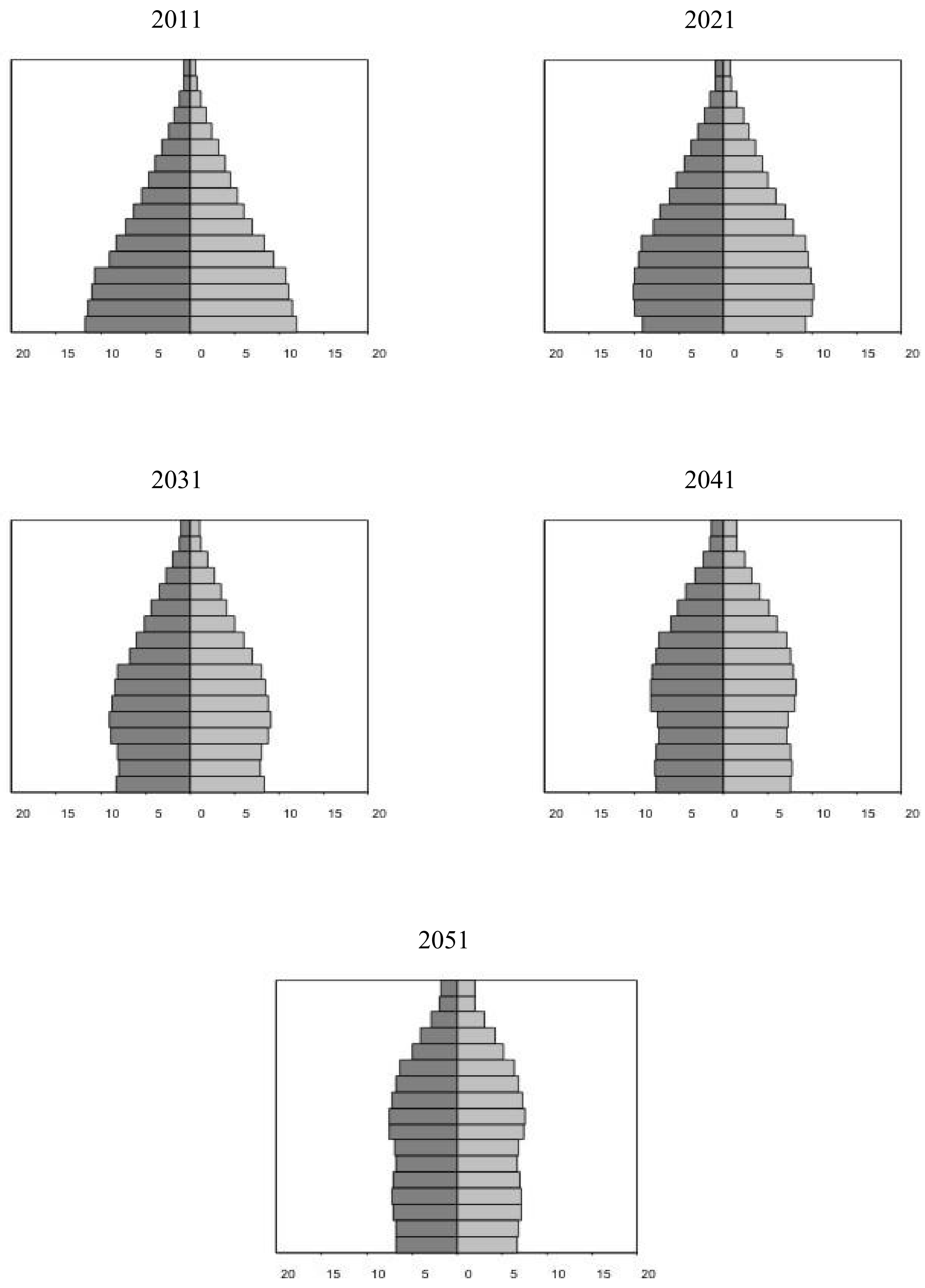
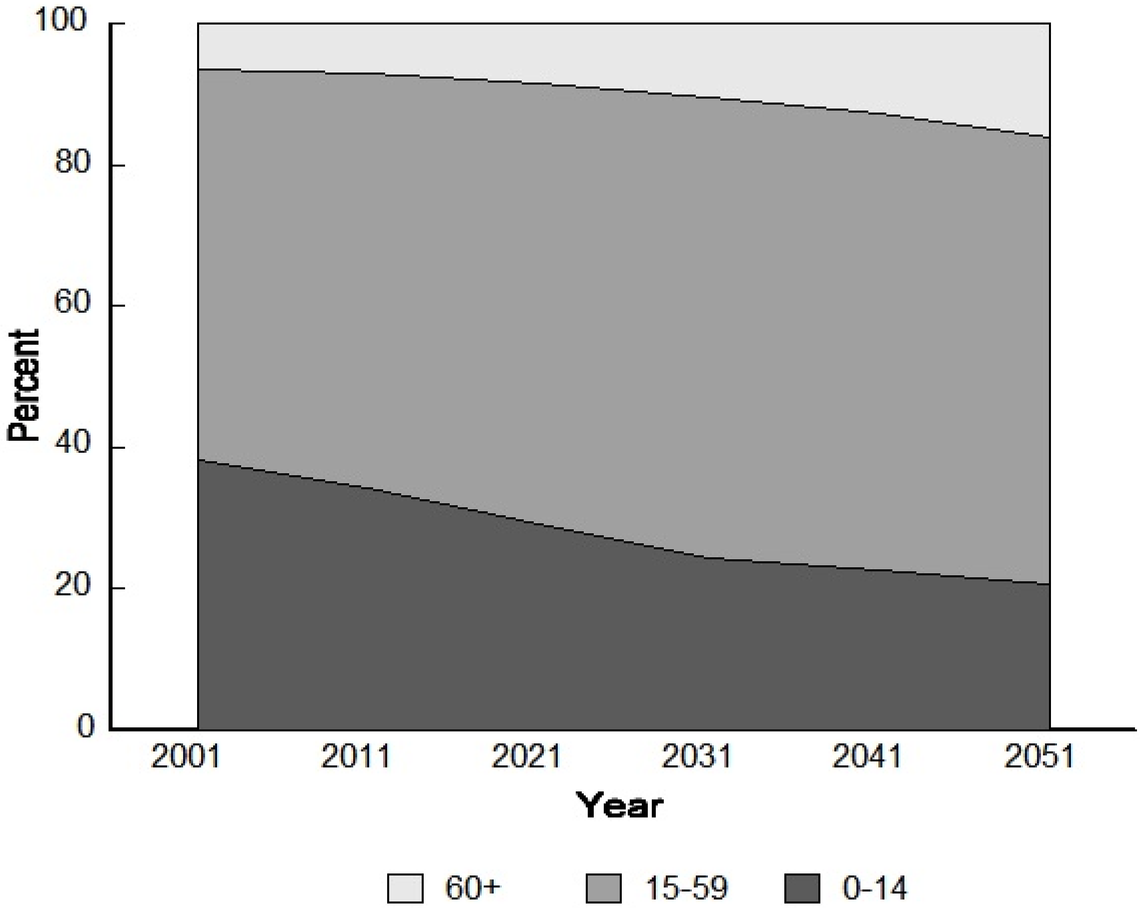


Figure 8.3
Age structure transition in Madhya Pradesh



The demographic dividend resulting out of the transition in the age structure of the population is very well reflected in terms of the projected trend in the dependency ratio. The dependency ratio in Madhya Pradesh was estimated to be about 800 dependents for every 1000 working age people in the year 2001. This ratio is projected to decrease rapidly up to the year 1931 to reach an all time low of just 529 dependents for every 1000 working age people. Beyond 1931, the dependency ratio is expected to increase again largely because of some very rapid increase in the old age population to reach 580 dependents for every 1000 working age people by the year 2051. This means, that the resources demand for supporting the dependent population will be at its minimum around the year 1931 so that resources available for productive utilisation will be at their maximum around this time. Obviously, if these resources are astutely utilised, significant acceleration in the growth of the economy of the state will be possible. It is also obvious that this demographic opportunity or dividend will start shrinking after 1931 because of the increase in the dependency ratio.

Madhya Pradesh, thus, has a unique opportunity in the next 15-25 years to cash on the demographic opportunity resulting out of age structure transition in accelerating economic growth. There is a need of evolving appropriate policies and programmes for economic and social development in the light of the projected transition in the age distribution of the population. The most critical issue in this direction is to chalk out strategies and programmes that can lead to the productive utilisation of the working age population that is expected to increase very rapidly in the coming years because of the reduction in fertility. It is also clear that if this rapidly increasing population is not productively utilised, the resultant situation may be catastrophic as the working age population is also the major consumer of the available resources. It is therefore important that development planning in general and economic development planning in particular takes into consideration the transition in the age distribution of the population of the state that is projected in the coming years. The real challenge is to build up the capacity of this growing population and to create opportunities for their productive utilisation. Any human development strategy or process must take into consideration the changes in the age structure of the population and effects of the changes in the structure of the population on the social and economic production system. It is obvious that the human development strategy or approach for a population which is young (characterised by a population pyramid triangular in shape) will be different from the human development strategy for a population with a population pyramid rectangular in shape (a relatively large proportion of population concentrated in the working ages). In fact, changes in the age structure of the population are themselves a result of the human development process.

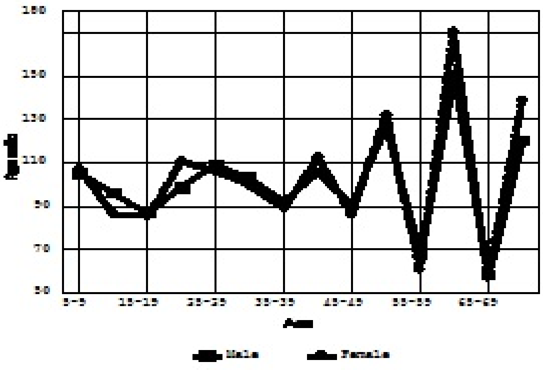
Age Ratios

The age composition of the population may also be examined in terms of age ratios (United Nations, 1955). An age ratio in any 5-year age interval is the ratio of the population in that age interval to the average population of adjacent (preceding and following) age intervals. In the absence of any major fluctuations in fertility and mortality and insignificant level of net migration, age ratios should be fairly similar across age categories (Arriaga, 1994). This means that if there are no violent fluctuations in fertility and mortality or big waves of migration (which is often age-selective), and if the number of persons in successive age-groups gradually deplete through mortality, the age ratio for any age group should be approximately 100. If there are fluctuations in fertility and mortality or if net migration is significant, age ratios may deviate significantly from 100. The age ratio may also deviate from the normative value of 100 if there is age misreporting or differential omission in the enumeration of persons belonging to a given age or both. It is well known that the age curve is not linear. Hence, even if the age data are completely accurate, the age ratios are bound to deviate from the normative value of 100.

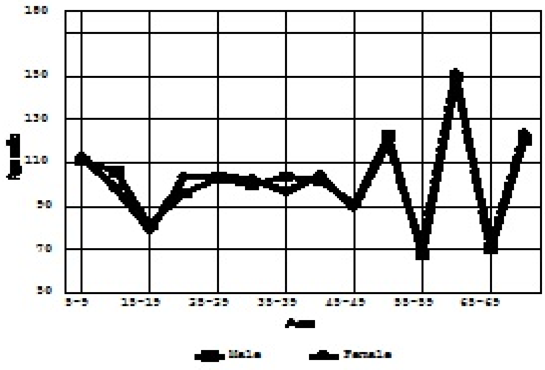
Figure 8.4

Age ratios in Madhya Pradesh

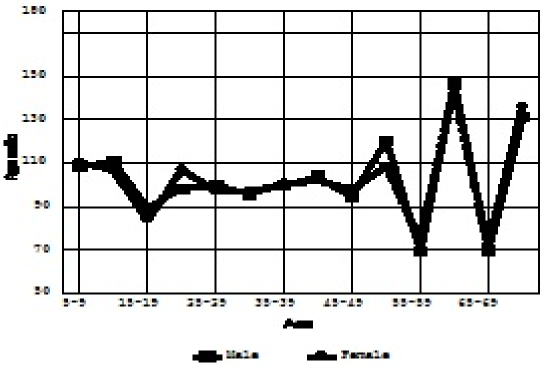
1961



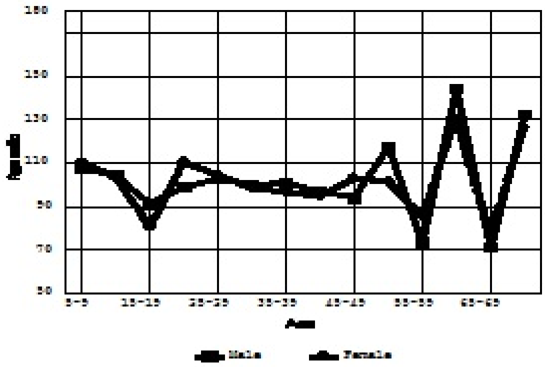
1971



1981



1991



2001

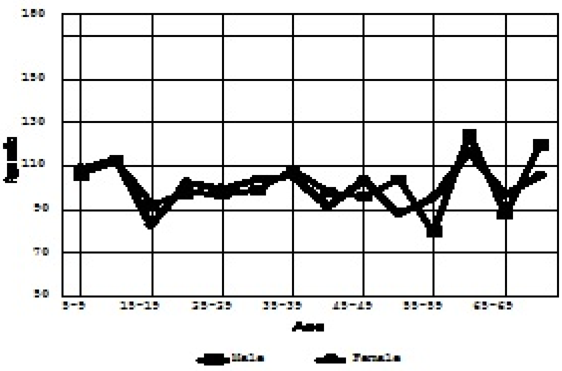


Figure 8.4 presents age ratios for males and females for each of the 5-year age groups from 5-9 years through 70-74 years for Madhya Pradesh as revealed through different population census. In general age ratios fluctuate within the narrow range of 90 to 110 for ages less than 50 years in all population census. However in ages 50 years and above, there are substantial fluctuations in the age ratios. In the year 2001, the highest age ratio was 124.8 for males and 116.2 for females in the age group 60-64 years. On the other hand, the lowest age ratio was 79.8 for males in the age group 55-59 years and 82.3 for females in the age group 15-19 years. An age ratio of 82.3 for females in the age group 15-19 years means that there are 17.7 per cent less females in the age group 15-19 years than the average number of females in the two adjacent age groups, i.e. age group 10-14 years and the age group 20-24 years. Similarly, an age ratio of 124.8 for males in the age group 60-64 years means that there are almost 25 per more males in the age group 60-64 years than the average number of males in the two adjacent age groups.

Changes in the Age Composition

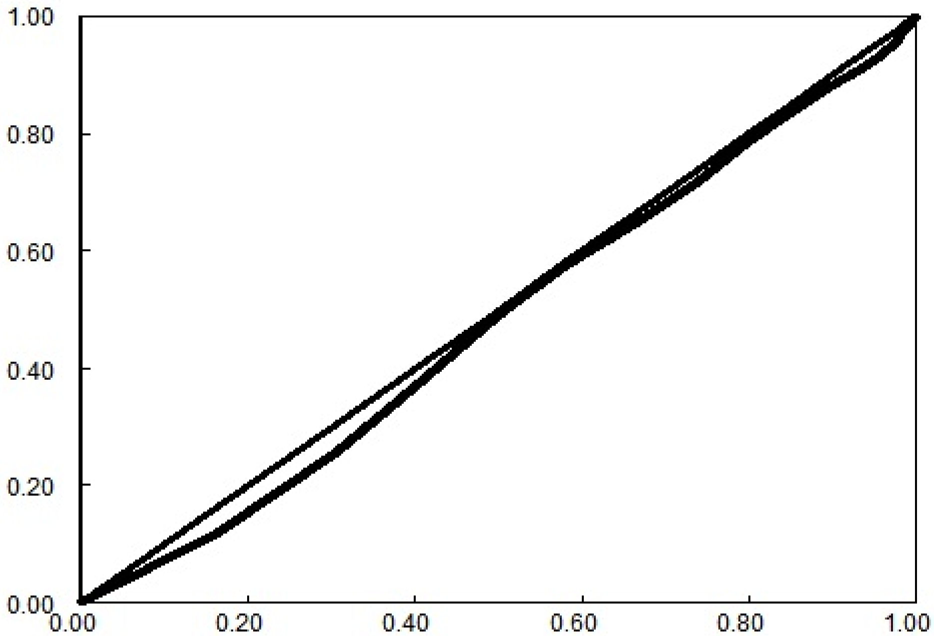
The essential similarity of the age composition of the Indian population over time in contrast to the age composition of West European and North American countries is well known (Mukherjee, 1976). The transition in the age composition of population of West European and North American countries is marked by a steep fall in the proportion of population in the younger ages, a remarkable increase in the old age population, and a slight increase in the proportion of working age population. This pattern of transition is attributed to the decline in fertility (United Nations, 1958). On the other hand, the near constancy of age distribution in India has been attributed to substantively unchanged fertility over a long period of time and a secular decline in mortality (Government of India, 1973; Lopez, 1961; Saxena, 1965; Visaria, 1961). In the above context, this section analyses the transition in the age composition of the population of Madhya Pradesh by comparing the age composition of the population in reference to the quasi stability which means a population with a history of constant fertility (both level and pattern) and constant mortality (both level and pattern) up to a certain time and thereafter a changing level of mortality, the pattern of mortality remaining restricted within a family of model life tables (Mukherjee, 1976).

Figure 8.5 presents the Lorenz curve of the age composition of the population of Madhya Pradesh for the years 1961 and 2001 for males and females respectively. This curve plots the cumulative proportions of one population against another over the same age groups arranged in the ascending order. When the age composition of population at two points of time are exactly similar, the Lorenz curve reduces to the straight diagonal; the larger is the dissimilarity between the two age composition, the more Lorenz curve deviates from the diagonal.

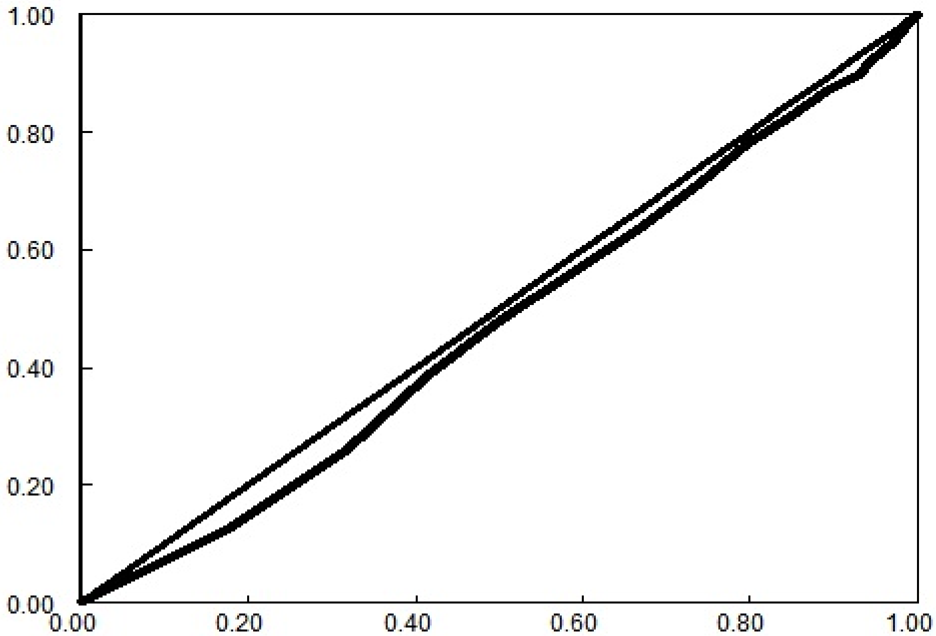
Figure 8.5

Lorenz curve of the age composition of population for 1961 (horizontal axis) and 2001 (vertical axis)

Males



Females



A number of summary measures can be derived from the Lorenz curve to ascertain the nature and the extent of the dissimilarity between two age compositions. These include aggregate dissimilarity, $|D|$; concentration dissimilarity, $|C|$; net concentration dissimilarity, C; partial dissimilarity, D_p and partial concentration dissimilarity, C_p. The method of estimating these indexes and their interpretation is given elsewhere and is not repeated here (Shryock and Siegel, 1976; Mukherjee, 1976).

Corresponding to five census years 1961 through 2001, there are 10 values for each of the indexes $|D|$, $|C|$, C, D_p and C_p so that there are 50 values for the male population and 50 values for the female population of the state. These values are set out in table 8.3. On the basis of the figure 8.5 and the table 8.3, the following conclusions may be drawn about the change in the age composition of the population of the state between 1961 and 2001:

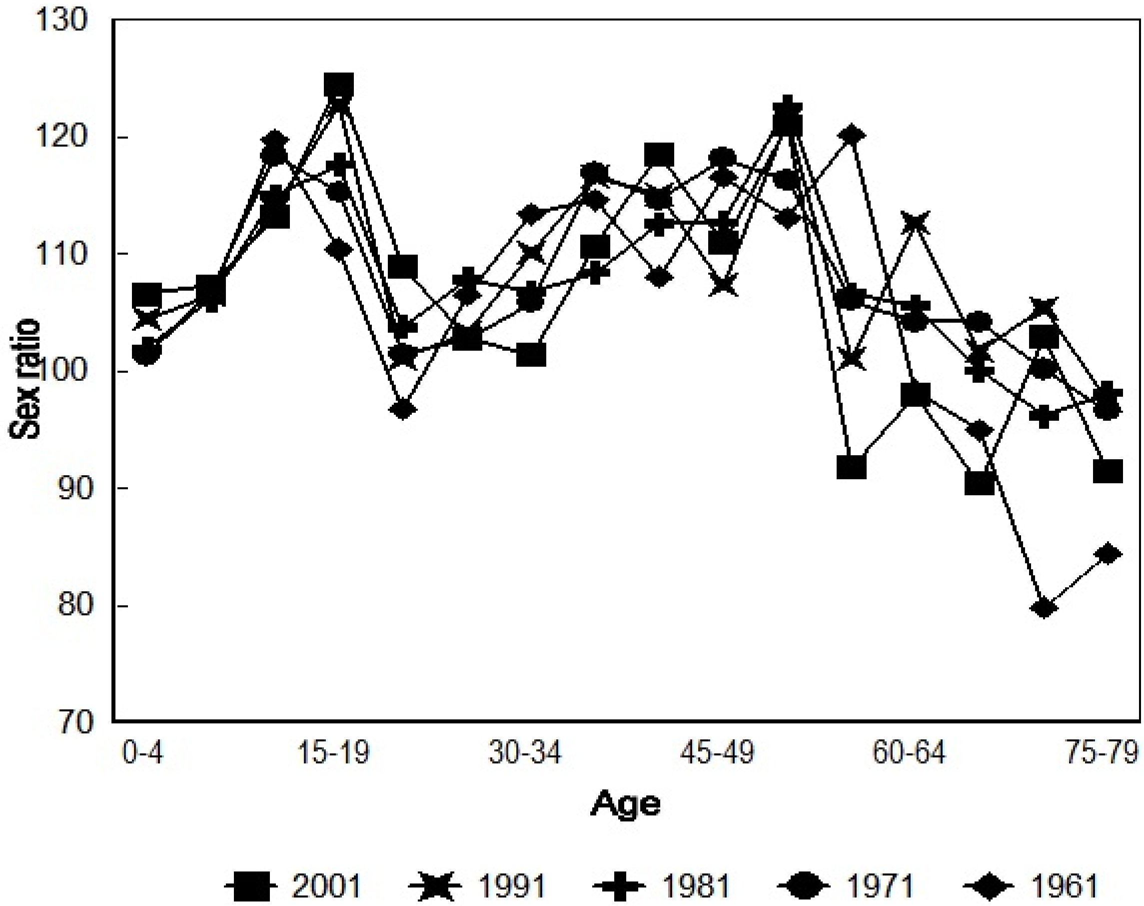
- The distance measures between the age compositions in the state at two points of time are very small; they are never more than 0.1000. This implies that over the years, there has been only a marginal change in the age composition of the population of the state.
- Although not very clear, the distance measures for successive census years appears to be increasing albeit very slowly irrespective of which year is taken as base.
- The substantial difference between the values of indexes $|C|$ and C for corresponding age compositions indicate that there are substantial errors in the age data available through different population census in the state.

Sex Ratios

It is well known that the probability of a male birth and the probability of a female birth are not the same. The ratio of a male to a female birth is universally assumed to be around 106 males for every 100 females. At the time of conception, however, this ratio is even more favourable to males, around 120 males for every 100 females because the bulk of evidence suggests that males are more fragile than females and the intra-uterine mortality of male foetus is substantially higher than that of the female foetus (Naeye et al., 1971; Calle et al., 1999). It has also been observed that the mother nature tries hard to compensate for the fragility of the male foetus by allowing significantly more boys to be conceived at a time of the year when conditions for pregnancy and birth are optimal (Cagnacci et al. 2003).

After birth, the survival probability of a female child is generally higher than that of the male child because of a number of factors. The fact that females have two X chromosomes and males one probably confers a survival advantage on females as compared to males (Naeye et al., 1971);

Figure 8.6
Sex ratios by age in Madhya Pradesh



greater average level of estrogen in pre-menopausal women almost certainly protect them against the development of coronary heart diseases (Epstein, 1965). Women have also been found to adjust more rapidly to changes in the environmental temperature and they have a number physiological advantages. On the other hand, tougher living conditions of women including social discrimination against the fair sex and the risk of death associated with the complications of pregnancy and delivery put women at a disadvantage to men in most of the developing countries (Chaurasia, 1983). Similarly, the sex selective migration of the working age population also affects the ratio of males to females in different age groups and is reflected in this ratio for the whole population. The net result of all these factors is that the ratio of males to females in any population, popularly known as the sex ratio varies with age. If the effect of migration is excluded then the sex ratio is very high at very young ages starting at around 105-106 at the age 0. Age-specific sex ratios are then expected to decline with age, attaining a ratio of around 100 for persons in late 20s, and continues to decline to levels around 50 to 60 in the oldest ages

(Poston et al., 2003) because of lower female to male mortality. This normative age pattern of sex ratio is disturbed by extreme forms of a number of man made interventions which include war and conflicts which effect the size of the male population and discrimination against females at individual, family and community levels of which perhaps the most livid example is the female-specific abortion and female infanticide.

Some idea about the extent to which human interventions disturb the normative sex ratio patterns can be made by calculating the sex ratio for each 5-year age group and then calculating the sex ratio difference which is the difference between the sex ratio of the reference age group and the sex ratio of the immediately preceding age group. The difference so obtained may be summarised for the all age groups by taking the mean of the age-specific sex ratio differences without regard to the sign of the difference.

The age pattern of the sex ratio in Madhya Pradesh is presented in figure 8.6 which shows that there has been little change over time in the age pattern of sex ratio in the state, although there are some subtle differences. Another important observation is that the age pattern of sex ratio does not conform to the normative age pattern described above. Unlike the normative pattern, the sex ratio in Madhya Pradesh do not decrease monotonically with age. Rather, it first increases in the younger age groups then decreases, rather sharply, in the young working age groups and then gradually increases again to reach very high level around 50 years of age. After 50 years of age, the sex ratio again decreases. Reasons for this fluctuating pattern of age-specific sex ratio may be seen in both sex-specific age misreporting as well as in differential mortality of males and females in different age groups. For example, the increase in the sex ratio in younger ages may be due to higher female as compared to male mortality. Similarly, rapid drop in sex ratio between the age groups 15-19 years and 20-24 years in each census may be due to some very substantial under reporting of females in the age group 15-19 years and consequently some very substantial over reporting of females in the age group 20-24 years. In India, female marriages below the age of 18 years are barred under the Child Marriages Restraint Act, 1978. Despite this Act, female marriage at a young age is very common in Madhya Pradesh because of a host of cultural, religious, family and social and economic considerations. Since marriage, especially of females, has a number of social, cultural and religious sensitiveness, there may be a tendency in the population to over report the age of married females to avoid legal implications. This over reporting of females in the age group 20-24 years at the cost of the age group 15-19 years appears to have resulted in the deficiency of females in the age group 15-19 years but excess in the age group 20-24 years so that the sex ratio (males/females) shows a steep decrease between ages 15-19 years and 20-24 years.

On the other hand, the increase in the sex ratio after 25 years of age may be attributed to high to very high risk of death associated with the complications of pregnancy and delivery that affect married women only. Even in older ages - age beyond 60 years - the sex ratio has not been found to be as low as is expected according to the normative age pattern. The reason may be relatively higher female mortality compared to male mortality in the older ages.

Quality of Age and Sex Data

Observed variation in the age and sex ratios as discussed above are the result of two groups of factors, the overall quality of the age and sex data and changes in demographic processes. In the absence of changes in demographic processes, the 'accurate' age data are rectangularly distributed and age-specific sex ratios decline over the life cycle in an even manner. Departure from these patterns reveal inaccuracies in data.

The overall quality of age and sex data can be judged by the age-sex accuracy index which is the sum of age ratio score for males, age ratio score for females and three times the sex ratio score (Shryock and Siegel, 1976; United Nations, 1955). The permissible values of the age ratio score is 2.6 for males and 2.4 for females and 1.5 for sex ratio score. Combining the three, the permissible limit for age-sex accuracy index is 9.5.

The age and sex ratio scores and age-sex accuracy index for Madhya Pradesh for different census years are given in table 8.9. The age-sex accuracy index is found to be well above the permissible limit of 9.5 indicating that there are substantial inaccuracies in the age-sex data. Perhaps, even more disturbing is the fact that the age-sex accuracy index has worsened since 1981 largely because of the increase in the sex ratio score. The age-sex accuracy index in the 2001 population census was 41 which is well above the permissible value of 9.5 and is almost same as the age-sex accuracy index 40 years earlier, at the time of 1961 population census.

Although, age-sex accuracy index is a very simple summary measure of the accuracy of age and sex data, yet it has a number of limitations. Perhaps, the most serious limitation is that it does not take into account the expected decline in the sex ratio with increasing age and real irregularities in the age composition due to normal fluctuations in births, deaths and patterns of migration. Another problem with the index is that considerable weight is given to sex ratio component in estimating the index and the logic of giving this weight is not clear. Because of these limitations, the age and sex accuracy index is useful in making only rough comparisons and distinctions between and among populations (Hobbs, 2003). The major function of this index appears to be its ability to flag extreme values in the age and sex data. In general these extreme values are due to under enumeration and misreporting. At the same time, some of inaccuracies in the data captured by the age-sex accuracy index may really be due to fluctuations in demographic processes.

Age-sex Selectivity in Under Enumeration

One of the basic causes of the inaccuracies in the age and sex data is age and sex selective under enumeration. The age and sex selectivity in under enumeration can be examined by calculating survival ratios by sex on the basis of the age and sex data for two consecutive population census. If it is assumed that the population is closed to migration or if population increase or decrease due to migration is negligible as compared to the natural population increase or decrease, then the number of persons in the age group (x+10 to x+14) years in the later census are the survivors of the number of persons in the age group (x to x+4) years in the population census conducted 10 years earlier. These survival ratios are given in table 8.10. In general, survival ratios are very high and do not match to the prevailing levels of mortality. Moreover, in many cases, survival ratios are found to be greater than 1. For example, in case of males, the survival ratios are always greater than 1, implying that there were more males in the age group 10-14 years in the latter census than those aged 0-4 in the earlier one. In females, a similar situation may be seen in the recent census. Clearly, the exceptionally high census survival ratios indicate large under enumeration in age group 0-4 years in the respective census years.

The sex selectivity in under enumeration may be judged by comparing the survival ratios for the female population with those for male population. Table 8.10 suggests that males 0-4 years are consistently under enumerated more than females. Similar interpretations can also be made for other age groups by comparing male and female survival ratios.

Conclusions

This paper has attempted to describe the age and sex composition of the population of Madhya Pradesh and changes in the age and sex structure over time. The purpose of analysis has primarily been to highlight the importance of considering the patterns and transition in the age and sex structure in human development planning process. The analysis reveals that, in the next 30 years, more and more population of the state will get concentrated in the working ages. The added productivity of this group can produce a demographic opportunity or dividend for rapid economic growth and eradication of poverty if policies to take advantage of this opportunity are in place. The fact is that the combined effect of this large working-age population and appropriate health, family, labour, financial, and human development policies can create virtuous cycles of wealth creation in the state thereby improving the quality of life of the people.

The paper has also attempted to analyse the age and sex data from the demographic perspective along with their accuracy. The analysis reveals that there has been very little change in the age structure of the population in the past but in the coming years, significant changes in the age structure are expected which when en-cashed may provide the impetus for rapid economic growth. The analysis also reveals that age sex data are not rectangularly distributed and there are large deviations from the normative trend. These deviations appear to have increased over time. This could be due to both errors in the age and sex data, fluctuations in fertility and mortality and patterns of migration.

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Table 8.1

Enumerated population of Madhya Pradesh: 1961-2001

Age	2001			1991			1981			1971			1961		
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
0-4	7368736	3801712	3567024	6651176	3397526	3253650	5293645	2672139	2621506	4851352	2441654	2409698	3890633	1959777	1930856
5-9	8114671	4198430	3916241	6738739	3474692	3264047	5614874	2889903	2724971	4738304	2447050	2291254	3319307	1709923	1609384
10-14	7769009	4123794	3645215	5755267	3063850	2691417	4995471	2671490	2323981	3629963	1967725	1662238	2384558	1299317	1085241
15-19	5690617	3155715	2534902	4322524	2381171	1941353	3563038	1925784	1637254	2369824	1268922	1100902	1903780	998785	904995
20-24	5168016	2693698	2474318	4304777	2163643	2141134	3208363	1633588	1574775	2270916	1143833	1127083	2029345	997573	1031772
25-29	4664502	2364315	2300187	3936104	1999688	1936416	2731836	1417310	1314526	2205397	1116894	1088503	1989557	1025956	963601
30-34	4348461	2189149	2159312	3318433	1738838	1579595	2337534	1206770	1130764	1997454	1026939	970515	1676462	890908	785554
35-39	3927208	2062808	1864400	2746590	1478387	1268203	2124648	1105104	1019544	1755826	946320	809506	1318909	704401	614508
40-44	3016434	1635980	1380454	2244171	1200920	1043251	1917405	1015305	902100	1507634	805125	702509	1233767	640592	593175
45-49	2437191	1281601	1155590	1935105	1001788	933317	1606048	850964	755084	1182204	640215	541989	952847	512876	439971
50-54	1890978	1035226	855752	1704324	934931	769393	1425270	785035	640235	1111795	597700	514095	918065	487092	430973
55-59	1511753	723319	788434	1176762	591391	585371	880665	454408	426257	652501	335716	316785	469416	256231	213185
60-64	1572796	778022	794774	1281894	679085	602809	1025924	526843	499081	774867	395375	379492	542728	268987	273741
65-69	1102622	523430	579192	691210	348505	342705	529538	264778	264760	377026	192339	184687	209166	101836	107330
70-74	816977	414281	402696	589668	302566	287102	473245	232015	241230	298066	149118	148948	184887	82065	102822
75-79	352761	168501	184260	221776	109420	112356	179362	88826	90536	111317	54691	56626	106036	34727	41129
80+	435768	207559	228209	422175	227429	194746	238771	112761	126010	160758	69713	91045	121610	50729	70881

Source: Population census

Table 8.2

Age distribution of population of Madhya Pradesh: 1961-2001

Age	2001			1991			1981			1971			1961		
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
0-4	12.24	12.12	12.37	13.84	13.54	14.18	13.88	13.46	14.33	16.17	15.65	16.74	16.73	16.30	17.24
5-9	13.48	13.39	13.58	14.03	13.85	14.22	14.72	14.56	14.90	15.80	15.69	15.92	14.28	14.22	14.37
10-14	12.91	13.15	12.64	11.98	12.21	11.73	13.10	13.46	12.70	12.10	12.61	11.55	10.26	10.81	9.69
15-19	9.45	10.06	8.79	9.00	9.49	8.46	9.34	9.70	8.95	7.90	8.13	7.65	8.19	8.31	8.08
20-24	8.59	8.59	8.58	8.96	8.62	9.33	8.41	8.23	8.61	7.57	7.33	7.83	8.73	8.30	9.21
25-29	7.75	7.54	7.98	8.19	7.97	8.44	7.16	7.14	7.19	7.35	7.16	7.56	8.56	8.53	8.60
30-34	7.22	6.98	7.49	6.91	6.93	6.88	6.13	6.08	6.18	6.66	6.58	6.74	7.21	7.41	7.01
35-39	6.52	6.58	6.47	5.72	5.89	5.53	5.57	5.57	5.57	5.85	6.07	5.62	5.67	5.86	5.49
40-44	5.01	5.22	4.79	4.67	4.79	4.55	5.03	5.11	4.93	5.03	5.16	4.88	5.31	5.33	5.30
45-49	4.05	4.09	4.01	4.03	3.99	4.07	4.21	4.29	4.13	3.94	4.10	3.76	4.10	4.27	3.93
50-54	3.14	3.30	2.97	3.55	3.73	3.35	3.74	3.95	3.50	3.71	3.83	3.57	3.95	4.05	3.85
55-59	2.51	2.31	2.73	2.45	2.36	2.55	2.31	2.29	2.33	2.18	2.15	2.20	2.02	2.13	1.90
60-64	2.61	2.48	2.76	2.67	2.71	2.63	2.69	2.65	2.73	2.58	2.53	2.64	2.33	2.24	2.44
65-69	1.83	1.67	2.01	1.44	1.39	1.49	1.39	1.33	1.45	1.26	1.23	1.28	0.90	0.85	0.96
70-74	1.36	1.32	1.40	1.23	1.21	1.25	1.24	1.17	1.32	0.99	0.96	1.03	0.80	0.68	0.92
75-79	0.59	0.54	0.64	0.46	0.44	0.49	0.47	0.45	0.49	0.37	0.35	0.39	0.46	0.29	0.37
80+	0.72	0.66	0.79	0.88	0.91	0.85	0.63	0.57	0.69	0.54	0.45	0.63	0.52	0.42	0.63

Source: Author’s calculations

Table 8.3

Projected population of Madhya Pradesh: 2011-2051

Age	2011			2021			2031			2041			2051		
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
0-4	8625711	4454085	4171626	7588803	3922820	3665983	7652606	3949510	3703096	7613354	3924761	3688593	7151119	3682041	3469078
5-9	8307205	4302275	4004930	8225910	4261311	3964599	7277074	3765520	3511554	7711321	3980188	3731133	7214869	3718353	3496516
10-14	8008424	4149700	3858724	8398182	4351071	4047111	7450894	3859971	3590923	7548569	3899892	3648677	7534370	3885810	3648560
15-19	7757385	4019670	3737715	8202707	4249220	3953487	8151487	4222138	3929349	7227363	3737969	3489394	7669910	3956183	3713727
20-24	6694657	3433251	3261406	7885100	4083637	3801463	8304320	4298577	4005743	7386984	3822208	3564776	7497493	3868281	3629212
25-29	6016627	3117729	2898898	7599063	3934776	3664287	8080311	4180861	3899450	8057895	4166980	3890915	7161432	3697273	3464159
30-34	5179338	2728774	2450564	6526147	3346104	3180043	7738270	4004279	3733991	8184653	4230614	3954039	7301498	3771528	3529970
35-39	4503106	2382639	2120467	5830103	3022076	2808027	7421753	3841476	3580277	7931670	4099263	3832407	7937372	4098295	3839077
40-44	3917666	2054551	1863115	4974666	2620946	2353720	6326240	3241666	3084574	7545886	3899242	3646644	8016235	4135903	3880332
45-49	3362623	1758197	1604426	4268872	2255331	2013541	5587048	2890772	2696276	7164185	3698668	3465517	7697705	3966479	3731226
50-54	2815528	1466458	1349070	3639913	1901082	1738831	4682760	2456896	2225864	6009348	3063758	2945590	7215942	3708489	3507453
55-59	2294120	1192072	1102048	3026013	1570679	1455334	3904573	2047580	1856993	5169949	2651495	2518454	6690899	3422191	3268708
60-64	1756962	917678	839284	2408640	1242057	1166583	3180275	1643199	1537076	4153953	2151822	2002131	5400122	2714425	2685697
65-69	1303774	680345	623429	1813053	931114	881939	2454153	1254636	1199517	3228385	1661198	1567187	4355971	2189070	2166901
70-74	896953	465820	431133	1236656	638118	598538	1749817	884709	865108	2365659	1188775	1176884	3171534	1596451	1575083
75-79	557455	288704	268751	765887	394637	371250	1111181	559988	551193	1550551	770715	779836	2100681	1046814	1053867
80+	511628	263923	247705	680198	349251	330947	969553	493174	476379	1425992	706999	718993	2032298	991479	1040819

Source: Author’s calculations

Table 8.4

Projected age distribution of population of Madhya Pradesh: 2011-2051

Age	2011			2021			2031			2041			2051		
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
0-4	11.90	11.82	11.98	9.14	9.11	9.17	8.31	8.30	8.33	7.59	7.60	7.59	6.74	6.76	6.71
5-9	11.46	11.42	11.50	9.90	9.89	9.91	7.91	7.91	7.90	7.69	7.71	7.67	6.80	6.83	6.76
10-14	11.04	11.01	11.08	10.11	10.10	10.12	8.10	8.11	8.08	7.53	7.55	7.50	7.10	7.14	7.06
15-19	10.70	10.67	10.73	9.87	9.86	9.88	8.86	8.87	8.84	7.21	7.24	7.18	7.23	7.27	7.18
20-24	9.23	9.11	9.36	9.49	9.48	9.50	9.02	9.03	9.01	7.37	7.40	7.33	7.06	7.10	7.02
25-29	8.30	8.28	8.32	9.15	9.13	9.16	8.78	8.78	8.77	8.04	8.07	8.00	6.75	6.79	6.70
30-34	7.14	7.24	7.04	7.86	7.77	7.95	8.41	8.41	8.40	8.16	8.19	8.13	6.88	6.93	6.83
35-39	6.21	6.32	6.09	7.02	7.02	7.02	8.06	8.07	8.06	7.91	7.94	7.88	7.48	7.53	7.43
40-44	5.40	5.45	5.35	5.99	6.08	5.88	6.87	6.81	6.94	7.53	7.55	7.50	7.55	7.60	7.51
45-49	4.64	4.67	4.61	5.14	5.24	5.03	6.07	6.07	6.07	7.14	7.16	7.13	7.25	7.28	7.22
50-54	3.88	3.89	3.87	4.38	4.41	4.35	5.09	5.16	5.01	5.99	5.93	6.06	6.80	6.81	6.78
55-59	3.16	3.16	3.16	3.64	3.65	3.64	4.24	4.30	4.18	5.16	5.13	5.18	6.30	6.29	6.32
60-64	2.42	2.44	2.41	2.90	2.88	2.92	3.46	3.45	3.46	4.14	4.17	4.12	5.09	4.99	5.19
65-69	1.80	1.81	1.79	2.18	2.16	2.21	2.67	2.64	2.70	3.22	3.22	3.22	4.10	4.02	4.19
70-74	1.24	1.24	1.24	1.49	1.48	1.50	1.90	1.86	1.95	2.36	2.30	2.42	2.99	2.93	3.05
75-79	0.77	0.77	0.77	0.92	0.92	0.93	1.21	1.18	1.24	1.55	1.49	1.60	1.98	1.92	2.04
80+	0.71	0.70	0.71	0.82	0.81	0.83	1.05	1.04	1.07	1.42	1.37	1.48	1.91	1.82	2.01

Source: Author’s calculations

Table 8.5

Age ratios in Madhya Pradesh: 1961-2001

Age	2001		1991		1981		1971		1961	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
0-4										
5-9	105.9	108.6	107.6	109.8	108.2	110.2	111.0	112.5	104.9	106.7
10-14	112.1	113.0	104.6	103.4	110.9	106.6	105.9	98.0	95.9	86.3
15-19	92.6	82.8	91.1	80.3	89.5	84.0	81.6	78.9	87.0	85.5
20-24	97.6	102.3	98.8	110.4	97.7	106.7	95.9	103.0	98.5	110.4
25-29	96.8	99.3	102.5	104.1	99.8	97.2	102.9	103.8	108.7	106.0
30-34	98.9	103.7	100.0	98.6	95.7	96.9	99.5	102.3	103.0	99.6
35-39	107.9	105.3	100.6	96.7	99.5	100.3	103.3	96.8	92.0	89.1
40-44	97.8	91.4	96.8	94.8	103.8	101.7	101.5	104.0	105.2	112.5
45-49	96.0	103.4	93.8	103	94.5	97.9	91.3	89.1	91.0	85.9
50-54	103.3	88.0	117.4	101.3	120.3	108.4	122.5	119.7	126.7	132.0
55-59	79.8	95.5	73.3	85.3	69.3	74.8	67.6	70.9	67.8	60.5
60-64	124.8	116.2	144.5	129.9	146.5	144.4	149.7	151.4	150.2	170.8
65-69	87.8	96.7	71.0	77	69.8	71.5	70.6	69.9	58.0	57
70-74	119.7	105.5	132.1	126.2	131.2	135.8	120.7	123.4	120.2	138.5
75-79										
80+										

Source: Author’s calculations

Table 8.6

Dissimilarity indexes for Madhya Pradesh 1961-2001: Male

Index	Year of latter census			
	1971	1981	1991	2001
|D|	0.0454	0.0624	0.0553	0.0748
		0.0400	0.0513	0.0643
			0.0303	0.0383
				0.0328
Dp	-0.0005	-0.0003	0.0040	0.0081
		0.0002	0.0045	0.0086
			0.0043	0.0084
				0.0041
C	-0.0088	-0.0087	-0.0086	-0.0086
		-0.0014	-0.0020	-0.0028
			-0.0007	-0.0014
				-0.0007
Cp	-0.0505	-0.0501	-0.0490	-0.0488
		-0.0096	-0.0158	-0.0202
			-0.0066	-0.0109
				-0.0041
|C|	0.0893	0.0885	0.0872	0.0874
		0.0206	0.0249	0.0321
			0.0180	0.0232
				0.0179

Source: Author’s calculations

Table 8.7

Dissimilarity indexes for Madhya Pradesh 1961-2001: Female

Index	Year of latter census			
	1971	1981	1991	2001
|D|	0.0449	0.0648	0.0475	0.0830
		0.0448	0.0491	0.0739
			0.0310	0.0431
				0.0416
Dp	-0.0002	0.0026	0.0042	0.0162
		0.0028	0.0044	0.0164
			0.0016	0.0136
				0.0121
C	-0.0087	-0.0086	-0.0085	-0.0007
		-0.0008	-0.0014	-0.0036
			-0.0007	-0.0007
				-0.0015
Cp	-0.0531	-0.0523	-0.0516	-0.0048
		0.0008	-0.0070	-0.0218
			-0.0081	-0.0089
				-0.0060
|C|	0.0939	0.0929	0.0921	0.0357
		0.0311	0.0239	0.0404
			0.0167	0.0168
				0.0222

Source: Author's calculations

Table 8.8

Sex ratios in Madhya Pradesh: 1961-2001

Age	2001	1991	1981	1971	1961
0-4	106.6	104.4	101.9	101.3	101.5
5-9	107.2	106.5	106.1	106.8	106.2
10-14	113.1	113.8	115.0	118.4	119.7
15-19	124.5	122.7	117.6	115.3	110.4
20-24	108.9	101.1	103.7	101.5	96.7
25-29	102.8	103.3	107.8	102.6	106.5
30-34	101.4	110.1	106.7	105.8	113.4
35-39	110.6	116.6	108.4	116.9	114.6
40-44	118.5	115.1	112.5	114.6	108.0
45-49	110.9	107.3	112.7	118.1	116.6
50-54	121.0	121.5	122.6	116.3	113.0
55-59	91.7	101.0	106.6	106.0	120.2
60-64	97.9	112.7	105.6	104.2	98.3
65-69	90.4	101.7	100.0	104.1	94.9
70-74	102.9	105.4	96.2	100.1	79.8
75-79	91.4	97.4	98.1	96.6	84.4

Source: Author’s calculations

Table 8.9

Age-sex accuracy indexes in Madhya Pradesh: 1961-2001

Year	Age ratio score		Age accuracy index	Sex ratio score	Age-sex accuracy index
	Male	Female			
2001	9.0	7.4	8.2	9.5	44.9
1991	13.2	11.1	12.2	8.9	51.0
1981	14.7	13.7	14.2	5.3	44.3
1971	15.1	15.5	15.3	5.1	45.9
1961	16.3	22.4	19.4	8.7	64.8

Source: Author’s calculations

Table 8.10

Age-sex selectivity in under enumeration

Age at earlier census	Age at later census	Year of later census			
		1971	1981	1991	2001
Male					
0-4	5-9	1.0041	1.0941	1.1466	1.2138
5-9	15-19	0.7421	0.7870	0.8240	0.9082
10-14	20-24	0.8803	0.8302	0.8099	0.8792
15-19	25-29	1.1183	1.1169	1.0384	0.9929
Female					
0-4	5-9	0.8609	0.9644	1.0267	1.1203
5-9	15-19	0.6841	0.7146	0.7124	0.7766
10-14	20-24	1.0386	0.9474	0.9213	0.9193
15-19	25-29	1.2028	1.1940	1.1827	1.1848

Source: Author's calculations

AGEING OF POPULATION

Introduction

Greying of the population or population ageing is the inevitable consequence of demographic transition. Until recently, ageing of population has been perceived as a concern for the more developed countries of the world. In these countries, decrease in fertility after the second World War has resulted in a substantial increase in the proportion of the elderly population - population aged 60 years and above. Recent estimates prepared by United Nations suggest that the proportion of population with at least 60 years of age, in these countries, increased from around 12 per cent in 1950 to almost 22 per cent in the year 2010. This proportion is expected to increase to almost 33 per cent by the year 2050 (United Nations 2002). This concentration of the population in the old age segment has led to the development of national policies and programmes for the aged, and the expression of national and international concerns. By contrast, in the less developed countries, including India, the proportion of population aged 60 years and above increased from less than 6 per cent in 1950 to around 9 per cent in 2010 and is projected to increase to around 20 per cent by the year 2050.

Shifting the attention from proportions to absolute numbers, however, changes the whole scenario radically. Estimates prepared by the United Nations suggest that the aged in the world increased from about 205 million in 1950 to more than 759 million in 2010. Most of this increase has been confined to the less developed countries of the world were the aged population increased from almost 110 million in 1950 to nearly 490 million in the year 2010. This means that, despite low proportions and despite a slow increase in these proportions during the second half of the last century, the less developed countries have recorded a very substantial increase in the actual number of the aged. Currently, aged in the less developed countries of the world account for about 8.6 per cent of the total population. According to United Nations projections, these countries may expect substantial increase in the aged population from around 490 million in 2010 to more than 1592 million by the year 2050. Between 2010 and 2050, the net increase in the aged population in the world is projected to be around 1249 million out of which, around 1102 million or more than 88 per cent will be in the less developed countries. This shows that from both demographic and human development perspective, population ageing in the less developed countries is going to be a major issue.

The inevitable increase in the number of the old people brings about a number of social and economic concerns such as increased susceptibility of the old people to chronic and long term diseases and disabilities, social security, dependence and many more. These concerns have important implications to human development process in the context of building endowments, developing capacities and creating opportunities for the aged people. Unlike the young population, investments on the aged people is not going to contribute to the social and economic production system. It is in this context that studying population ageing including patterns of growth of the aged population and speed of ageing attains significance for human development. It is also important to analyse patterns and changes in the structure of the aged population as changes in the age and sex structure have some important social and economic implications that need to be incorporated in human development policies and programmes. Since, population ageing is linked with the process of demographic transition - decrease in fertility and mortality - it is obvious that formulation of policies and programmes for the welfare and effective utilisation of the rapidly increasing number of the old people is both the development and the demographic imperative which cannot be given a neglected, residual attention in the process of human development.

The present paper attempts to analyse the process of population aging in Madhya Pradesh which is one of the least developed states of India in terms of both demography and development. The population of the state is still in the early stages of demographic transition. The demographic factors that are responsible for changes in the age structure continue to be weak and are expected to remain weak, at least, in the coming years (Ranjan, 2004). However, an analysis of the process of aging in the state still makes sense since there has been considerable increase in the number of aged people in the state during the second half of the last century. It has also been projected that the number of the aged people in the state is expected to increase substantially in the first half of the present century.

Data Source

The present analysis uses data on the age and sex structure of the population available through decennial population census for the period 1961 through 2001. The age and sex data available through the population census are known to be associated with a number of errors including errors related to digit preference, errors related to age misstatements, etc. An analysis of the quality of age and sex data suggests that while there is some improvement in the quality of age data, the quality of information about sex appears to have deteriorated over time (Ranjan 2004). To address these issues, the normal procedure is smoothing of age and sex data. The problem with the smoothing of age and sex data, however, is that it may hide real fluctuations in the age and sex structure of the population.

Measurement of Population Aging

Any investigation about how the phenomenon of aging is manifested first demands fixing of the age at the entry into old age. The definition of the aged is very much dependent on its use in a particular context. This flexibility leads to different cut-off points even within the same population. In the less developed countries like India, the aged are defined as those who have attained 60 years of age.

Ryder (1975) has suggested the lower boundary of the old age should be decided on the basis of a fixed interval to death. An analysis by Guha Roy has discussed in detail the applicability of the method suggested by Ryder in the Indian context (Guha Roy, 1989). The study concludes that the lower boundary of the aged in India should not be less than 60 years. The present analysis, therefore, assumes the age of 60 years as the lower boundary of the aged population.

The most popular and traditional measure of ageing is the proportion of the aged to the total population. Limitations of this simple measure of ageing are well known in the context of those populations which are in transition. In such populations, increase in the aged population may not get reflected in the proportion aged because of the continued high fertility and low or declining mortality. Because of these reasons, more refined measures of ageing such as the ageing index, age specific population growth rate and the aged dependency ratio are used along with the proportion of the aged population to study the process of population ageing.

A second, axiomatic, approach to the measurement and analysis of the process of population ageing has been suggested by Basu and Basu (1987). This approach has been followed by Guha Roy (1989) to analyse the process of population ageing in India. This approach takes the clue from the measurement of the extent of poverty in economics. There are, however, some problems in using this approach particularly when the last age interval is an open end interval. Kulkarni (1988) has suggested amendments in the indicators proposed by Basu and Basu.

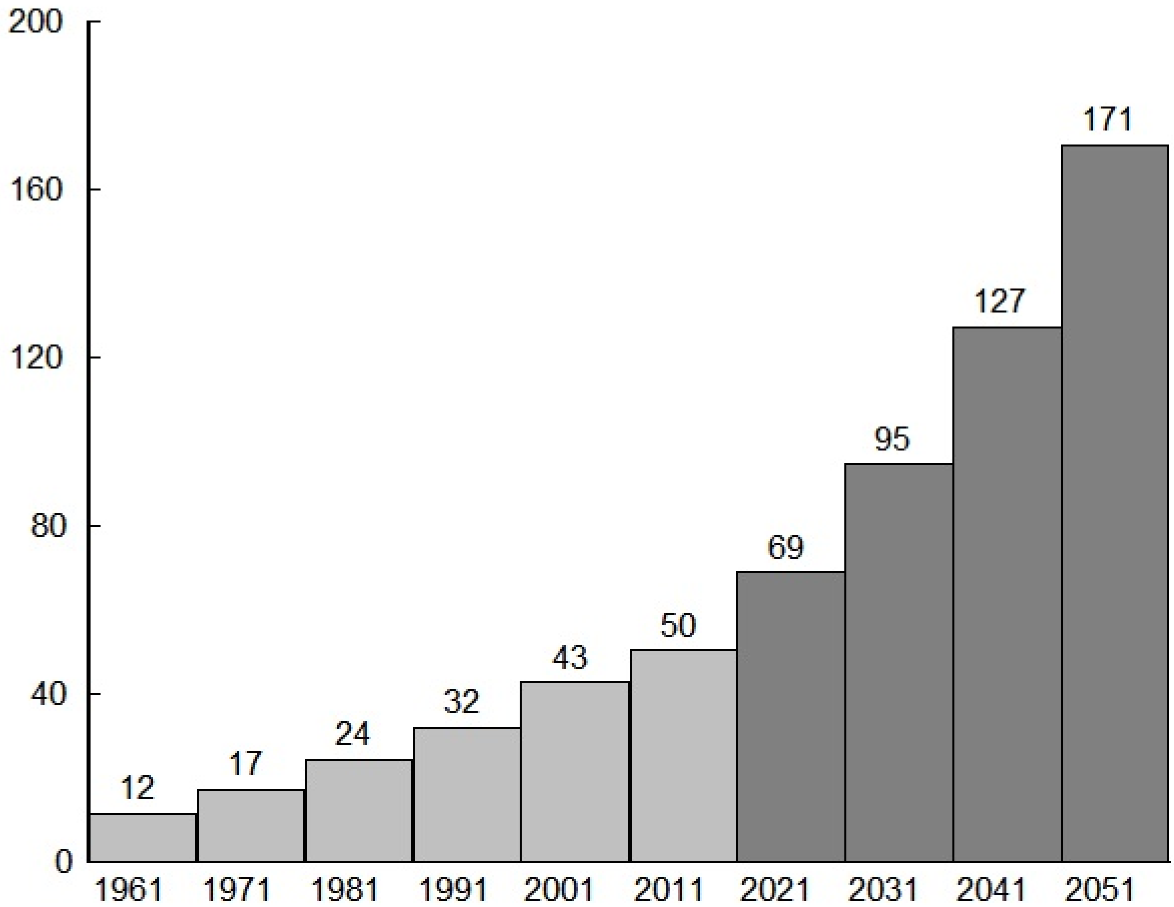
United Nations has analysed changes in the age structure of the population by using the age-specific population growth approach (United Nations, 1988). This method measures and decomposes the proportionate growth of different population age groups in order to investigate the population dynamics, particularly the process of population ageing over time. This approach is based on the fact that if all age groups in a population grow at the same rate, then the age structure of the population will remain unchanged over time. It is the difference in the growth rate of the population in different age groups that produces changes in the age structure of the population. The proportion of the population in an age group increases if the growth of the population of that age group is faster than the growth of the total population. As such, the process of population ageing can be studied in terms of the differentials in the growth rate of population aged 60 years and above and the growth rate of the total population. The same approach can also be used to analyse the changes in the age structure of the aged population.

Population Ageing in Madhya Pradesh

Total number of the aged people in Madhya Pradesh were enumerated to be 1.135 million at the 1961 population census which increased to 4.281 million at the 2001 population census resulting in an average annual growth rate of 3.25 per cent in the aged population of the state. During the same period, population less than 60 years of age increased by about 2.5 times at an average annual growth rate of 2.32 per cent from 22.09 million in 1961 to 55.91 million in 2001. The young population - population in the age group 0-14 years - on the other hand, increased at an average annual growth rate of 2.21 per cent during this period whereas the adult population - population in the age group 15-59 years - increased at an average annual growth rate of 2.61 per cent per year. These figures indicate that the growth of the aged population in Madhya Pradesh has been more rapid than the growth of the population in other age groups despite the fact that the process of demographic transition in the state has been slow during this period. It is clear that the phenomenon of the greying of the people is not confined to those populations only which are at the advanced stage of demographic transition.

In terms of proportions, the aged population in Madhya Pradesh increased from 5.01 per cent in 1961 to 7.11 per cent in 2001. The proportion of aged males increased from 4.72 per cent to 6.67 per cent while that of aged females increased from 5.32 per cent to 7.59 per cent, although the

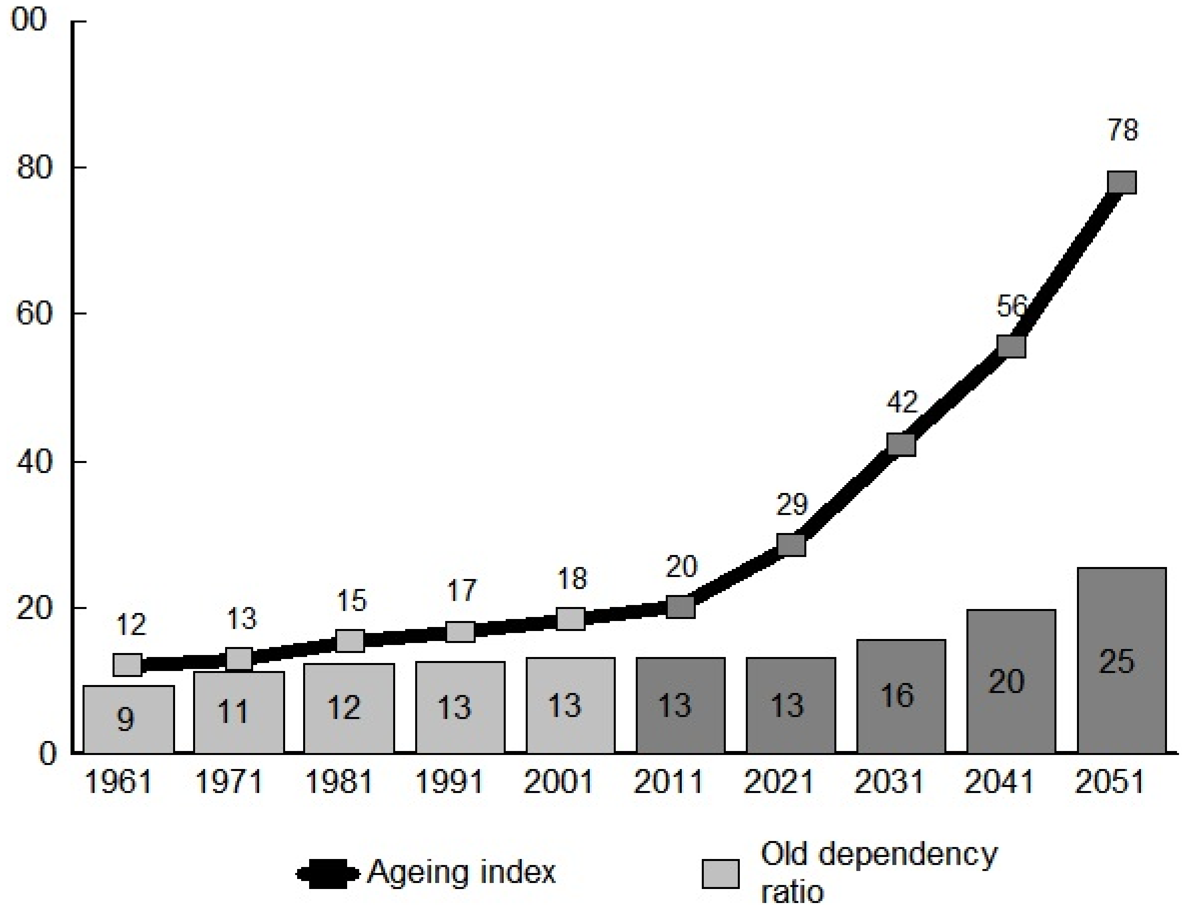
Figure 9.1
Growth of the aged population in Madhya Pradesh



average annual growth rate of both male and female aged has been almost the same during the period under reference. The relatively slow increase in the proportion of the aged population however, does not reflect the magnitude of the actual increase in the size of the aged population in the state as discussed above.

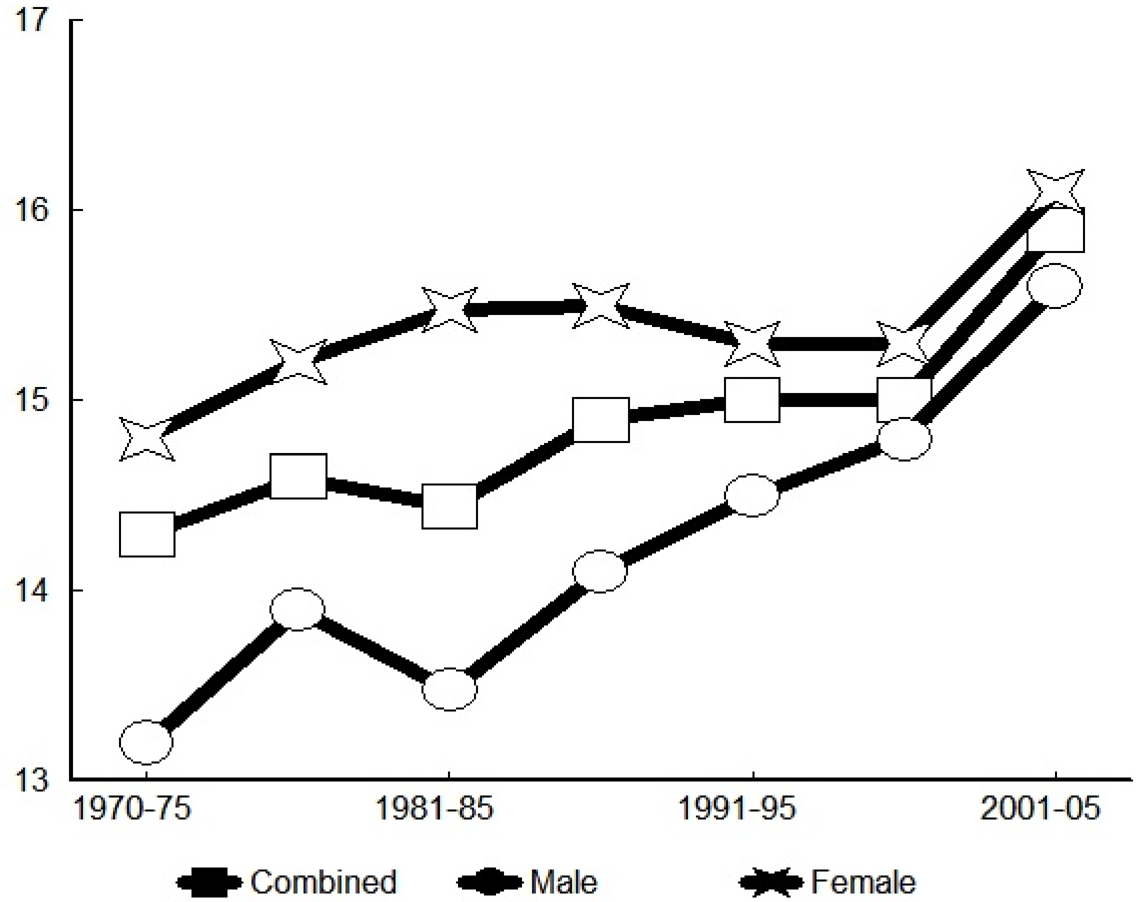
As regards future growth of the aged population in the state is concerned, the number of people aged 60 and above in the state is expected to increase to about 1.71 million by the year 2051 (Ranjan 2004). This means that the aged population in the state is expected to increase by four times in the first half of the present century at an average annual growth rate of 2.77 per cent per year. This is in quite contrast, the population below 60 years of age which is expected to increase by only about 1.6 times between 2001 and 2051 at an average annual growth rate of 0.93 per cent per year. By the year 2051, more than 16 per cent of the population of the state is expected to be the aged population.

Figure 9.2
Ageing index and old dependency ratio



An idea about the speed of ageing in the state can be made through the trend in the ageing index - the ratio of the aged population to the young population. During the 40 years between 1961 and 2001, the speed of ageing in the state has been relatively slow as the ageing index increased from about 12 per cent in 1961 to around 18 per cent in 2001. However, it is projected that between 2001 and 2051, there will be a very rapid increase in this index. It is estimated that the ageing index will increase from around 18 per cent to almost 78 per cent by the year 2051. Similarly, the old age dependency ratio, defined as the number of the aged people per 100 persons in the working ages (age 15-59 years), is expected to increase rapidly from around 13 in the year 2001 to more than 25 by the year 2051. The rapid increase in the ageing index as well as in the old age dependency ratio clearly indicates that both the younger generation and the working age population will have to bear ever increasing responsibility of caring for the aged. Similarly, the government will have to bear the ever increasing burden of meeting the basic needs of the elderly population. It is worth repeating here that the rapid increase in the number of the aged people in

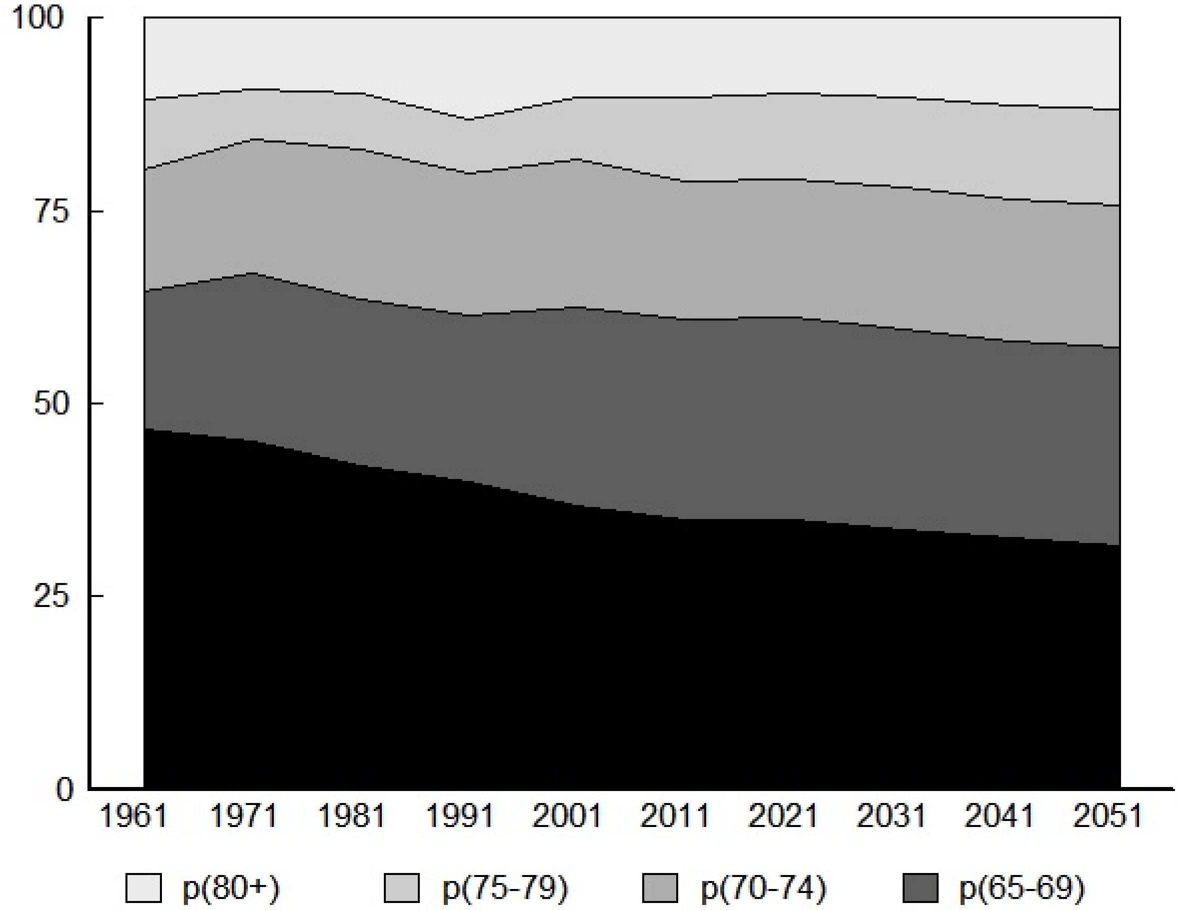
Figure 9.3
Trends in expectation of life at birth at age 60 in Madhya Pradesh



the state are inevitable and the process of ageing will in fact gain momentum in the years to come. Since, the basic needs of the aged population are very special and specific in nature, the greying of population is going to be a major development challenge in the state.

Primary reason behind the increase in the aged population is the decrease in the levels of mortality. More and more people in Madhya Pradesh are reaching 60 years of age as the result of improvement in mortality. According to the sample registration system, the expectation of life at birth in Madhya Pradesh was around 47.2 years during the period 1970-75, 47.6 years for males and 46.3 years for females (Government of India, 1984) which increased to 58 years during the period 2002-06, 58.1 years for males and 57.9 years for females (Government of India, 2009). The expectation of life at birth will continue to increase in the years to come. Since mortality reduction and elongation of life is the cherished goal of all development and welfare activities, it is obvious that substantial increase in the total number of the aged is inevitable.

Figure 9.4
Structure of the aged population in Madhya Pradesh

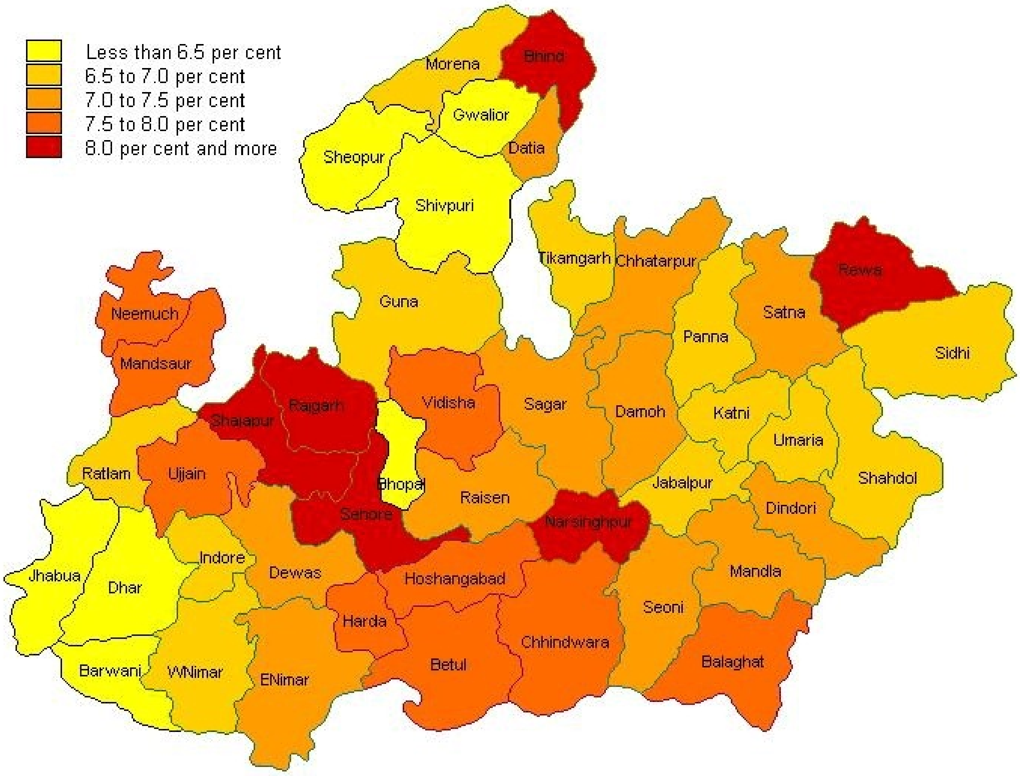


At the same time, fertility in the state continues to be on the higher side. Moreover, the available evidence suggests that the decrease in fertility in the past has at best been slow so that the annual number of live births in the state have been increasing right since 1961. With time, these new born will move further on the age scale suggesting that the aged population in the state will continue to increase at least for the next 60 years. It is also projected that the decrease in fertility will gather pace in the years to come. Thus, because of the continued decline in fertility in the state, the proportion of the aged population is expected to grow rather rapidly, making the challenge of ageing even more challenging.

Structure of the Aged Population

The increase in the aged population will be associated with significant changes in its structure. In 1961, around half of the aged population in the state was concentrated in the age group 60-64 years which decreased to about 35 per cent at the 2001 population census. It is projected that this

Figure 9.5
Proportion of aged population in districts of Madhya Pradesh: 2001



proportion will continue to decrease further in the first half of the present century and, by the year 2051, population in the age group 60-64 years will constitute less than one third of the total aged population in the state. On the other hand, the number of very old people - people with at least 80 years of age - is projected to increase sharply in the state in the coming years. In 1961, there were only about 0.122 million people with at least age 80 years of age in the state. This number increased to around 0.438 million in the year 2001. It is projected that the population with at least 80 years of age in the state will increase to more than 2 million by the year 2051.

During the period 1970-75, the expected life of an aged person, a person who has attained 60 years of age, in the state was 14.3 years - 13.2 years for males and 14.8 years for females according to the sample registration system. By the period 2002-06, the expectation of life at age 60 in the state has increased to 16.1 years, 15.8 years for males and 16.3 years for females. Although, the male expectation of life at age 60 increased at a relatively faster rate than the female expectation of life at age 60, yet aged females continue to live longer than aged males in the state.

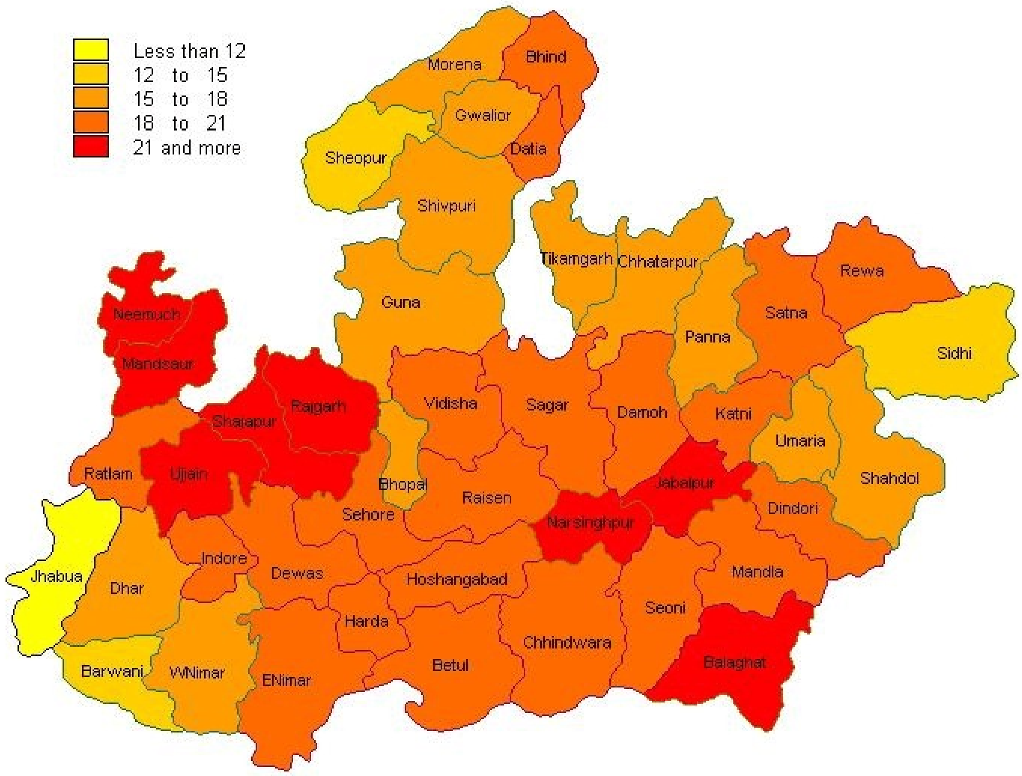
The relatively higher female expectation of life at age 60 as compared to the male expectation of life at age 60 has resulted in the dominance of the females in the aged population in the state. According to the 2001 population census, there were 1047 aged females for every 1000 aged males in the state whereas there were only about 919 females for every 1000 males for the whole population. It is argued that, in the years to come, female mortality will decline at a faster rate than the male mortality with the result that the average life of an aged female will increase at a faster rate than the average life of an aged male. In such a projected scenario, the aged population of the state will be dominated even more by females in the coming years. This feminisation of the aged population will have its own implications in terms of meeting the basic needs of the aged people.

Inter-district Variations in Population Ageing

Discussion of any demographic phenomenon in Madhya Pradesh is incomplete without a discussion on inter-district variations. The reason is that state is very vast in terms of geographical spread and very diverse in terms of culture, terrain and levels of social and economic development. According to the 2001 population census, nearly 20 per cent of the population of the state is classified as tribal. Nearly all the tribal population of the state lives in the southern part of the state whereas the northern part of the state is known for a society strongly organised on religion, caste and kinship considerations and where the status of women in the society is extremely low. It may therefore be argued that the process of ageing also varies widely across the districts of the state.

In order to analyse inter-district variations in the ageing process, we have estimated four indices of ageing - proportion of the aged population to total population, ageing index, aged dependency ratio and aged sex ratio - for each of the 45 districts of the state as they existed at the time of the 2001 population census. Inter-district variations in the four indexes of ageing are presented in figures 9.5 through 9.8. It may be seen from these figures that the process of ageing varies widely across the districts of the state. This is expected because of the wide diversity in the level of social and economic development as well as in the stage of demographic transition across the districts of the state. Thus the proportion of the aged population varies widely across the districts (Figure 9.5). In Rajgarh, Shajapur, Sehore, Narsimhapur, Rewa and Bhind districts, aged population has been found to constitute more than 8 per cent of the total population enumerated at the 2001 population census. Out of these five districts, three districts - Rajgarh, Shajapur and Sehore constitute a geographical cluster. By contrast, in Sheopur, Gwalior, Shivpuri, Bhopal, Jhabua, Dhar, and Barwani, aged population has been found to constitute less than 6.5 per cent of the total population enumerated at the 2001 population census. Here again, the Sheopur,

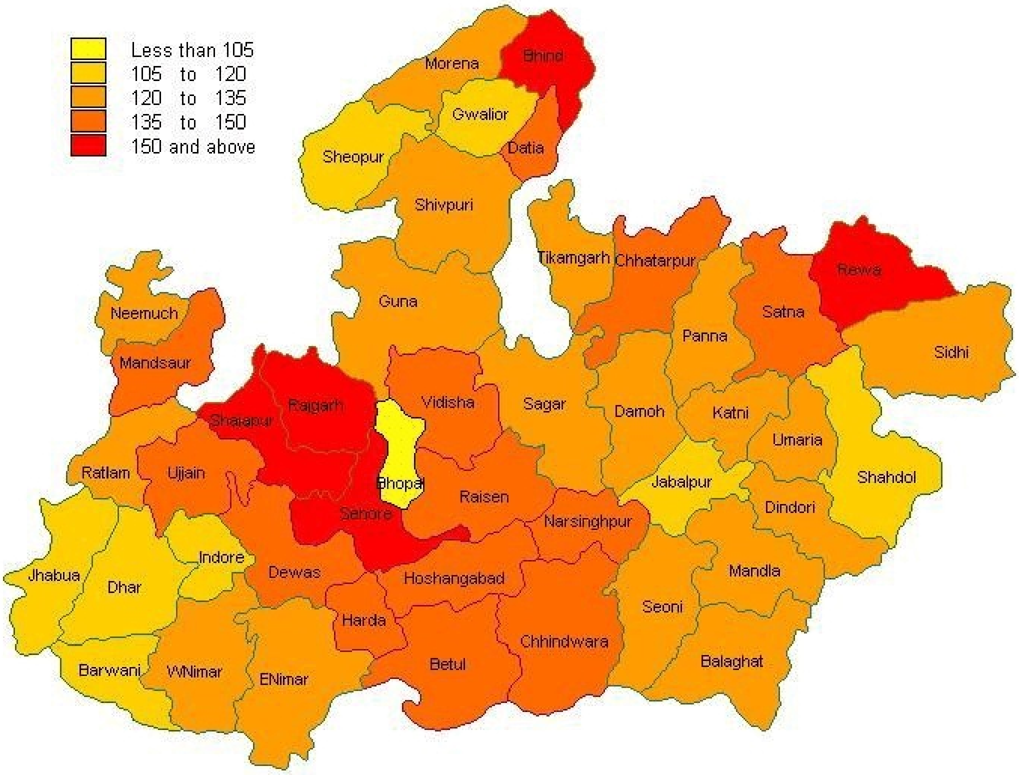
Figure 9.6
Ageing index in districts of Madhya Pradesh, 2001



Gwalior and Shivpuri districts and Jhabua, Dhar and Barwani districts constitute two geographically contiguous clusters as far as the proportion of the aged population is concerned. Reasons for a high proportion of the aged population in some districts and a low proportion in other districts are not known at present. In any case, the strong inter-district variations in the proportion of the aged population have some important social and economic implications in the context of meeting the basic needs of the aged population. Moreover, factors affecting ageing of the population at the district level merit attention in view of the observed inter-district diversity in the proportion of the aged population.

The inter-district variations in the index of ageing - the ratio of the population aged to the population young (in the age group 0-14 years) are presented in figure 9.6. There is only one district in the state - district Jhabua - where the ageing index has been found to be less than 12 per cent on the basis of the information available through the 2001 population census. By contrast, in eight districts - Neemuch, Mandsaur, Ujjain, Shajapur, Rajgarh Narsimhapur,

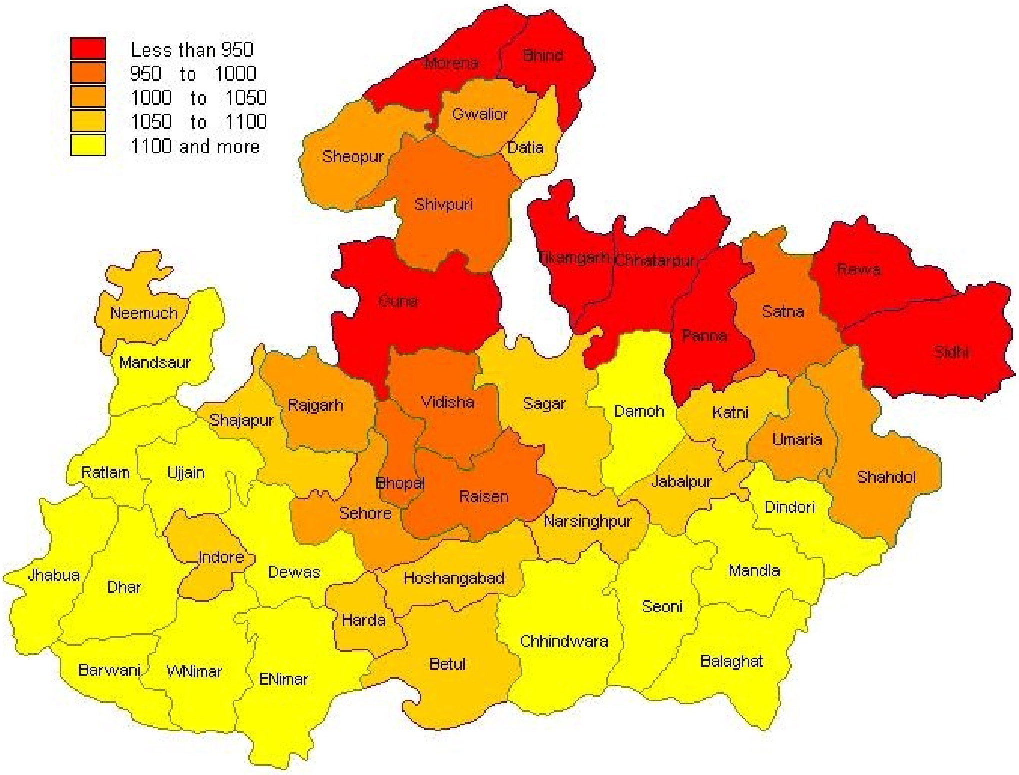
Figure 9.7
Aged dependency ratio in Madhya Pradesh, 2001



Jabalpur and Balaghat, the ageing index has been found to be more than 20 per cent. Ageing index has also been found to be quite low in Sheopur, Sidhi and Barwani districts. A low ageing index is reflective of the persistence of high fertility and high mortality because of which the young population remains large and the aged population remains small in numbers. On the other hand, a high ageing index is reflective of declining fertility and declining mortality as the result of which the young population decreases while the aged population increases. It is clear that in different districts of the state, the patterns and changes in the levels of fertility and mortality interact differently to affect the process of ageing. This observation suggests the need of exploring the interaction between fertility and mortality as they affect the process of population ageing.

Figure 9.7 highlights the inter-district variations in the aged dependency ratio which is the ratio of the aged population to the working age population (population in the age group 15-59 years). The aged dependency has been found to be relatively high in Shajapur, Rajgarh, Sehore, Rewa

Figure 9.8
Sex ratio of the aged population in Madhya Pradesh, 2001



and Bhind districts whereas it has been found to be low to very low in Bhopal, Sheopur, Gwalior, Jabalpur, Shahdol, Jhabua, Dhar, Indore and Barwani districts. Reasons for relatively low aged dependency in districts like Bhopal, Indore, Gwalior and Jabalpur may lie in the large scale in-migration of the working age population to these districts, especially in the urban areas of these districts from the neighbouring districts to earn a livelihood. Bhopal, Indore, Gwalior and Jabalpur districts have large to very large urban population. This reasoning also applies to Dhar and Shahdol where there is a lot of industrial activity attracting working age population as labourers and workers from the neighbouring districts thereby increasing the size of the working age population and hence decreasing the aged dependency ratio. Like many other aspects and issues associated with the ageing of the population, this aspect of population ageing needs to be explored further. One implication of the observed inter-district variation in the pattern of migration is that a low aged dependency in one district may be associated with a high aged dependency in the neighbouring districts because of the out migration of the working age population from the neighbouring districts.

Finally, figure 9.8 highlights the inter-district variations in the sex ratio of the aged population as estimated from the information available through the 2001 population census. The figure shows that the districts of the state can be grouped into two categories as regards the sex ratio of the aged population - districts where aged females out number aged males and districts where aged males out number aged females. There are ten districts in the state, all located in the northern part of the state, were aged males out number aged females and in some districts of this category, the aged sex ratio has been found to be highly unfavourable to aged females. This very unfavourable aged sex ratio reflects the low status accorded by the society to women in these districts. On the other hand, in the remaining districts of the state, aged females out number aged males. Interestingly, throughout the southern part of the state, aged females comprehensively out number aged males. This part of the state is dominated by the tribal population. It appears the tribal culture and the tribal way of life has some strong linkages with the sex ratio of the aged population. In these districts, the status accorded to the women is relatively better and this may be one of the factors in influencing the sex ratio of the aged population. Again, very little information is currently available about the factors influencing the sex ratio of the aged population.

Conclusions

Ageing or greying of the population appears to be an emerging demographic and development issue in Madhya Pradesh. In view of the projected future population growth and demographic transition, significant increase in the aged population in the state is inevitable in the next fifty years. At the same time, the age and sex structure of the aged population will undergo a substantive change. The increase in the number of aged people and the change in the age structure will have important social, psychological and economic implications. From the view point of the public policy, it is important that these and other implications of population ageing are explored objectively and findings are incorporated into human development planning process. It is high time that a process of transformation is initiated so that human development and welfare services either in public or private sector are readied to address the needs of the aged population which, obviously, are of very special nature. The first step in this direction is to sensitize the younger generation that the aged are not a social, economic and family liability. Rather population ageing is inevitable in view of the transition in the demographic process and therefore ways should be explored to ensure productive utilization of this group of population. The analysis also suggests that the time has come to recognise the social and economic implications of the inevitable population ageing and to develop suitable pension schemes, social security and health care systems, create economic opportunities for the aged and strengthen support systems to eliminate violence and discrimination, especially against aged women. A beginning should be made to introduce elements of the concerns for the aged in human development policies and programmes.

In the above context, there is a strong felt need of a detailed study of social and economic implications of ageing in Madhya Pradesh. The tradition of the aged co-residing with their family members is still very common in the state, especially in its large rural tracts and small towns. The aged, often provide help to their children's families, for example, caring for grandchildren. Yet the aged experience varying degrees of dependency on external support, especially in poor families or families with uncertain incomes. The current trend is that the traditional means of family support to the aged are steadily eroding. In such a situation, development of alternative systems of support to the aged is the need of the time.

An important issue in the development of the support system for the aged is their productive utilisation, especially, productive utilisation of the 'young' aged - people in the age group 60-69 years. It is obvious that the steady increase in the aged population will impose higher demand on the working-age population. This demand can be reduced only through productive utilisation of the aged population. The knowledge and experience of the aged can be effectively harnessed to keep them economically active.

There have been a number of efforts to evolve policies and programmes to improve the living conditions of the aged, especially in countries and societies where population ageing is fairly advanced. It would be useful to describe some of the best practices tried out to address the needs of ever growing aged population.

Community Participation. The need to ensure and provide opportunities for social integration and participation of the aged in their native communities has been emphasized by many as a 'pressing moral imperative' to boost the self confidence and morale of the aged and provide them with psychological security. In Bangladesh, forms of interaction range from the traditional *adda* (informal social gathering) to elders' clubs which combine recreational pursuits with loan collection and disbursement services, and also serve as centres for the mediation of disputes (Khan, 1998). In Cochin, association of the aged runs a day-care centre for the aged with dementia which provide the aged an enabling environment in addition to giving family members a break from their responsibilities (Help Age International 1998a; 1998b).

Income Security. A major concern for the aged is minimal or almost non-existent sources of social security and pension schemes. Majority of the aged are dependent upon the informal sector for income generation. In this context, small credit programmes have been found to have a good impact in many countries including India. Elders' group has also been found to own and manage the community's irrigation wells. In this way, the aged are taking new economic and social roles. In some states of India, National Old Age Pension Scheme has been launched (United Nations, 1994)

Health Care. Availability, access and affordability of quality health care services is perhaps the most pressing need of the aged. The problem turns particularly serious when the public health care delivery system is weak, inefficient and ineffective. To address the problem, the aged have been trained to become 'community gerontologists' in return for free health services and medicines in the Philippines. The community gerontologists perform basic check-ups and keep records (Masulit, 1998).

Family Support and Co-residence. Family, in India and many other countries continues to be the basis of the social structure where care of the old is perceived as a special family responsibility. The joint family system - the aged co-residing with their family members - has been the norm in Madhya Pradesh. However, the joint family system is being rapidly replaced by the nuclear families, especially in the urban areas. In such situations, the aged are left to fend for themselves without any family support. To cope with the problem, day-care homes and community-based programmes have been established for the aged. In Korea, a programme of voluntary home visits by the community members has been launched to support the aged in household tasks and to provide emotional and social support. In Singapore, education and training programme has been launched for informal care givers on the issues related to the aged including nutrition, exercise and communication skills.

Perhaps the most important challenge to evolving policies and programmes for the aged is to avoid viewing the aged as a 'problem'. One of the key lessons that can be learnt from the developed countries is that state sponsored programmes and activities cannot be sustained in the face of poverty, low allocation of public resources and rapid increase in the aged population. The need is to develop creative, community-based and affordable support system for the ever growing aged population that emphasize community and home-based care.

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Table 9.1

Trends and patterns of population ageing in Madhya Pradesh

Year	Population 60+		Ageing Index %	Aged dependency ratio %	Structure of the aged population (per cent)				
	Number (lakh)	%			60-64	65-69	70-74	75-79	80+
1961	11.64	5.01	12.14	9.30	46.61	17.96	15.88	9.11	10.44
1971	17.22	5.74	13.03	11.40	45.00	21.89	17.31	6.46	9.34
1981	24.47	6.41	15.39	12.40	41.93	21.64	19.34	7.33	9.76
1991	32.07	6.68	16.75	12.50	39.98	21.56	18.39	6.92	13.15
2001	42.81	7.11	18.41	13.10	36.74	25.76	19.08	8.24	10.18
2011	50.27	7.71	20.15	13.20	34.95	25.94	17.84	11.09	10.18
2021	69.04	8.31	28.52	13.30	34.89	26.26	17.91	11.09	9.85
2031	94.65	10.28	42.29	15.70	33.60	25.93	18.49	11.74	10.24
2041	127.25	12.69	55.63	19.70	32.64	25.37	18.59	12.19	11.21
2051	170.61	16.07	77.90	25.40	31.65	25.53	18.59	12.31	11.92

Source: For 1961, 1971, 1981, 1991 and 2001, Census of India.
For 2011 through 2051, Ranjan (2004)

Table 9.2

Life expectancy at age 60 in Madhya Pradesh

Period	Expectation of life at age 60 (years)		
	Combined	Male	Female
1970-75	14.30	13.20	14.80
1976-80	14.60	13.90	15.20
1981-85	14.45	13.48	15.48
1986-90	14.90	14.10	15.50
1991-95	15.00	14.50	15.30
1996-2000	15.00	14.80	15.30
2001-05	15.90	15.60	16.10
2002-06	16.10	15.80	16.30

Source: Government of India (1984)
Government of India (1986)
Government of India (1990)
Government of India (1994)
Government of India (1998)
Government of India (2004)
Government of India (2009)

Table 9.3

Patterns of population ageing in districts of Madhya Pradesh

State/District	Aged Population		Ageing Index	Aged Dependency Ratio	Aged Sex Ratio (F/M)
	Number	Proportion (%)			
Madhya Pradesh	4280924	7.11	18.411	131.095	1047
Sheopur	30944	5.54	12.829	108.097	1020
Morena	103499	6.51	15.710	125.185	866
Bhind	114384	8.02	20.356	152.571	877
Gwalior	104627	6.42	17.578	112.596	1032
Datia	46461	7.46	19.522	137.447	1088
Shivpuri	91641	6.38	15.433	122.134	966
Guna	112616	6.78	16.466	130.319	921
Tikamgarh	82674	6.88	17.120	129.951	940
Chhatarpur	107396	7.29	17.605	142.142	867
Panna	58062	6.79	16.621	129.673	936
Sagar	144264	7.15	18.290	132.947	1071
Damoh	77146	7.13	18.433	131.608	1117
Satna	137835	7.39	18.629	139.472	953
Rewa	159128	8.08	19.848	157.638	940
Umaria	33850	6.57	16.670	121.652	1014
Shahdol	102589	6.52	17.560	115.723	1044
Sidhi	118998	6.51	14.957	130.148	938
Neemuch	54672	7.54	21.542	131.153	1085
Mandsaur	91983	7.78	21.672	138.192	1111
Ratlam	84287	6.95	18.535	125.039	1167
Ujjain	131343	7.76	21.584	138.021	1132
Shajapur	107658	8.35	21.896	156.043	1056
Dewas	96337	7.41	19.131	137.479	1138
Jhabua	72212	5.18	11.293	105.885	1162
Dhar	108460	6.25	15.415	117.375	1196
Indore	167746	6.82	20.441	114.129	1072
West Nimar	105943	6.93	17.297	130.833	1190
Barwani	58572	5.49	12.291	110.101	1141

State/District	Aged Population		Ageing Index	Aged Dependency Ratio	Aged Sex Ratio (F/M)
	Number	Proportion (%)			
East Nimar	121168	7.08	18.165	131.331	1146
Rajgarh	104844	8.38	21.588	158.727	1011
Vidisha	90671	7.50	18.475	144.588	959
Bhopal	113657	6.18	17.758	104.749	973
Sehore	86695	8.05	19.909	156.161	1027
Raisen	81940	7.29	18.153	138.768	971
Betul	106603	7.65	20.003	141.360	1059
Harda	36343	7.68	19.478	145.158	1073
Hoshangabad	82060	7.59	20.711	136.164	1060
Katni	72842	6.86	18.288	123.362	1061
Jabalpur	149994	6.98	21.138	116.402	1099
Narsimhapur	77779	8.13	22.980	143.925	1070
Dindori	42887	7.39	20.223	131.955	1150
Mandla	64184	7.25	19.944	128.609	1236
Chhindwara	144529	7.83	20.948	142.764	1152
Seoni	83639	7.18	19.125	129.803	1189
Balaghat	115762	7.74	22.159	134.872	1209

Source: Census 2001

PATTERNS OF FERTILITY

Introduction

Madhya Pradesh is one of the eight states of India where the total fertility rate was estimated to be more than 3 live births per woman of reproductive age around the year 2005 against the national average of 2.68 according to the National Family Health Survey 2005-06 (IIPS and Macro International, 2007). Latest estimates available through the sample registration system suggests that the total fertility rate in Madhya Pradesh was 3.3 live births per woman of reproductive age in the year 2008, well above the national average of 2.6. Madhya Pradesh has always ranked amongst the five highest fertility states among the major states of India since 1970. It is clear that the state is going to miss the goal of achieving the replacement fertility by the year 2011 as stipulated in the Madhya Pradesh Population Policy 2000 (Government of Madhya Pradesh, 2000). Population projections prepared by the Government of India suggest that there is little probability of achieving the replacement fertility in the state before 2025 (Government of India, 2006).

Despite persistent unacceptably high levels of fertility, an understanding about fertility patterns and differentials in the state is at best perfunctory, largely limited to state averages. At the state level, estimates of fertility are available through the sample registration system and through the National Family Health Survey. At the district level, however, the only source of information for assessing levels, trends and differentials in fertility is the decennial population census. Information about children ever born per married woman and number of births per married woman during 12 months prior to the census can be used to generate indicators of fertility

(United Nations, 1983). Using this approach, the Census Commissioner and Registrar General of India has prepared district level estimates of fertility for the districts of Madhya Pradesh on the basis of 1981 and 1991 population census. In this paper, we analyse fertility patterns in the districts of the state on the basis of the information available through the 2001 population census. Information available through the 2001 population census permits estimation of fertility by religion and caste as well as by the education of the mother which provides an opportunity to analyse fertility differentials by religion and social class and by the education of the mother across the districts.

The paper is organised as follows. The next section of the paper presents the methodology used for estimating fertility at the district level and a comparison of state level estimates of fertility derived in this paper with estimates available from other sources, particularly the sample registration system and the National Family Health Survey. The third section of the paper presents district level estimates of fertility and fertility differentials by religious and caste groups, and by the education of the mother for every district of the state separately for the total as well as rural and urban population. The sixth and the last section of the paper summarises findings of the analysis and argues for a district level approach to hasten the pace of fertility transition in the state.

Methodology

The paper employs the relational Gompertz technique for estimating total fertility rate from data on children ever born and live births during one year prior to the census. The relational Gompertz model was first proposed by Brass (1978) and subsequently developed by Booth (1980, 84) and Zaba (1981). The model provides an estimate of total fertility rate based on each five-year age group in the childbearing ages. Actual calculations were performed using the spreadsheet templet REL-GMPZ developed by United States Bureau of Census (Arriaga, 1994).

The relational Gompertz fertility model essentially assumes that the ratio $F(x)/TF$ follows a Gompertz distribution function, whose form is

$$F(x)/TF = \exp(A \exp(Bx)) \qquad (1)$$

where $F(x)$ is the cumulated fertility up to age x and TF is the total fertility, the ratio $F(X)/TF$ is the proportion of total fertility experienced up to age x and A and B are the parameters of the model, $A<0$. This expression can be reduced to a linear function of x in the following manner:

$$-\ln(-\ln(F(x)/TF)) = \ln(-A)+Bx, \text{ or}$$

$$\eta(F(x)) = \ln(-A)+Bx. \qquad (2)$$

This model approximates the observed $F(x)/TF$ fairly well over central ages of the child bearing period but its fit deteriorates at the extremes. Brass discovered that a better fit can be obtained by substituting for age variable x a function of x that can be interpreted as an η transformation of a specific standard fertility schedule. Accordingly, equation (3) can be transformed into

$$\eta(F(x)) = \alpha+\beta\eta(F_s(x)) \qquad (3)$$

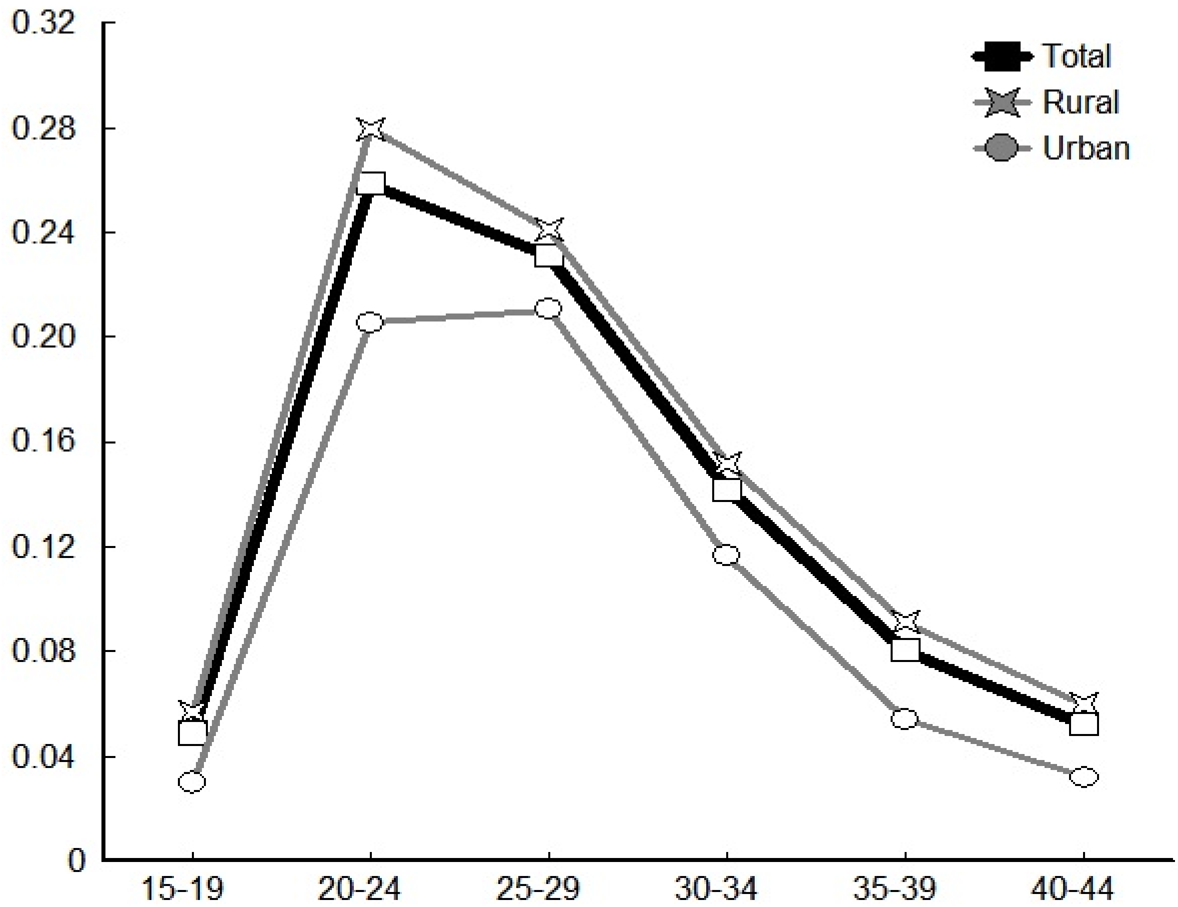
The application of relational Gompertz model provides estimates of total fertility rate only. In order to obtain estimates of age specific fertility rates, we make pro-rata adjustments in the age specific fertility rates obtained on the basis of live births reported during one year prior to the census on the basis of the total fertility rate estimated through the application relational Gompertz model. We assume that the distribution of fertility by age is invariant of the level of fertility. Unlike other approaches, this approach retains the age structure of fertility specific to the district as well as specific to different population groups.

Fertility in Madhya Pradesh

Estimates of fertility for the state are presented in table 10.1 for the total population and for different population sub-groups. Our estimation exercise suggests that, around the year 2001, total fertility rate in Madhya Pradesh was around 4.3 live births per woman of reproductive age. Among different religious groups, fertility has been estimated to be the highest among Muslims followed by Hindus. Among the Hindus, total fertility rate has been estimated to be the highest among Scheduled Tribes. Table 10.1 also suggests that education of the mother has a strong negative impact on fertility. Similarly, fertility has been estimated to be invariably higher in rural than in urban areas of the state.

Estimates of total fertility rate for the year 2001 are also available through the sample registration system for the undivided Madhya Pradesh as it existed before 1 November 2000. According to these estimates, the total fertility rate in the undivided Madhya Pradesh was around 3.9 live births per woman of reproductive age - 4.3 in the rural areas and 2.5 in the urban areas (Government of India, 2004). Our estimates, based on the 2001 population census, appear to be higher than that available through the sample registration system because of at least two reasons. First, it is well known that there is some under reporting in the sample registration system so that the estimates of total fertility rate obtained through the system are underestimates of the prevailing situation. Second, the estimates available through the sample registration system are for the undivided Madhya Pradesh whereas estimates of total fertility rate presented here are for the existing Madhya Pradesh. The undivided Madhya Pradesh as it existed prior to 1 November 2000 was

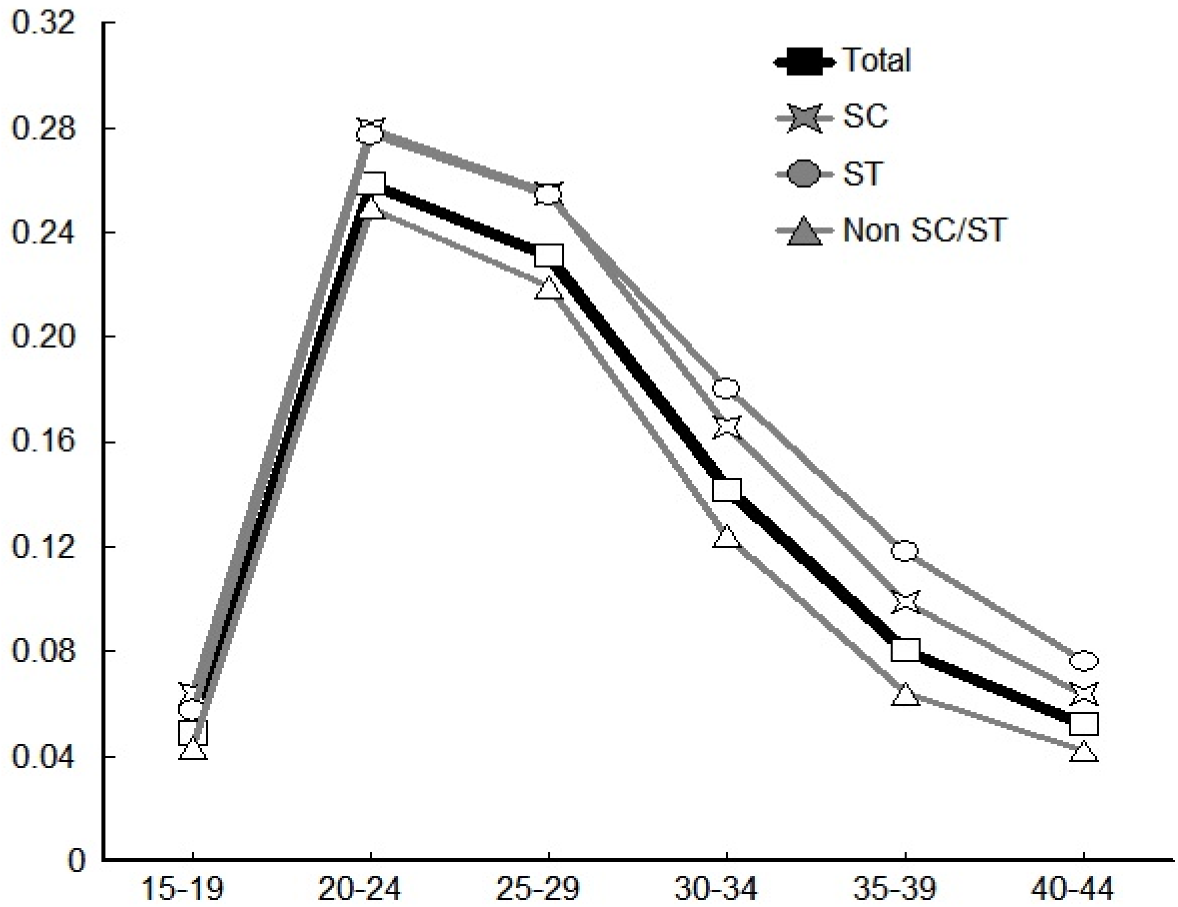
Figure 10.1
Age specific fertility rates by residence



divided into the existing state of Madhya Pradesh and the state of Chhattisgarh on 1 November 2000. The south-eastern part of undivided Madhya Pradesh, which now constitutes the state of Chhattisgarh had the lowest fertility in the undivided Madhya Pradesh (Government of Madhya Pradesh, 2000). As such, fertility in the existing Madhya Pradesh is expected to be marginally higher than fertility in the undivided Madhya Pradesh. This observation is also supported by the regional estimates of total fertility rate available through the National Family Health Survey, 1998-99 according to which, the total fertility rate in the Chhattisgarh region of the undivided Madhya Pradesh was well below the total fertility rate in other regions of the state (IIPS and ORC Macro, 2001).

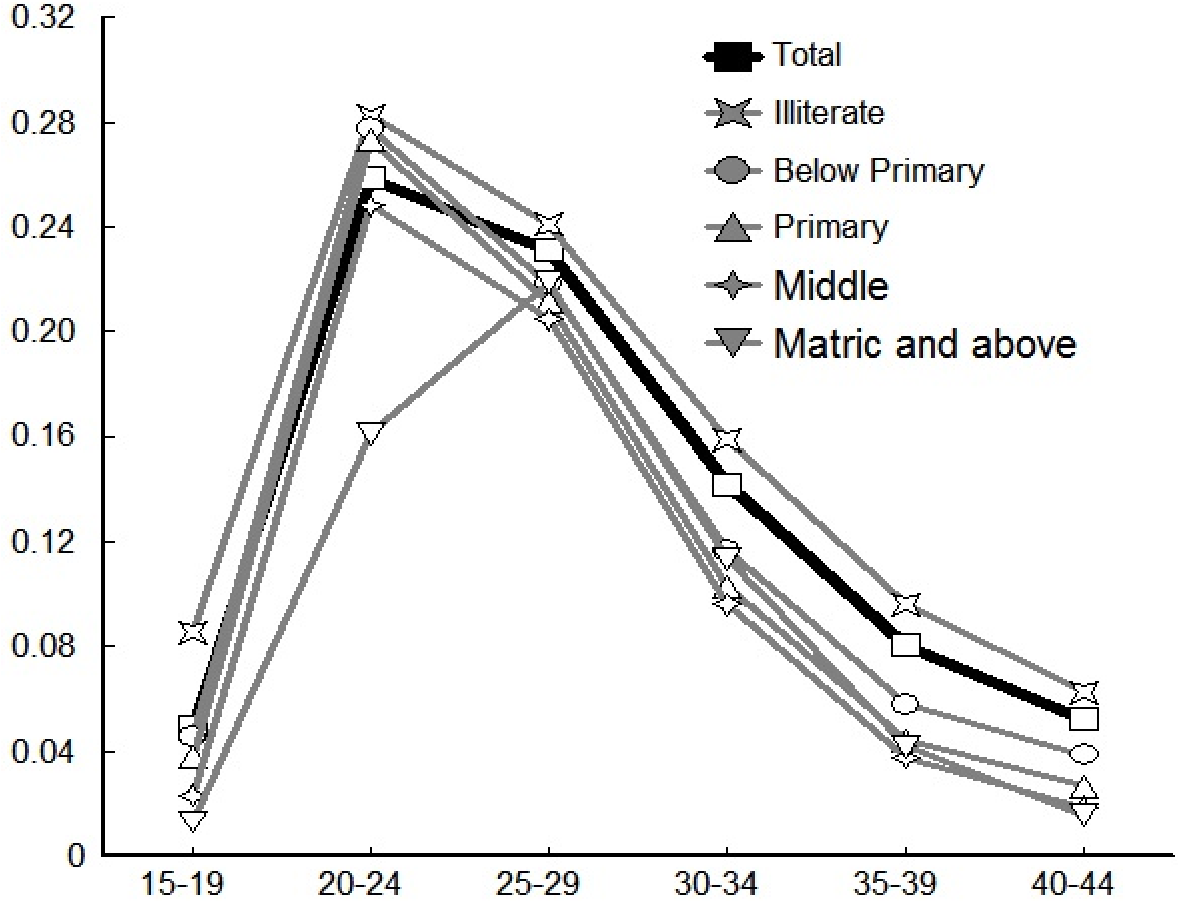
The age specific fertility rates for the state as a whole and for different population groups within the state are presented in table 10.2 and depicted in figure 10.2 which suggests that the age pattern of fertility varies across different population groups. In order to characterise the variation

Figure 10.2
Age specific fertility rates by social class



in the age pattern of fertility across different population groups, we have compared the age pattern of fertility in a population group with the age pattern of fertility of the state as a whole. This comparison is done by fitting the relational Gompertz fertility model with the age pattern of fertility of the state as a whole taken as the standard. Thus the parameters α and β of the relational Gompertz model characterise the age pattern of fertility of a population group relative to the age pattern of fertility for the state as a whole. It is well known that the parameter α is taken as determining the age location of fertility schedule or, more specifically, the age by which half of the childbearing occurs while β is interpreted as determining the spread or degree of concentration of fertility (United Nations, 1983). When the two age patterns of fertility are exactly same, α=0 and β=1. When α<0 for a population group, fertility of that population group is younger than the standard population - state in this case - and vice versa. Similarly, when β>1 for a population group, fertility of that population group is wider than that of the standard (Zaba, 1981).

Figure 10.3
Age specific fertility rates by education of the mother



Estimates of the parameters α and β for different population groups in Madhya Pradesh are given in table 10.3 along with the mean age at child bearing. Variation in the values of α and β across different population groups reflect the difference in the age pattern of fertility. For example, compared to the age pattern of fertility for the state as a whole, the age pattern of fertility in the rural areas of the state is characterised by a relatively higher value of α but a lower value of β. By contrast, the value of α in the urban population is relatively low but the value of β is relatively high. In other words, the age location of fertility schedule in the urban areas is younger than that in the rural areas. Similarly, fertility is concentrated more around the age location of fertility schedule in the urban areas as compared to rural areas. This observation is also verified by the mean age at childbearing which is higher in the rural areas and lower in the urban areas.

Figures 10.2 and 10.3 also suggest that the age pattern of fertility in Madhya Pradesh varies by religious and castes groups as well as by the educational status of the mother. It is also apparent that the age pattern of fertility in urban women is very similar to that in women of other religions and in women having at least matric level education. In all these population groups, the value of α is negative but the value of β is greater than 1. A negative value of α implies that the age location of fertility is shifted to the younger ages whereas a value of β greater than 1 indicates a relatively higher concentration of fertility around the age location of fertility. This pattern is reflective of a relatively advanced stage of fertility transition. By contrast, in rural women and in women belonging to Hindu religion, the value of α is positive but the value of β is less than 1which reflect a fertility regime which is in an earlier stage of transition than the standard one.

In case of fertility by the education of the mother, the age pattern of fertility in mothers who are educated at least up to matric level is contrastingly different from the age pattern of fertility in mothers who are either illiterate or having education below matric. In case of illiterate mothers as well as in case of mothers having education below matric, the value of α has been estimated to be positive while the value of β has been estimated to be greater than 1. This means that the age location of fertility in mothers having education below matric is shifted towards older ages and there is relatively more concentration of fertility around the age location of fertility schedule. The mothers having at least matric level education, $\alpha<0$ which indicates that fertility in educated mothers is younger than the state average.

Fertility Across Districts

We have also estimated fertility for different population groups in each of the 45 districts of the state as they existed at the time of 2001 population census. Summary measures of the distribution of the total fertility rate across the districts of the state are given in table 10.4 which suggest that there is considerable inter-district variations in the total fertility rate within the same population group. For example, the total fertility rate varies from a low of 3.545 to a high of 5.523 children per woman of reproductive age across the districts of the state. Similarly, the total fertility rate varies from a low of 2.858 to a maximum of 5.063 in the urban areas across the districts. The coefficient of variation, given in table 10.4, provides an idea of inter-district variability in the total fertility rate in different population groups. The inter-district variability in the total fertility rate is found to be higher in urban as compared to rural areas of the state. Similarly, the inter-district variability in the total fertility rate is very high in women of other religions as compared to Hindu and Muslim women. Among different castes, inter-district variability is higher in Scheduled Tribes as compared to Scheduled Castes and non Scheduled Castes/Tribes. On the other hand, inter-district variability has been found to be the highest in women with at least matric level education.

In order to characterise the age pattern of fertility across districts, we have estimated parameters of the relational Gompertz model with the state level age specific fertility schedule as standard. Estimates of the parameters model along with estimates of the mean age at child bearing are given in table 10.5. The parameter α of the relational Gompertz model varies from -0.163 in district Sheopur to 0.144 in district Dewas whereas the parameter β varies from 0.890 in district Indore to 1.173 in district Balaghat. Wide variations in parameters α and β of the relational Gompertz model across the districts of the state indicate that not only the level of fertility but also the age pattern of fertility varies widely across the districts.

Table 10.6 classifies districts of the state on the scale of parameters α and β. District Indore has a relatively high value of α but a low value of β so that the mean age at child bearing in the district is estimated to be more than 28.8 years. The total fertility rate in district Indore has been estimated to be around 3.3 births per woman of reproductive age. This implies that the age pattern of fertility in district Indore is a dispersed one along with the fact that the total fertility rate in the district is the lowest in the state. By contrast, the value of α is very low while the value of β is very high in district Balaghat so that the mean age at child bearing in the district is around 28.7 years. The total fertility rate in district Balaghat is also amongst the lowest in the country but the age pattern of fertility in district Indore and district Balaghat is essentially different as is reflected from the values of α and β.

Values of α and β are not related. They basically reflect the two dimensions of the age pattern of fertility - the dimension of location and the dimension of dispersion. The age pattern of fertility of a district A is more dispersed than that in district B irrespective of the value of α if the value of β is smaller in district A as compared to district B. In this context, the age pattern of fertility in district Indore is more dispersed than that of district Balaghat. On the other hand the location of the age pattern of fertility in district A is younger than that in district B irrespective of the value of β if the value of α in district A is smaller than that in district B. In this context, the age at which half of the fertility occurs in district Balaghat is much younger than that in Indore. Thus in district Balaghat, half of the fertility occurs at a very young age and the fertility is heavily concentrated around this age whereas in district Indore half of the fertility occurs at an older age and the fertility is not concentrated around this age. The two districts have contrasting age pattern of fertility despite very similar levels of total fertility rate and mean age at child bearing. This means that the approach towards fertility reduction should be different in district Indore as compared to district Balaghat. The contrasting age pattern of fertility across the districts of the state calls for a district based approach of reducing fertility levels. Such a decentralised approach is missing at present.

Conclusions

Estimates of fertility derived from the information available through the 2001 population census indicate that not only the level but also the age pattern of fertility varies widely across different population groups in the state as well as across districts. This suggests that there are district specific factors that influence fertility across all population groups within the same district. Because of these district specific factors, the age pattern of fertility also varies widely across the districts.

The foregoing analysis suggests that there is a need of a district specific approach to hasten the pace of fertility transition in the state. It is important that the factors influencing fertility and the age pattern of fertility are identified at the district level and, accordingly, local situation specific policies and programmes of fertility transition are evolved and implemented. The current approach of fertility reduction is essentially normative in scope that does not take into account district specific factors that largely determine the level and the age pattern of fertility as revealed in the present analysis.

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Table 10.1

Levels and differentials in total fertility rate in Madhya Pradesh, 2001

Population group	Combined	Rural	Urban
Total	4.273	4.622	3.414
Scheduled Castes	4.864	5.11	4.205
Scheduled Tribes	5.071	5.132	4.245
Non Scheduled Castes/Tribes	3.896	4.295	3.182
Hindu	4.285	4.599	3.366
Muslim	4.591	5.302	4.23
Other religion	3.325	4.171	2.502
Illiterate	4.86	4.909	4.623
Below Primary	3.947	3.979	3.827
Primary	3.62	3.697	3.494
Middle	3.266	3.424	3.116
Matric and above	2.918	3.806	2.601

Source: Author’s calculations

Table 10.2

Age patterns of fertility in Madhya Pradesh, 2001

Population group	Age						
	15-19	20-24	25-29	30-34	35-39	40-44	45-49
				Total			
Total	0.049	0.258	0.231	0.142	0.081	0.052	0.041
Scheduled Castes	0.064	0.280	0.255	0.166	0.099	0.064	0.045
Scheduled Tribes	0.057	0.277	0.254	0.180	0.118	0.076	0.051
Others	0.043	0.249	0.219	0.124	0.064	0.042	0.037
Hindu	0.051	0.260	0.230	0.141	0.081	0.053	0.041
Muslim	0.038	0.259	0.258	0.169	0.094	0.058	0.042
Others	0.020	0.190	0.225	0.120	0.052	0.027	0.031
Illiterate	0.086	0.282	0.241	0.159	0.096	0.063	0.045
Below Primary	0.046	0.278	0.218	0.117	0.058	0.039	0.035
Primary	0.038	0.273	0.211	0.103	0.044	0.027	0.028
Middle	0.023	0.248	0.205	0.096	0.038	0.019	0.025
Matric and above	0.013	0.161	0.219	0.114	0.042	0.015	0.020
				Rural			
Total	0.057	0.279	0.241	0.152	0.091	0.060	0.044
Scheduled Castes	0.072	0.289	0.262	0.174	0.109	0.069	0.046
Scheduled Tribes	0.058	0.280	0.256	0.182	0.121	0.078	0.052
Others	0.053	0.279	0.231	0.133	0.073	0.049	0.040
Hindu	0.058	0.278	0.239	0.151	0.091	0.060	0.044
Muslim	0.050	0.299	0.281	0.191	0.116	0.074	0.049
Others	0.030	0.265	0.251	0.142	0.071	0.040	0.035
Illiterate	0.084	0.281	0.242	0.162	0.101	0.066	0.046
Below Primary	0.045	0.276	0.220	0.119	0.061	0.040	0.035
Primary	0.038	0.272	0.216	0.108	0.048	0.029	0.028
Middle	0.026	0.252	0.212	0.106	0.044	0.021	0.022
Matric and above	0.021	0.229	0.264	0.135	0.058	0.029	0.025
				Urban			
Total	0.030	0.205	0.211	0.116	0.054	0.032	0.034
Scheduled Castes	0.046	0.255	0.240	0.140	0.072	0.046	0.043
Scheduled Tribes	0.048	0.241	0.235	0.150	0.084	0.051	0.04
Others	0.025	0.192	0.201	0.109	0.049	0.028	0.032
Hindu	0.031	0.206	0.207	0.112	0.052	0.031	0.034
Muslim	0.032	0.240	0.249	0.157	0.082	0.048	0.039
Others	0.007	0.117	0.202	0.098	0.034	0.015	0.028
Illiterate	0.095	0.288	0.233	0.141	0.075	0.049	0.043
Below Primary	0.046	0.277	0.213	0.108	0.050	0.034	0.038
Primary	0.035	0.267	0.202	0.097	0.041	0.025	0.031
Middle	0.019	0.235	0.196	0.089	0.036	0.019	0.030
Matric and above	0.009	0.13	0.203	0.108	0.039	0.013	0.019

Source: Author’s calculations

Table 10.3

Parameters of the age patterns of fertility across population groups in Madhya Pradesh, 2001

Population group		α	β	Mean age at child bearing
Total		0.000	1.000	29.073
Residence	Rural	0.005	0.990	29.105
	Urban	-0.012	1.042	28.911
Religion	Hindu	0.006	0.980	29.046
	Muslim	-0.099	0.998	29.490
	Others	-0.069	1.115	29.001
Caste	Scheduled Castes	-0.006	0.996	29.191
	Scheduled Tribes	-0.089	0.947	29.759
	Others	0.048	1.065	28.731
Education	Illiterate	0.071	1.033	28.871
	Below primary	0.118	1.043	28.249
	Primary	0.177	1.100	27.750
	Middle	0.135	1.114	27.754
	Matric and above	-0.082	1.160	28.652

Source: Author’s calculations

Table 10.4

Summary measures of inter-district variations in total fertility rate in Madhya Pradesh, 2001

Population		Min	Q_1	Med	Q_3	Max	Mean	SD	CV
Total	Total	3.317	3.757	4.234	4.555	5.221	4.185	0.546	0.13
	Rural	3.545	4.201	4.628	4.917	5.523	4.577	0.460	0.1
	Urban	2.858	3.313	3.744	4.136	5.063	3.771	0.609	0.162
				Religion					
Hindu	Total	3.292	3.956	4.416	4.676	5.239	4.326	0.495	0.114
	Rural	3.561	4.223	4.642	4.898	5.498	4.594	0.445	0.097
	Urban	2.847	3.240	3.517	3.752	4.474	3.513	0.402	0.115
Muslim	Total	3.370	4.225	4.687	4.928	6.063	4.634	0.594	0.128
	Rural	3.525	4.668	5.157	5.595	6.576	5.137	0.718	0.140
	Urban	3.207	3.900	4.355	4.651	5.382	4.285	0.498	0.116
Others	Total	2.351	2.830	3.124	3.663	5.504	3.346	0.728	0.218
	Rural	2.913	3.497	3.939	4.620	7.510	4.165	0.901	0.216
	Urban	1.977	2.355	2.550	2.765	3.689	2.588	0.327	0.126
				Caste					
Scheduled Castes	Total	3.149	4.336	4.718	5.116	5.947	4.727	0.597	0.126
	Rural	3.186	4.625	5.056	5.217	6.110	4.945	0.580	0.117
	Urban	2.982	3.971	4.382	4.870	6.010	4.417	0.686	0.155
Scheduled Tribes	Total	3.759	4.571	5.050	5.719	6.301	5.097	0.693	0.136
	Rural	3.809	4.901	5.351	5.859	6.345	5.307	0.657	0.124
	Urban	3.125	4.197	4.480	5.155	6.027	4.583	0.702	0.153
Others	Total	3.002	3.428	3.717	4.054	4.746	3.800	0.477	0.126
	Rural	3.410	3.842	4.191	4.482	5.097	4.195	0.414	0.099
	Urban	2.690	3.097	3.494	3.866	4.826	3.534	0.571	0.162

Population		Min	Q_1	Med	Q_3	Max	Mean	SD	CV
				Education of the Mother					
Illiterate	Total	3.832	4.512	4.884	5.157	5.617	4.833	0.443	0.092
	Rural	3.853	4.558	4.945	5.184	5.705	4.878	0.451	0.092
	Urban	3.576	4.339	4.605	4.942	5.535	4.630	0.418	0.090
Below Primary	Total	3.406	3.829	3.976	4.207	4.497	3.998	0.269	0.067
	Rural	3.423	3.847	4.054	4.240	4.528	4.034	0.275	0.068
	Urban	3.248	3.697	3.949	4.154	4.416	3.916	0.266	0.068
Primary	Total	3.224	3.465	3.629	3.871	4.072	3.650	0.234	0.064
	Rural	3.245	3.502	3.705	3.904	4.158	3.709	0.243	0.066
	Urban	3.041	3.390	3.526	3.762	4.128	3.554	0.243	0.068
Middle	Total	2.947	3.093	3.245	3.472	3.847	3.300	0.221	0.067
	Rural	3.007	3.215	3.397	3.608	4.007	3.408	0.232	0.068
	Urban	2.873	3.013	3.174	3.336	3.605	3.180	0.202	0.063
Matric and above	Total	2.377	2.704	3.066	3.277	4.294	3.094	0.459	0.148
	Rural	2.820	3.422	3.711	4.237	5.918	3.858	0.698	0.181
	Urban	2.116	2.490	2.733	2.908	3.511	2.724	0.293	0.108

Source: Author's calculations

Table 10.5

Estimates of TFR, MACB and parameters of relational Gompertz model, 2001

District	TFR	α	β	MACB
Balaghat	3.449	-0.066	1.173	28.734
Barwani	5.221	0.004	0.957	29.258
Betul	4.002	-0.093	1.068	29.218
Bhind	4.517	0.023	0.946	29.149
Bhopal	3.414	-0.062	1.076	29.137
Chhatarpur	5.100	-0.040	0.990	29.481
Chhindwara	3.865	0.032	1.135	28.354
Damoh	4.544	0.131	1.023	28.238
Datia	4.555	0.114	0.977	28.483
Dewas	4.518	0.144	0.943	28.350
Dhar	4.445	0.044	0.930	29.018
Dindori	3.763	0.018	0.971	29.001
East Nimar	4.296	0.004	1.028	28.896
Guna	4.806	-0.080	0.954	29.777
Gwalior	3.832	0.007	0.996	28.968
Harda	4.610	0.031	1.020	28.794
Hoshangabad	4.113	0.004	1.072	28.739
Indore	3.317	0.084	0.890	28.819
Jabalpur	3.420	0.029	1.032	28.652
Jhabua	4.964	-0.151	0.960	30.261
Katni	4.317	-0.059	1.057	29.246
Mandla	3.754	0.074	1.040	28.389
Mandsaur	3.984	0.072	1.003	28.623
Morena	4.987	0.010	0.941	29.268
Narsimhapur	3.904	0.133	0.980	28.248
Neemuch	3.819	0.095	1.025	28.445
Panna	4.754	-0.086	1.008	29.653
Raisen	4.349	-0.092	1.034	29.517
Rajgarh	4.234	-0.090	0.970	29.789
Ratlam	4.195	0.039	0.970	28.947
Rewa	4.704	-0.060	1.008	29.492
Sagar	4.503	0.005	1.040	28.974
Satna	4.628	-0.036	1.018	29.276
Sehore	4.492	-0.058	1.008	29.359
Seoni	3.845	0.060	1.107	28.286
Shahdol	4.021	-0.015	1.014	29.154
Shajapur	4.295	0.108	1.021	28.420
Sheopur	4.887	-0.163	0.982	30.255
Shivpuri	5.098	-0.034	0.948	29.548
Sidhi	4.952	-0.079	0.983	29.753
Tikamgarh	4.990	0.139	0.968	28.405

District	TFR	α	β	MACB
Ujjain	4.053	0.136	0.937	28.419
Umaria	4.426	-0.068	1.047	29.349
Vidisha	4.697	-0.098	0.993	29.763
West Nimar	4.457	0.095	0.996	28.456

Source: Author's calculations

Table 10.6

Classification of districts of Madhya Pradesh by parameters α and β of the relational Gompertz fertility model

β / α	<0.90	0.90/0.95	0.95/1.00	1.00/1.05	1.05/1.10	>=1.10
< -0.10			Sheopur Jhabua			
-0.10/-0.05			Vidisha Rajgarh Guna Sidhi	Raisen Panna Umaria Rewa Sehore	Betul Katni Bhopal	Balaghat
-0.05/0.00		Shivpuri	Chhatarpur	Satna Shahdol		
0.00/0.05		Morena Bhind Dhar	Barwani Gwalior Dindori Ratlam	East Nimar Sagar Jabalpur Harda	Hoshangabad	Chhindwara
0.05/0.10	Indore		West Nimar	Mandsaur Mandla Neemuch		Seoni
>=0.10		Ujjain Dewas	Datia Narsimhapur Tikamgarh	Shajapur Damoh		

Source: Author's calculations

Child Mortality
Levels, Trends, Determinants

Introduction

The risk of death during infancy and early childhood is a very sensitive indicator of social and economic development and quality of life. Reduction in infant and child mortality is one of the eight Millennium Development Goals identified by the United Nations as the development agenda for the 21st Century (United Nations, 2000). Infant and child mortality is also used as a measure of average population health (International Monetary Fund, 2000, UNICEF, 2001) and in analysing gaps in health outcomes between the poor and the better-off (Gwatkin et al, 2000; Wagstaff, 2000).

Infant and child mortality in Madhya Pradesh has been amongst the highest in India right since Independence. However, very little information is available about patterns and differentials in infant and child mortality within the state. It is however not clear how child mortality varies across different population groups and across the administrative units within the state. An understanding of the within state variations in infant and child mortality is expected to contribute to accelerated improvements in the probability of survival in the first five years of life.

In this paper, we present estimates of infant and child mortality for the districts of Madhya Pradesh based on the information available through the 2001 population census. Estimates of infant and child mortality for the districts of state have been estimated by the Registrar General and Census Commissioner of India on the basis of the information data available through the 1981, 1991 and 2001 population census (Government of India, 1997; 2009). Registrar General and Census Commissioner of India, however does not provide estimates of infant and child mortality by social class for the districts of the state. In this paper, we present estimates of infant and child mortality for districts of the state as they existed at the 2001 population census separately for the total population as well as for different population sub-groups - Scheduled Castes, Scheduled Tribes and non Scheduled Castes/Tribes. These estimates highlight the social class disparities in child survival in the state and in its constituent districts.

Methodology

There are many sources of information to estimate infant and child mortality. The gold standard is the vital registration system and the demographic surveillance system. However, the demographic surveillance system does not exist in Madhya Pradesh and under-reporting in the vital registration system is very substantial so that information available through the vital registration system is not suited to provide reliable estimates of infant and child mortality.

The second source of information to estimate infant and child mortality is the household survey. It is possible to estimate infant and child mortality from the fertility histories of women in the reproductive age group collected during the household survey. In Madhya Pradesh, district level household surveys have been carried out under the Reproductive and Child Health Project of the Government of India. However, detailed fertility history of reproductive age women interviewed has not been collected in these surveys. Moreover, the sample on the basis of which these surveys are undertaken is too small to provide reliable information to estimate infant and child mortality at the district level and for different social classes within the district.

Infant and child mortality can also be estimated on the basis of the information on children ever born and children surviving available through the population census. It is well known that the proportions of children ever born who have died are indicators of child mortality and yield robust estimates of infant and child mortality. Brass was the first to develop a procedure for converting proportions dead of children ever born reported by women in the reproductive age group into estimates of the probability of dying before attaining certain exact childhood age (Brass, 1964). Brass also observed that the relationship between the proportion of dead of the ever born children and a life-table probability measure is primarily determined by the age pattern of fertility (Brass, 1975).

The method developed by Brass is based on certain assumptions. The first assumption is that the risk of death of a child is the function of the age of the child only and not of other factors such as mother's age and birth order of the child. The second important assumption is that fertility and mortality levels have remained constant in the recent past. The method proposed by Brass essentially comprises of calculating multiplier which when multiplied with the proportion of dead children gives the probability of dying between birth and a given exact age. These multipliers are meant to adjust for non-mortality factors determining the proportion of dead children ever born. Another set of multipliers were developed by Sullivan (1972), Trussell (1975) and Palloni and Heligman (1985) to improve the flexibility of the original Brass approach. In order to circumvent the problem of changing fertility and mortality, multipliers have also been estimated to calculate the time reference of the probability of death using model life tables.

Using the multipliers developed by Palloni and Heligman, and by Trussell, United Nations Population Division has developed the routine CEBCS as part of the MORTPAK software package to calculate the probability of death in the first year of life and the probability of death between ages 1 to 5 years (United Nations, 1988; 1988a). The two probabilities can be combined to estimate the probability of death in the first five years of life.

Estimation of infant and child mortality on the basis of children ever born and children surviving data requires assumption about the model life table to be adopted for estimation as multipliers used for converting the proportion of dead children ever born into probability of dying are different for different model life tables. In the present paper, we have used the South Asian model life table which is based on the actual mortality experience of South Asian countries including India (United Nations, 1982).

Data Source

The estimates of infant and child mortality presented in this paper are based on the information on children ever born and children surviving collected from all currently married women at the 2001 population census. This information is usually associated with a number of errors of mis-classification and non-reporting. One approach of ascertaining the consistency the data available through the population census is to calculate the sex ratio of children ever born by the age of the mother. Ideally, these sex ratios should not vary systematically with age and they should not be too high and too low. Exceptionally high or low sex ratio suggests differential omission of females and males or misreporting of the sex of the reported children. Another error is due to the problem of non-response. This error is important in estimating average parities as childless women are often classified as cases of non-response. El-Badry (1961) has developed a technique for estimating the true level of non-response.

It may however be pointed out that the observed inconsistencies in the children ever born and children surviving data obtained through population census may also be the result of the differences in actual mortality experience of different population cohorts. There is however no way to separate the inconsistencies resulting from errors of non-response, mis-classification, etc. and inconsistencies resulting for actual difference in mortality experiences of different population cohorts in the data available from population census.

State Level Estimates

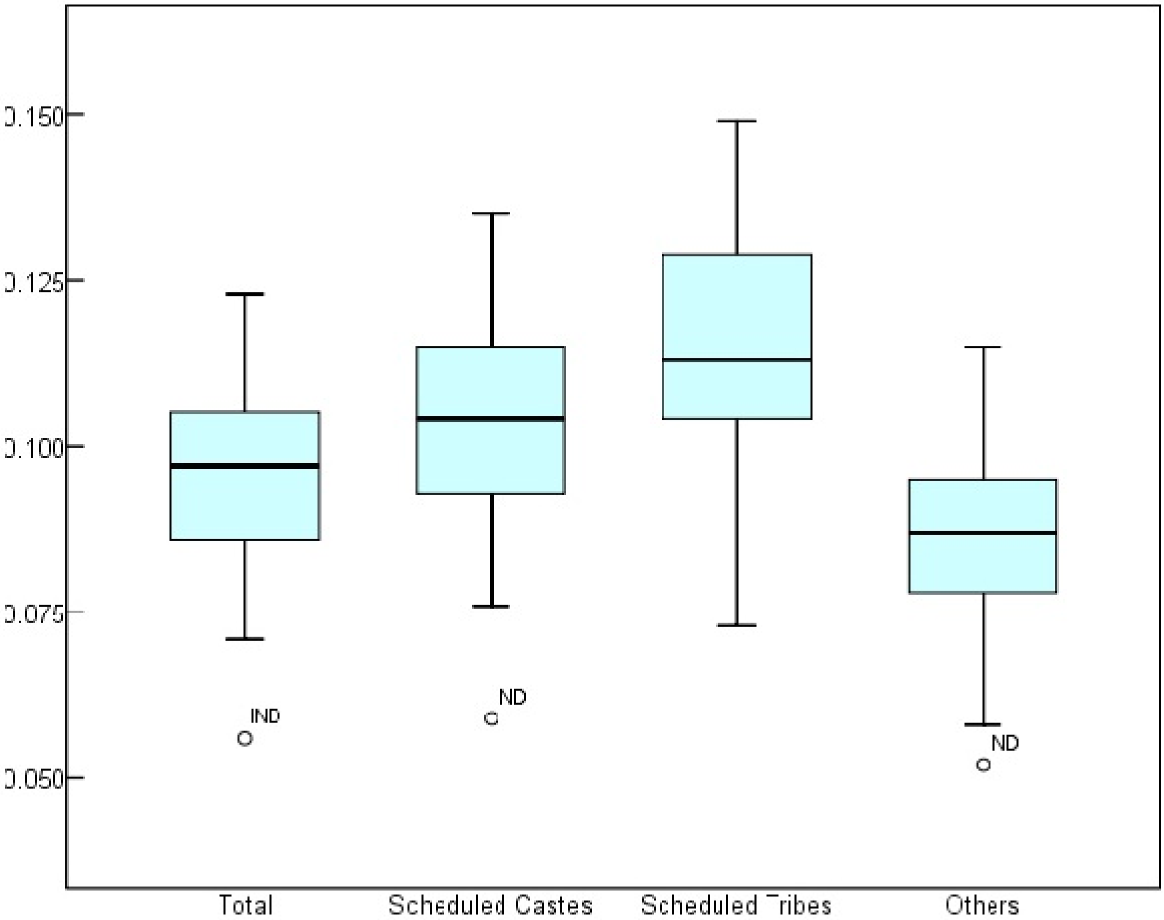
Estimates of infant and child mortality rates for Madhya Pradesh are given in table 11.1 separately for the total population, Scheduled Castes population, Scheduled Tribes population and non Scheduled Castes/Tribes population. These estimates reflect the child survival situation in the state around the year 1997. For the sake of comparison, estimates of infant and child mortality in Madhya Pradesh available through the National Family Health Survey, 1998-99 are also given in the table from which it is clear that our estimates conform very closely to infant and child mortality estimates obtained through the National Family Health Survey. This conformity validates our approach.

Table 11.1 suggests that the risk of death during infancy and early childhood in the state is the highest amongst Scheduled Tribes but the least in non Scheduled Castes/Tribes. This risk is also very high in the Scheduled Castes. Scheduled Castes and Scheduled Tribes accounted for more than 35 per cent of the population of the state at the 2001 population census. This suggests that high to very high infant and child mortality the Scheduled Castes and Scheduled Tribes appears to be largely responsible for persistent high infant and child mortality in the state.

It may also be seen from table 11.1 that the risk of death during infancy and early childhood is invariably higher in females as compared to males in all population groups. Moreover, the male-female gap in infant and child mortality is the widest in Scheduled Castes but the least in the Scheduled Tribes. If male-female gap in child mortality is an indicator of sex discrimination, then, it is obviously that the problem of sex discrimination is substantial in Scheduled Castes but not that substantial in Scheduled Tribes.

The female-male gap in infant and child mortality has also been found to be quite substantial in non Scheduled Castes/Tribes population despite the fact that the risk of death during infancy and childhood is the lowest amongst all social groups. This shows that discrimination against the fair sex has got some very strong cultural underpinnings in the state.

Figure 11.1
Inter-district variations in the probability of death during infancy



District Level Estimates

District level estimates of infant and child mortality are given in tables 11.4 through 11.7 which confirm that infant and child mortality varies widely across the districts of the state. There are at least five districts where infant and child mortality remains amongst the highest in the state. These districts are: Guna, Satna, Vidisha, Panna and Katni. In all these districts, the infant mortality is estimated to be more than 110 infant deaths per 1000 live births while the under-five mortality is estimated to be at least 170 under-five deaths per 1000 live births per year.

In addition to the above five districts where infant and child mortality rates are amongst the highest in the state for the total population as well as separately for different population groups, there are districts where infant and child mortality has been found to be amongst the highest in specific population groups. In case of Scheduled Castes, infant and child mortality has been found to be amongst the highest in Chhatarpur, Datia, Sagar, Hoshangabad and Damoh districts.

Similarly, in case of Scheduled Tribes, infant and child mortality has been found to be amongst the highest in Tikamgarh, Harda, Rewa, Datia and Shivpuri districts. On the other hand, in case of non Scheduled Castes/Tribes population, infant and child mortality has been found to be amongst the highest in Umaria, Damoh, Mandla, and Sidhi districts.

The above analysis suggests that there are 17 districts in the state where the risk of death during infancy and early childhood appears to be exceptionally high either in all population groups or in at least one specific population group in the districts. An accelerated reduction in infant and child mortality in these districts is necessary for an accelerated reduction in infant and child mortality in Madhya Pradesh.

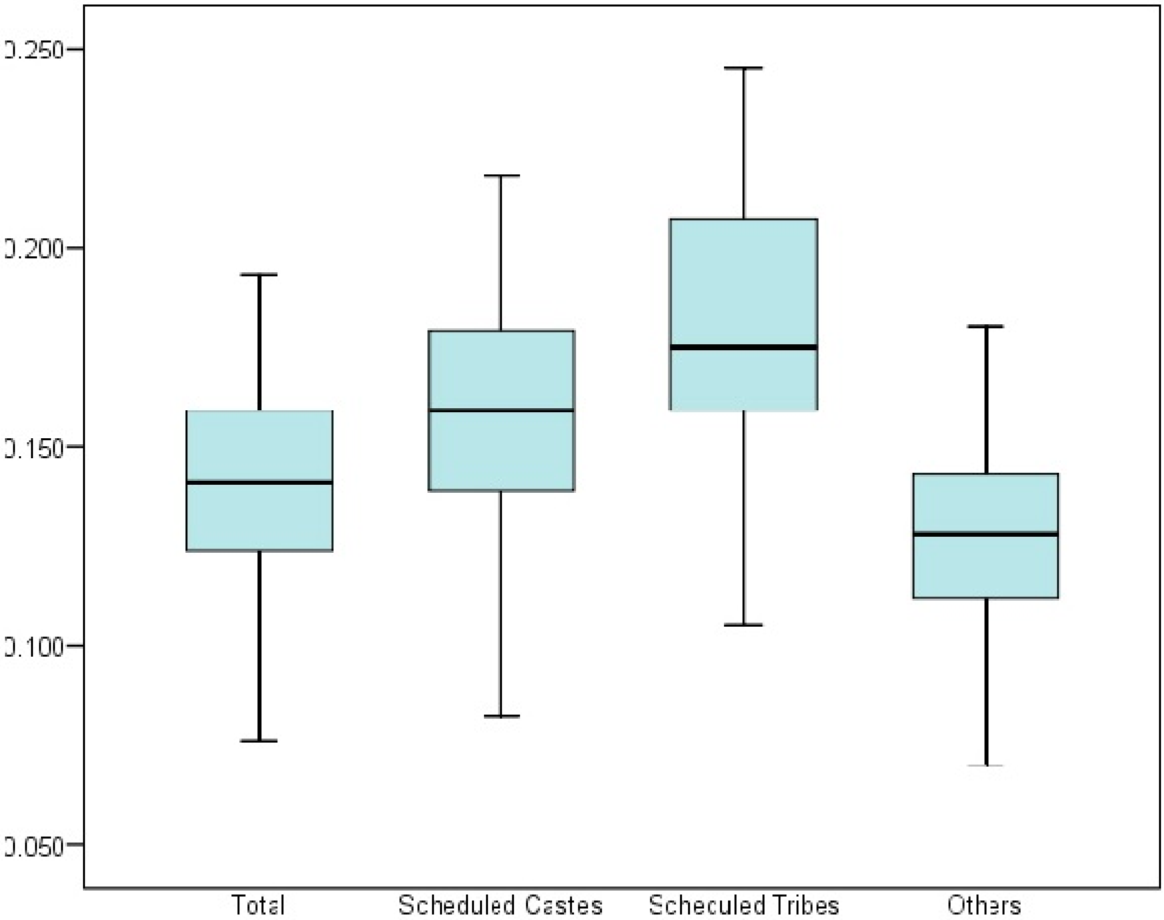
The observed inter-district variations in the risk of death during infancy and early childhood are due to many interacting factors including composition of the population, level of social and economic development, availability, access and quality of maternal and child health care services, etc. It is well known that the level of social and economic development varies widely across districts in Madhya Pradesh. This variation may have reflections in infant and child mortality at the district level as the risk of death during infancy and early childhood is very sensitive to social and economic progress.

The risk of death during infancy and childhood also varies by social class in the state and in districts within the state. The risk of death during infancy and early childhood has been found to be the highest in Scheduled Tribes in the state as well as in most of the districts. The, inter-district inequality in infant and child mortality - measured in terms of coefficient of variation - is also the highest in Scheduled Tribes. On the other hand, in a number of districts, the risk of death during infancy and early childhood is the highest in Scheduled Castes, not in Scheduled Tribes so that inter-district inequality in infant and child mortality in Scheduled Castes is also almost the same as in Scheduled Tribes.

Structure of Under-five Mortality

More than one third of the under-five deaths in Madhya Pradesh are estimated to be confined to the age group 1-4 years while about two-thirds in the first year of life. Among different population groups, the proportion of under-five deaths confined to 1-4 years of life is estimated to be the highest in the Scheduled Castes but the least in the non Scheduled Castes/Tribes. This means that the risk of death during 1-4 years of life is still quite substantial in Madhya Pradesh. This is so when most of these deaths can be avoided by simple low cost technology such as

Figure 11.2
Inter-district variations in the probability of death in first five years

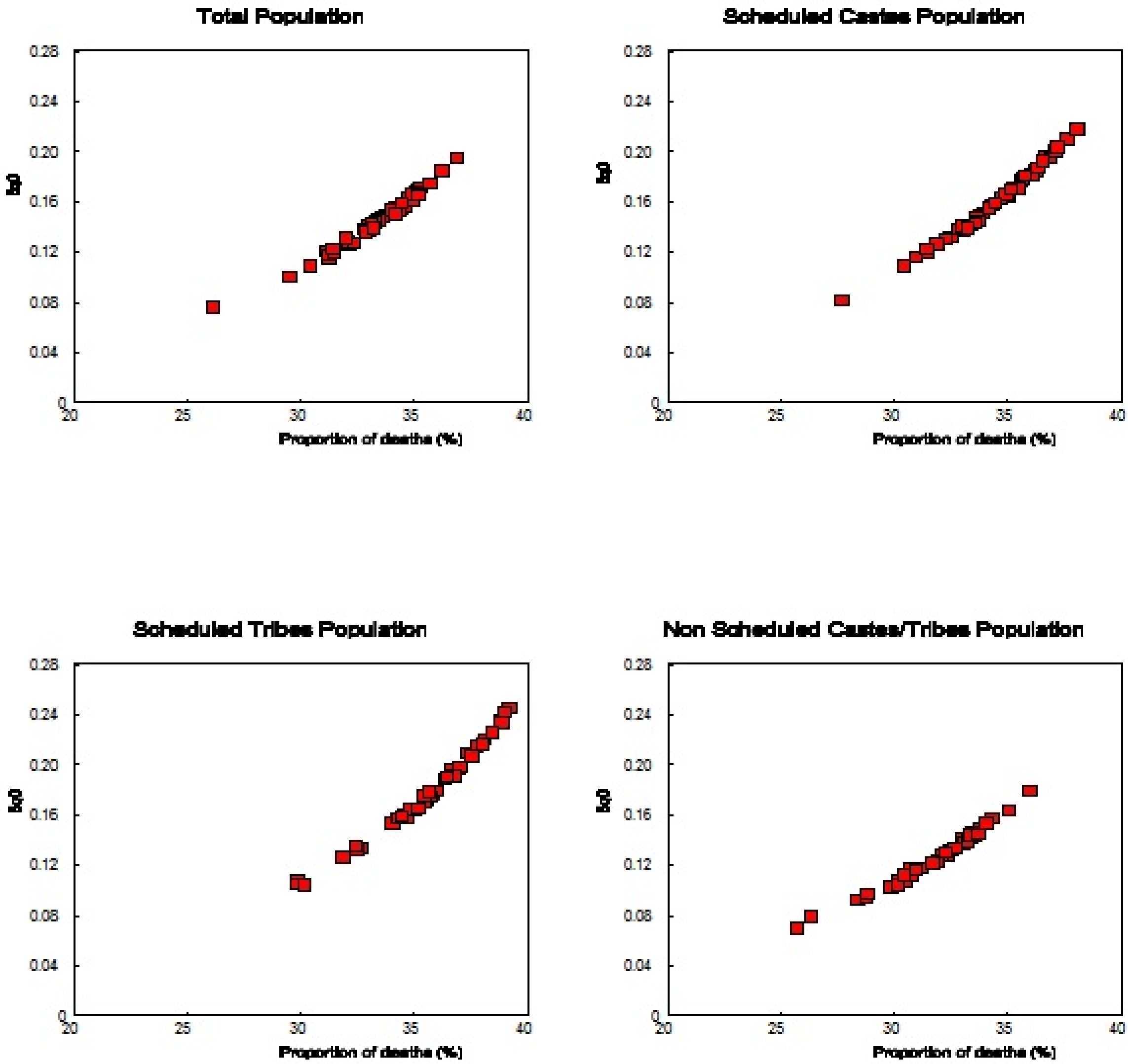


immunisation against vaccine preventable diseases, oral rehydration therapy to prevent deaths from dehydration during diarrhoea, Vitamin A supplementation, breastfeeding, etc. The challenge is to universalise the availability, access and use of these low cost appropriate technology to prevent deaths in children of 1-4 years of age. The fact that deaths in the age group 1-4 years are still very substantial in the state suggests that access to and use of these low cost appropriate technology in the is still not universal, especially among Scheduled Tribes and Scheduled Castes.

Among the districts of the state, the proportion of under-five deaths confined to 1-4 years of life varies widely. In district Indore, the district with the lowest under-five mortality rate, more than 73 per cent of the under-five deaths are confined to the first year of life. Besides Indore, Bhopal and Gwalior are the only other two districts where the proportion of under-five deaths confined to 1-4 years of age is less than 30 per cent of the total under-five deaths. By contrast, in district Katni, almost 37 per cent of the under-five deaths are estimated to be confined to 1-4 years of life. Other districts where more than 35 per cent of the under-five deaths are estimated to be confined to 1-4 years of life are: Panna, Vidisha, Satna, Hoshangabad, Guna, Mandla, Sidhi and Umaria. Reduction in the risk of death in the age group 1-4 years can contribute substantially to the reduction in the under-five mortality rate in these districts.

Figure 11.3

Relationship between $_5q_0$ and proportion of under-five deaths in the age group 1-4 years in Madhya Pradesh



There exists a near linear relationship between the proportion of the under-five deaths confined to 1-4 years of life and the level of under-five mortality rate across the districts of the state in all population groups as may been seen from figure 11.3. This shows that prevention of deaths in 1-4 years of age is going to have a direct impact on the under-five mortality rate. Obviously, universal availability, access and use of low cost appropriate child survival technology in the state can contribute very significantly in the reduction in under-five mortality.

Sex Differentials in Child Mortality

The risk of death during infancy and early childhood is not the same for males and females because of both biological differences between sexes and social preference for or discrimination against a particular sex. In Madhya Pradesh, females have a higher risk of death in both infancy and early childhood compared to males. The male infant mortality has been estimated to be 90 infant deaths per 1000 live births compared to the female infant mortality of 96 infant deaths per 1000 live births. On the other hand, the male under-five mortality has been estimated to be 136 under-five deaths per 1000 live births compared to female under-five mortality of 145 under-five deaths per 1000 live births.

Among different population groups, female child mortality has been estimated to be higher than the male child mortality in Scheduled Castes and non Scheduled Castes/Tribes. However, in Scheduled Tribes, female child mortality has been estimated to be marginally lower than the male child mortality. The difference between female and male infant and under-five mortality has been estimated to be the widest in Scheduled Castes. Male infant mortality in Scheduled Castes population is estimated to be 102 infant deaths per 1000 live births compared to a female infant mortality of 108 infant deaths per 1000 live births. Similarly, male under-five mortality rate in Scheduled Castes is estimated to be 155 under-five deaths per 1000 live births compared to female under-five mortality rate of 166 under-five deaths per 1000 live births. The very high risk of death in females 1-4 years of age in Scheduled Castes appears to be the result of some strong discrimination against the far sex.

In general, infant and under-five mortality rates have been estimated to be higher in females than in males in most of the districts, although the absolute difference varies widely. There are only 10 districts where the risk of death during infancy and during the first five years of life has been estimated to be lower in females as compared to males. In the remaining districts, male infant mortality and under-five mortality is estimated to be either less than female infant mortality and female under-five mortality or there appears to be little difference between the two.

As regards inter-district variations in sex-differentials in infant mortality, in Bhind and Morena districts, female infant mortality is estimated to be substantially higher than male infant mortality in total and non Scheduled Castes/Tribes populations. This has, however, not been the situation in Scheduled Castes. The reason is that inter-district variability in infant mortality in the Scheduled Castes is very high compared to total and non Scheduled Castes/Tribes population even if Bhind and Morena districts are treated as outliers as reflected through the coefficient of variation. In fact, if the extreme values and outliers are excluded, then inter-district variation in the sex-differentials in infant mortality are the narrowest in Scheduled Tribes. There are however five districts where sex differentials in infant mortality in the Scheduled Tribes population appear to be extraordinary. In Bhind and Tikamgarh districts, female infant mortality in the Scheduled Tribes appear to be extremely high compared to male infant mortality. By contrast, in Katni, Ujjain and Harda districts, male infant mortality appears to be very high compared to female infant mortality.

The pattern of inter-district variations in sex-differentials in under-five mortality. The patterns are very much similar to those in infant mortality. Sex differentials in under-five mortality in Bhind and Morena districts are extremely unfavourable to females in the total and in non-Scheduled Castes/Tribes population, although, there are some subtle differences. By contrast, Harda is the only district where male under-five mortality appears to be very high compared to female under-five mortality in Scheduled Tribes. If outliers and extreme values are excluded, then, like infant mortality, inter-district variations are the narrowest in the Scheduled Tribes but the widest in the Scheduled Castes.

Determinants of Infant and Child Mortality

Inter-district variations in infant and child mortality are the result of a host of factors which can be grouped into two categories - social, economic and cultural factors and factors related to the availability and use of health care services. As such, it may be hypothesised that inter-district variations in infant and child mortality is related to the inter-district variations in both the level of social and economic development and the availability and use of health care services. In order to analyse the factors responsible for the inter-district variations in infant and child mortality, we have employed the multivariate analysis approach. Since, variables related to the level of social and economic development and variables related to the availability and use of health care facilities are also correlated, the factor analysis technique (Dillon and Goldstein, 1984) was applied. Factors analysis leads to mutually independent linear combination of variables and there is very little loss of information in this combining process. These linear combination of the explanatory variables are then retained for further analysis.

For the purpose of the present analysis, the following 18 variables related to the level of social and economic development and the availability and use of health care services were selected. The selection of the variables was guided primarily by the availability of information related to the variable at the district level:

V1 Proportion of women married before reaching 18 years of age.
V2 Proportion of women receiving at least 3 antenatal check-up during their last pregnancy.
V3 Proportion of women who did not receive tetvac injection during their last pregnancy.
V4 Proportion of women received adequate IFA tablets/syrup during their last pregnancy.
V5 Proportion of safe deliveries (Either institutional delivery or home delivery conducted by doctor/nurse).
V6 Proportion of women started breastfeeding within 2 hours of delivery.
V7 Proportion of children 12-23 months of age fully immunised.
V8 Proportion of couples currently using a modern method of contraception.
V9 Proportion of 3rd and higher order births.
V10 Number of females per 1000 of males.
V11 Population density.
V12 Female literacy rate.
V13 Proportion of urban population to the total population.
V14 Proportion of households below the poverty line.
V15 Proportion of Scheduled Castes population.
V16 Proportion of Scheduled Tribes population.
V17 Proportion of households using banking facilities.
V18 Proportion of households having none of the following assets - .

Application of the factor analysis technique suggested that the 18 variables related to the level of social and economic development and the availability and use of health care services can be grouped into four mutually independent dimensions. The variables having significantly high loadings in different dimensions are as under:

Dimension I V5 Proportion of safe deliveries (Either institutional delivery or home delivery conducted by doctor/nurse).
V11 Population density.
V13 Proportion of urban population to the total population.
V17 Proportion of households using banking facilities.
V18 Proportion of households having none of the specified assets.

Dimension II	V1	Proportion of women married before reaching 18 years of age.
	V2	Proportion of women receiving at least 3 antenatal check-up during their last pregnancy.
	V3	Proportion of women who did not receive tetvac injection during their last pregnancy.
	V4	Proportion of women received adequate IFA tablets/syrup during their last pregnancy.
	V6	Proportion of women started breastfeeding within 2 hours of delivery.
	V7	Proportion of children 12-23 months of age fully immunised.
	V8	Proportion of couples currently using a modern method of contraception.
	V12	Female literacy rate.
Dimension III	V10	Proportion of households below the poverty line.
	V15	Proportion of Scheduled Castes population.
	V16	Proportion of Scheduled Tribes population.
Dimension IV	V9:	Proportion of 3^{rd} and higher order births

The four dimensions identified through the factor analysis solution can be termed as the dimension of urbanisation, the dimension of the availability and use of health care services, the dimension of population composition and the dimension of fertility or the reproductive behaviour of couples. The four dimensions accounted for more than 80 per cent of the variation in the original data set which suggests that the four dimensions are fairly good representation of the original 18 variables selected for the analysis. The scores generated through the application of the factor analysis technique for each of the four dimensions for the 45 districts of the states were then used in the regression analysis for exploring the determinants of inter-district variations in infant and child mortality in Madhya Pradesh.

Results of the regression analysis with the probability of death in the first year of life as the dependent variables are given in table 11.2 where as results of the regression analysis with the probability of death in the first five years of life as the dependent variables are given in table 11.3. These tables suggest that inter-district variations in the dimensions of urbanisation and the dimension of the coverage of health services are statistically significantly related to inter-district variations in infant and child mortality. On the other hand, inter-district variations in infant and child mortality have not been found to be statistically significantly related with the inter-district variations in the dimension of population composition and with the inter-district variations in the dimension of fertility.

The regression analysis suggests that inter-district variations in infant and child mortality in Madhya Pradesh are the result of both contextual and programme variables. The contextual variables are primarily defined in terms of the extent of urbanisation in the district. The programme variables, on the other hand, are defined primarily in terms of the coverage of health care services such as antenatal check up, immunisation, use of family planning methods, etc. On the other hand, inter-district variations in the dimension of fertility and the dimension of population composition have not been found to be related to inter-district variations in infant and child mortality. This means that significant reduction in inter-district variations in infant and child mortality can be obtained by reducing inter-district variations in the coverage of health care services.

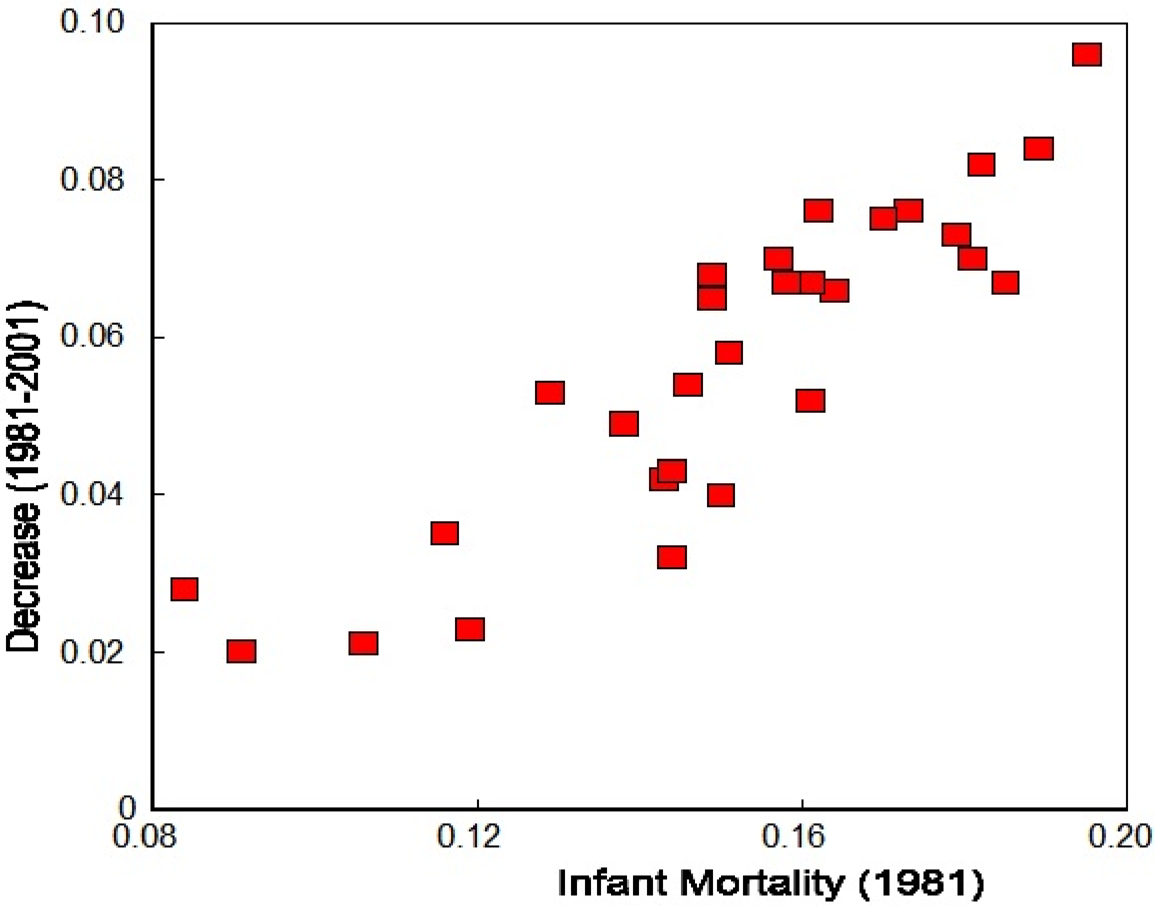
Trends in Child Mortality at the District Level

It is possible to have an assessment of the trend in infant and child mortality in those districts of the state where there has been no change in the administrative boundaries between 1981 and 2001. There are 29 such districts. For these 29 districts, estimates of the risk of death during infancy and during the first five years of life have been estimated on the basis of the information on children ever born and children surviving available through the 1981 and 1991 population census by the Registrar General of India (Government of India, 1997). These estimates when combined with the estimates of the risk of death during infancy and early childhood derived in this paper facilitate an assessment of the trend in infant and child mortality in these districts during 20 years period between 1981 and 2001.

A comparison of the risk of death during the first year of life based on the 1981 census with that based on the 2001 census indicates that the risk of death during infancy has decreased in all the 29 districts, although, the magnitude of the decrease varied from district to district. The most rapid decline in this risk has been observed in district Tikamgarh where the probability of death in the first year of life decreased from 0.195 circa 1981 to 0.099 circa 2001. Other districts where the decrease has been very rapid are Chhatarpur and Damoh. By contrast, the decrease in this risk was the slowest in district Bhopal where the probability of death in the first year of life decreased from 0.091 in 1981 to 0.071 in 2001. In Ujjain, Dewas and Indore districts also, the decrease in the risk of death in the first year of life has been very slow the 20 years under reference.

A similar situation prevailed in case of the probability of death in the first five year of life. The decrease has been the fastest in district Tikamgarh but the slowest in district Jhabua which had a fairly high under-five mortality in 1981. The decrease in the probability of death in the first five

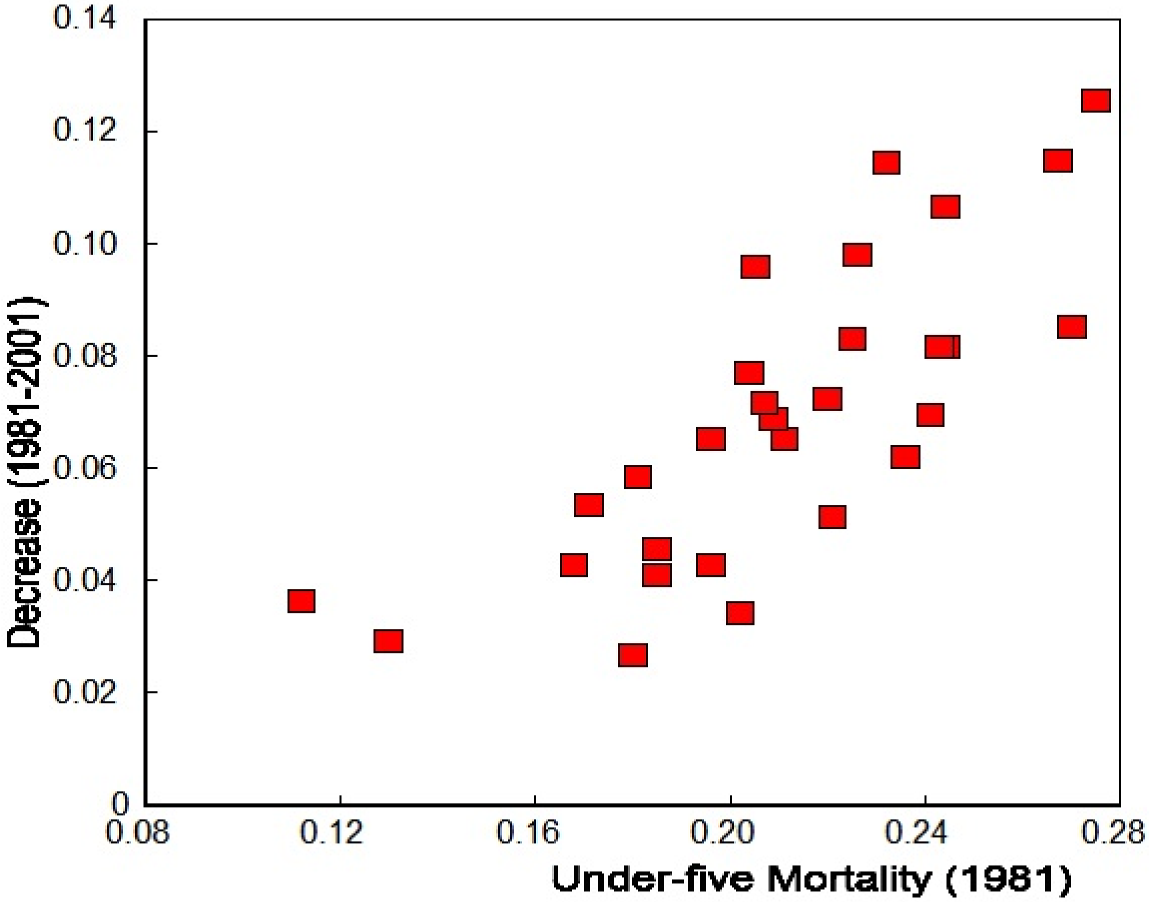
Figure 11.4
Decrease in Infant Mortality during 1981-2001
by the level of Infant Mortality in 1981



year of life has also been very rapid in Chhatarpur, Shajapur and Sehore districts but very slow in district Bhopal. In Sidhi, Ratlam, Ujjain, Dewas, Indore and Balaghat districts also, the decrease in the probability of death in the first year of life has been slow.

It is generally argued that the higher is the risk of death during infancy and early childhood, the faster is the decrease in this risk over time. The reason is that when infant and child mortality is high, large number of infant and child deaths are due to causes that constitute the soft rock of infant and child mortality. It is relatively easier to avoid deaths due to these causes because of the availability of low cost appropriate technology like immunisation and oral rehydration therapy. When the risk of death during infancy and early childhood decreases, more and more infant and child deaths are due to causes that constitute the hard rock of infant and child mortality. Preventing deaths from causes that constitute the hard rock of infant and child

Figure 11.5
Decrease in Under-five Mortality during 1981-2001
by the level of Under-five Mortality in 1981



mortality is relatively difficult and require advanced level of medical technology. As such, when infant and child mortality is high, its decrease is also rapid but as infant and child mortality decreases, the rate of decrease in infant and child mortality also slows down.

A similar situation appears to prevail in districts of Madhya Pradesh as may be seen from figures 11.4 and 11.5. The decrease in the risk of death during infancy during the period 1981 through 2001 has been found to be directly related to the level of this risk in 1981. In case of under-five mortality, there are however certain exceptions. For example, the decrease in the risk of death in the first five years of life has been very slow in district Jhabua despite the fact the level of under-five mortality was substantially high in this district in 1981. It appears that mortality in the age group 1-4 years has increased in district Jhabua during the period under reference which had a decelerating effect on the pace of decrease in the under-five mortality rate. In Rewa, Sidhi, Seoni and Balaghat districts also, mortality in the age group 1-4 years appears to have increased so that the pace of decrease in under-five mortality in these districts has been slower than the pace of decrease in infant mortality.

Conclusions

Information about children ever born and children surviving available from the 2001 population census suggests that the risk of death during the first five years of life is not only high in Madhya Pradesh but also there are very strong variations in this risk across districts of the state. The risk of death during infancy and during the first five years of life has also been found to vary widely by social class and by residence. The analysis has also revealed that the inter-district variation in the risk of death during infancy is largely due to inter-district variations in the use of health care services and the extent of urbanisation in the district. This implies that child survival efforts in the state are largely effective in reducing infant and child mortality in districts with a large proportion of the urban population. Districts where urban population constitute a small proportion of the total population are lagging behind in terms of infant and child mortality. This means that, in the rural areas of the state, the health care services are largely ineffective in reducing infant and child mortality.

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Table 11.1

Estimated levels of infant and child mortality in Madhya Pradesh based on 2001 population census

Population	Estimates based on 2001 population census			NFHS II (1998-99) estimates
	Total	Male	Female	
	Probability of death in the first year			
Total	0.094	0.090	0.096	0.093
Scheduled Castes	0.105	0.102	0.108	0.102
Scheduled Tribes	0.111	0.112	0.111	0.101
Non Scheduled Castes/Tribes	0.085	0.083	0.088	na
	Probability of death in first five years			
Total	0.141	0.136	0.145	0.145
Scheduled Castes	0.160	0.155	0.166	0.156
Scheduled Tribes	0.172	0.173	0.171	0.180
Non Scheduled Castes/Tribes	0.124	0.121	0.130	na

Source: Author's calculations

Notes
1. Estimates based on 2001 population census are author's calculations and date to circa 1997.
2. NFHS estimates are for the 10-year period prior to 1998-99 when the survey was carried out.
3. Figures given in the table are absolute probabilities, not rates.

Table 11.2

Determinants of inter-district variations of infant mortality

Variables	B	SE(B)	β	't'	'p'
Constant	0.095	0.001		63.760	0.000
D1	-0.008	0.002	-0.611	-5.459	0.000
D2	-0.005	0.002	-0.352	-3.151	0.003
D3	0.001	0.002	0.044	0.392	0.697
D4	0.000	0.002	0.019	0.170	0.865

$R^2=0.449$ $F=9.977$ $p=0.000$

Source: Author's calculations

Table 11.3

Determinants of inter-district variations in under-five mortality in Madhya Pradesh

Variables	B	SE(B)	β	't'	'p'
Constant	0.143	0.003		53.136	0.000
D1	-0.014	0.003	-0.601	-5.301	0.000
D2	-0.008	0.003	-0.351	-3.101	0.004
D3	0.001	0.003	0.044	0.385	0.702
D4	0.000	0.003	0.019	0.168	0.868

R^2=0.435 F=9.474 p=0.000

Source: Author's calculations

Table 11.4

Infant and child mortality in Madhya Pradesh - Total Population

State/District	Total			Male			Female		
	${}_1q_0$	${}_5q_0$	${}_4q_1$	${}_1q_0$	${}_5q_0$	${}_4q_1$	${}_1q_0$	${}_5q_0$	${}_4q_1$
Madhya Pradesh	0.094	0.141	0.052	0.090	0.136	0.050	0.096	0.145	0.054
Balaghat	0.093	0.139	0.051	0.095	0.142	0.052	0.092	0.136	0.049
Barwani	0.099	0.150	0.057	0.099	0.149	0.056	0.100	0.151	0.057
Betul	0.091	0.136	0.049	0.091	0.135	0.048	0.092	0.137	0.050
Bhind	0.076	0.109	0.036	0.066	0.092	0.028	0.087	0.128	0.045
Bhopal	0.071	0.101	0.032	0.071	0.101	0.032	0.070	0.099	0.031
Chhatarpur	0.100	0.152	0.058	0.097	0.147	0.055	0.104	0.159	0.061
Chhindwara	0.089	0.131	0.046	0.087	0.129	0.046	0.090	0.133	0.047
Damoh	0.105	0.161	0.063	0.104	0.159	0.061	0.107	0.164	0.064
Datia	0.102	0.156	0.060	0.096	0.144	0.053	0.109	0.169	0.067
Dewas	0.096	0.144	0.053	0.094	0.140	0.051	0.099	0.149	0.056
Dhar	0.081	0.118	0.040	0.081	0.118	0.040	0.082	0.120	0.041
Dindori	0.104	0.159	0.061	0.106	0.162	0.063	0.102	0.155	0.059
East Nimar	0.094	0.140	0.051	0.093	0.139	0.051	0.094	0.141	0.052
Guna	0.110	0.170	0.067	0.106	0.162	0.063	0.114	0.178	0.072
Gwalior	0.071	0.101	0.032	0.066	0.092	0.028	0.078	0.113	0.038
Harda	0.108	0.166	0.065	0.105	0.161	0.063	0.110	0.170	0.067
Hoshangabad	0.107	0.165	0.065	0.104	0.159	0.061	0.111	0.171	0.068
Indore	0.056	0.076	0.021	0.056	0.076	0.021	0.055	0.075	0.021
Jabalpur	0.087	0.128	0.045	0.086	0.126	0.044	0.087	0.129	0.046
Jhabua	0.101	0.153	0.058	0.101	0.153	0.058	0.101	0.153	0.058
Katni	0.123	0.195	0.082	0.122	0.193	0.081	0.124	0.197	0.083
Mandla	0.107	0.165	0.065	0.107	0.164	0.064	0.108	0.166	0.065
Mandsaur	0.083	0.121	0.041	0.083	0.122	0.042	0.082	0.120	0.041

State/District	Total			Male			Female		
	$_1q_0$	$_5q_0$	$_4q_1$	$_1q_0$	$_5q_0$	$_4q_1$	$_1q_0$	$_5q_0$	$_4q_1$
Morena	0.093	0.138	0.050	0.082	0.120	0.041	0.105	0.160	0.062
Narsimhapur	0.086	0.127	0.045	0.085	0.124	0.043	0.088	0.130	0.046
Neemuch	0.079	0.115	0.039	0.079	0.114	0.038	0.080	0.116	0.039
Panna	0.118	0.185	0.076	0.116	0.181	0.074	0.120	0.190	0.079
Raisen	0.087	0.128	0.045	0.088	0.130	0.046	0.087	0.128	0.045
Rajgarh	0.095	0.142	0.052	0.094	0.141	0.052	0.097	0.146	0.054
Ratlam	0.101	0.153	0.058	0.101	0.153	0.058	0.100	0.151	0.057
Rewa	0.097	0.146	0.054	0.093	0.139	0.051	0.100	0.151	0.057
Sagar	0.098	0.148	0.055	0.096	0.145	0.054	0.100	0.151	0.057
Satna	0.111	0.171	0.068	0.108	0.167	0.066	0.114	0.178	0.072
Sehore	0.092	0.137	0.050	0.090	0.133	0.047	0.096	0.144	0.053
Seoni	0.084	0.122	0.042	0.085	0.124	0.043	0.082	0.120	0.041
Shahdol	0.102	0.155	0.059	0.101	0.154	0.059	0.102	0.155	0.059
Shajapur	0.081	0.118	0.040	0.079	0.115	0.039	0.083	0.122	0.042
Sheopur	0.101	0.154	0.059	0.097	0.146	0.054	0.106	0.162	0.063
Shivpuri	0.106	0.162	0.063	0.100	0.151	0.057	0.112	0.173	0.069
Sidhi	0.109	0.168	0.066	0.109	0.168	0.066	0.109	0.169	0.067
Tikamgarh	0.099	0.149	0.056	0.093	0.138	0.050	0.105	0.161	0.063
Ujjain	0.085	0.125	0.044	0.086	0.126	0.044	0.085	0.124	0.043
Umaria	0.109	0.168	0.066	0.108	0.167	0.066	0.109	0.168	0.066
Vidisha	0.112	0.174	0.070	0.110	0.170	0.067	0.115	0.180	0.073
West Nimar	0.082	0.120	0.041	0.085	0.124	0.043	0.080	0.116	0.039

State/District	Total			Male			Female		
	${}_1q_0$	${}_5q_0$	${}_4q_1$	${}_1q_0$	${}_5q_0$	${}_4q_1$	${}_1q_0$	${}_5q_0$	${}_4q_1$
					Summary Measures				
Minimum	0.056	0.076	0.021	0.056	0.076	0.021	0.055	0.075	0.021
1st Quartile	0.086	0.127	0.045	0.085	0.124	0.043	0.087	0.128	0.045
Median	0.097	0.146	0.054	0.094	0.141	0.052	0.100	0.151	0.057
3rd Quartile	0.105	0.161	0.063	0.104	0.159	0.061	0.108	0.166	0.065
Maximum	0.123	0.195	0.082	0.122	0.193	0.081	0.124	0.197	0.083
Unweighted Average	0.094	0.141	0.052	0.092	0.138	0.051	0.096	0.145	0.054
Standard Deviation	0.014	0.025	0.013	0.014	0.025	0.013	0.014	0.025	0.013
Coefficient of Variation	0.146	0.173	0.242	0.151	0.180	0.251	0.147	0.175	0.242

Source: Author's calculations

Table 11.5

Infant and child mortality in Madhya Pradesh - Scheduled Castes Population

State/District	Total			Male			Female		
	$_1q_0$	$_5q_0$	$_4q_1$	$_1q_0$	$_5q_0$	$_4q_1$	$_1q_0$	$_5q_0$	$_4q_1$
Madhya Pradesh	0.105	0.160	0.062	0.102	0.155	0.059	0.108	0.166	0.065
Balaghat	0.093	0.139	0.051	0.101	0.153	0.058	0.085	0.124	0.043
Barwani	0.086	0.126	0.044	0.086	0.126	0.044	0.086	0.126	0.044
Betul	0.093	0.138	0.050	0.092	0.137	0.050	0.093	0.139	0.051
Bhind	0.089	0.132	0.047	0.079	0.114	0.038	0.100	0.152	0.058
Bhopal	0.080	0.116	0.039	0.080	0.116	0.039	0.080	0.116	0.039
Chhatarpur	0.116	0.181	0.074	0.111	0.172	0.069	0.122	0.192	0.080
Chhindwara	0.084	0.122	0.042	0.081	0.118	0.040	0.087	0.128	0.045
Damoh	0.123	0.195	0.082	0.123	0.195	0.082	0.123	0.195	0.082
Datia	0.118	0.185	0.076	0.110	0.170	0.067	0.126	0.200	0.085
Dewas	0.104	0.159	0.061	0.096	0.145	0.054	0.112	0.174	0.070
Dhar	0.086	0.126	0.044	0.084	0.122	0.042	0.089	0.132	0.047
Dindori	0.11	0.170	0.067	0.109	0.168	0.066	0.111	0.171	0.068
East Nimar	0.094	0.141	0.052	0.095	0.140	0.050	0.093	0.139	0.051
Guna	0.124	0.196	0.082	0.119	0.187	0.077	0.128	0.205	0.088
Gwalior	0.082	0.120	0.041	0.075	0.107	0.035	0.090	0.133	0.047
Harda	0.104	0.159	0.061	0.093	0.139	0.051	0.116	0.181	0.073
Hoshangabad	0.122	0.192	0.080	0.117	0.182	0.074	0.128	0.204	0.087
Indore	0.059	0.082	0.024	0.060	0.083	0.024	0.059	0.081	0.023
Jabalpur	0.096	0.145	0.054	0.095	0.143	0.053	0.098	0.148	0.055
Jhabua	0.092	0.137	0.050	0.095	0.142	0.052	0.089	0.132	0.047
Katni	0.128	0.204	0.087	0.129	0.206	0.088	0.127	0.202	0.086
Mandla	0.094	0.140	0.051	0.088	0.130	0.046	0.100	0.152	0.058
Mandsaur	0.095	0.143	0.053	0.097	0.147	0.055	0.093	0.139	0.051

State/District	Total			Male			Female		
	${}_1q_0$	${}_5q_0$	${}_4q_1$	${}_1q_0$	${}_5q_0$	${}_4q_1$	${}_1q_0$	${}_5q_0$	${}_4q_1$
Morena	0.104	0.159	0.061	0.089	0.132	0.047	0.119	0.188	0.078
Narsimhapur	0.095	0.143	0.053	0.094	0.140	0.051	0.097	0.146	0.054
Neemuch	0.088	0.130	0.046	0.087	0.128	0.045	0.089	0.132	0.047
Panna	0.131	0.210	0.091	0.127	0.202	0.086	0.135	0.217	0.095
Raisen	0.108	0.166	0.065	0.104	0.159	0.061	0.113	0.175	0.070
Rajgarh	0.116	0.181	0.073	0.111	0.171	0.068	0.120	0.190	0.079
Ratlam	0.111	0.171	0.068	0.114	0.178	0.072	0.107	0.164	0.064
Rewa	0.111	0.171	0.068	0.104	0.159	0.061	0.118	0.185	0.076
Sagar	0.119	0.187	0.077	0.119	0.187	0.077	0.119	0.187	0.077
Satna	0.126	0.200	0.085	0.121	0.191	0.080	0.131	0.210	0.091
Sehore	0.110	0.171	0.068	0.107	0.165	0.065	0.113	0.176	0.071
Seoni	0.076	0.109	0.036	0.079	0.114	0.038	0.073	0.104	0.033
Shahdol	0.100	0.151	0.057	0.094	0.140	0.051	0.106	0.162	0.063
Shajapur	0.102	0.155	0.059	0.099	0.149	0.056	0.105	0.160	0.062
Sheopur	0.106	0.163	0.064	0.099	0.150	0.057	0.114	0.178	0.072
Shivpuri	0.114	0.177	0.071	0.108	0.166	0.065	0.120	0.189	0.078
Sidhi	0.115	0.179	0.072	0.117	0.183	0.075	0.112	0.174	0.070
Tikamgarh	0.106	0.162	0.063	0.099	0.149	0.056	0.113	0.176	0.071
Ujjain	0.099	0.149	0.056	0.099	0.150	0.057	0.099	0.149	0.056
Umaria	0.103	0.157	0.060	0.099	0.149	0.056	0.108	0.163	0.062
Vidisha	0.135	0.218	0.096	0.135	0.217	0.095	0.135	0.218	0.096
West Nimar	0.098	0.148	0.055	0.106	0.163	0.064	0.088	0.130	0.046

State/District	Total			Male			Female		
	${}_{1}q_{0}$	${}_{5}q_{0}$	${}_{4}q_{1}$	${}_{1}q_{0}$	${}_{5}q_{0}$	${}_{4}q_{1}$	${}_{1}q_{0}$	${}_{5}q_{0}$	${}_{4}q_{1}$
					Summary Measures				
Minimum	0.059	0.082	0.024	0.060	0.083	0.024	0.059	0.081	0.023
1st Quartile	0.093	0.139	0.051	0.092	0.137	0.050	0.093	0.139	0.051
Median	0.104	0.159	0.061	0.099	0.149	0.056	0.108	0.164	0.064
3rd Quartile	0.115	0.179	0.072	0.111	0.171	0.068	0.119	0.188	0.078
Maximum	0.135	0.218	0.096	0.135	0.217	0.095	0.135	0.218	0.096
Unweighted Average	0.102	0.156	0.060	0.099	0.151	0.057	0.105	0.161	0.063
Standard Deviation	0.017	0.030	0.016	0.016	0.029	0.016	0.018	0.034	0.018
Coefficient of Variation	0.164	0.195	0.271	0.164	0.196	0.275	0.175	0.208	0.288

Source: Author's calculations

Table 11.6

Infant and child mortality in Madhya Pradesh - Scheduled Tribes Population

State/District	Total			Male			Female		
	$_1q_0$	$_5q_0$	$_4q_1$	$_1q_0$	$_5q_0$	$_4q_1$	$_1q_0$	$_5q_0$	$_4q_1$
Madhya Pradesh	0.111	0.172	0.069	0.112	0.173	0.069	0.111	0.171	0.068
Balaghat	0.107	0.165	0.065	0.108	0.166	0.065	0.107	0.164	0.064
Barwani	0.105	0.160	0.062	0.106	0.162	0.063	0.104	0.159	0.061
Betul	0.110	0.171	0.068	0.111	0.171	0.068	0.110	0.171	0.068
Bhind	0.076	0.108	0.035	0.044	0.057	0.014	0.105	0.160	0.062
Bhopal	0.073	0.105	0.034	0.072	0.103	0.033	0.074	0.105	0.034
Chhatarpur	0.124	0.196	0.082	0.121	0.190	0.079	0.127	0.202	0.086
Chhindwara	0.104	0.159	0.061	0.105	0.161	0.063	0.102	0.156	0.060
Damoh	0.125	0.199	0.084	0.128	0.204	0.087	0.122	0.193	0.081
Datia	0.144	0.236	0.107	0.145	0.237	0.108	0.143	0.234	0.106
Dewas	0.115	0.180	0.073	0.116	0.181	0.074	0.114	0.178	0.072
Dhar	0.090	0.134	0.048	0.089	0.131	0.046	0.091	0.136	0.049
Dindori	0.107	0.164	0.064	0.110	0.170	0.067	0.105	0.160	0.062
East Nimar	0.112	0.174	0.070	0.113	0.175	0.070	0.112	0.173	0.069
Guna	0.133	0.214	0.093	0.130	0.207	0.089	0.136	0.220	0.097
Gwalior	0.113	0.175	0.070	0.113	0.175	0.070	0.112	0.176	0.072
Harda	0.134	0.216	0.095	0.141	0.229	0.103	0.127	0.202	0.086
Hoshangabad	0.121	0.190	0.079	0.125	0.199	0.084	0.116	0.181	0.073
Indore	0.074	0.105	0.034	0.076	0.109	0.036	0.072	0.102	0.032
Jabalpur	0.113	0.175	0.070	0.112	0.173	0.069	0.114	0.178	0.072
Jhabua	0.105	0.160	0.062	0.106	0.162	0.063	0.105	0.160	0.062
Katni	0.139	0.226	0.101	0.145	0.236	0.107	0.134	0.216	0.095
Mandla	0.115	0.179	0.072	0.114	0.178	0.072	0.115	0.180	0.073
Mandsaur	0.101	0.153	0.058	0.097	0.147	0.055	0.104	0.160	0.062

State/District	Total			Male			Female		
	${}_1q_0$	${}_5q_0$	${}_4q_1$	${}_1q_0$	${}_5q_0$	${}_4q_1$	${}_1q_0$	${}_5q_0$	${}_4q_1$
Morena	0.120	0.189	0.078	0.117	0.182	0.074	0.124	0.197	0.083
Narsimhapur	0.103	0.157	0.060	0.100	0.151	0.057	0.106	0.162	0.063
Neemuch	0.106	0.163	0.064	0.104	0.160	0.062	0.102	0.156	0.060
Panna	0.148	0.243	0.111	0.149	0.245	0.113	0.147	0.241	0.110
Raisen	0.103	0.158	0.061	0.108	0.166	0.065	0.099	0.149	0.056
Rajgarh	0.104	0.159	0.061	0.107	0.164	0.064	0.101	0.153	0.058
Ratlam	0.111	0.172	0.069	0.110	0.170	0.067	0.112	0.174	0.070
Rewa	0.136	0.220	0.097	0.133	0.214	0.093	0.139	0.225	0.100
Sagar	0.124	0.197	0.083	0.123	0.194	0.081	0.125	0.199	0.084
Satna	0.143	0.234	0.106	0.144	0.235	0.106	0.143	0.233	0.105
Sehore	0.110	0.171	0.068	0.109	0.168	0.066	0.112	0.173	0.069
Seoni	0.091	0.135	0.048	0.092	0.136	0.049	0.089	0.132	0.047
Shahdol	0.113	0.176	0.071	0.115	0.179	0.072	0.112	0.173	0.069
Shajapur	0.086	0.126	0.044	0.089	0.132	0.047	0.082	0.120	0.041
Sheopur	0.131	0.209	0.090	0.130	0.208	0.090	0.131	0.210	0.091
Shivpuri	0.149	0.245	0.113	0.148	0.243	0.111	0.151	0.249	0.116
Sidhi	0.129	0.207	0.089	0.130	0.207	0.089	0.129	0.206	0.088
Tikamgarh	0.134	0.215	0.094	0.125	0.198	0.083	0.143	0.234	0.106
Ujjain	0.086	0.126	0.044	0.091	0.136	0.049	0.080	0.116	0.039
Umaria	0.121	0.191	0.080	0.122	0.192	0.080	0.121	0.190	0.079
Vidisha	0.143	0.234	0.106	0.140	0.228	0.102	0.147	0.241	0.110
West Nimar	0.089	0.132	0.047	0.091	0.136	0.049	0.088	0.130	0.046

State/District	Total			Male			Female		
	$_1q_0$	$_5q_0$	$_4q_1$	$_1q_0$	$_5q_0$	$_4q_1$	$_1q_0$	$_5q_0$	$_4q_1$
					Summary Measures				
Minimum	0.073	0.105	0.034	0.044	0.057	0.014	0.072	0.102	0.032
1st Quartile	0.104	0.159	0.061	0.105	0.161	0.063	0.104	0.159	0.061
Median	0.113	0.175	0.070	0.113	0.175	0.070	0.112	0.174	0.070
3rd Quartile	0.129	0.207	0.089	0.128	0.204	0.087	0.127	0.202	0.086
Maximum	0.149	0.245	0.113	0.149	0.245	0.113	0.151	0.249	0.116
Unweighted Average	0.113	0.175	0.071	0.112	0.175	0.071	0.113	0.176	0.072
Standard Deviation	0.018	0.034	0.020	0.021	0.039	0.021	0.017	0.033	0.019
Coefficient of Variation	0.164	0.196	0.274	0.190	0.223	0.302	0.155	0.185	0.259

Source: Author's calculations

Table 11.7

Infant and child mortality in Madhya Pradesh - Non Scheduled Castes/Tribes Population

State/District	Total			Male			Female		
	${}_1q_0$	${}_5q_0$	${}_4q_1$	${}_1q_0$	${}_5q_0$	${}_4q_1$	${}_1q_0$	${}_5q_0$	${}_4q_1$
Madhya Pradesh	0.085	0.124	0.043	0.083	0.121	0.041	0.088	0.130	0.046
Balaghat	0.088	0.130	0.046	0.089	0.132	0.047	0.087	0.128	0.045
Barwani	0.083	0.122	0.042	0.079	0.114	0.038	0.087	0.128	0.045
Betul	0.073	0.105	0.034	0.071	0.099	0.030	0.075	0.107	0.035
Bhind	0.072	0.103	0.033	0.062	0.085	0.025	0.083	0.122	0.042
Bhopal	0.069	0.097	0.030	0.069	0.098	0.031	0.068	0.096	0.030
Chhatarpur	0.094	0.140	0.051	0.092	0.136	0.049	0.096	0.145	0.054
Chhindwara	0.078	0.112	0.037	0.076	0.109	0.036	0.080	0.116	0.039
Damoh	0.096	0.144	0.053	0.093	0.139	0.051	0.098	0.148	0.055
Datia	0.095	0.143	0.053	0.089	0.132	0.047	0.102	0.155	0.059
Dewas	0.088	0.130	0.046	0.086	0.126	0.044	0.090	0.134	0.048
Dhar	0.067	0.094	0.029	0.069	0.097	0.030	0.065	0.091	0.028
Dindori	0.096	0.144	0.053	0.098	0.148	0.055	0.094	0.140	0.051
East Nimar	0.081	0.118	0.040	0.079	0.115	0.039	0.083	0.122	0.042
Guna	0.101	0.153	0.058	0.097	0.146	0.054	0.106	0.162	0.063
Gwalior	0.066	0.092	0.028	0.060	0.083	0.024	0.073	0.104	0.033
Harda	0.093	0.139	0.051	0.088	0.130	0.046	0.098	0.148	0.055
Hoshangabad	0.101	0.153	0.058	0.096	0.144	0.053	0.105	0.161	0.063
Indore	0.052	0.070	0.019	0.052	0.070	0.019	0.053	0.070	0.018
Jabalpur	0.077	0.111	0.037	0.077	0.110	0.036	0.078	0.112	0.037
Jhabua	0.058	0.079	0.022	0.055	0.073	0.019	0.061	0.084	0.024
Katni	0.115	0.180	0.073	0.112	0.174	0.070	0.119	0.187	0.077
Mandla	0.096	0.145	0.054	0.097	0.146	0.054	0.096	0.145	0.054
Mandsaur	0.079	0.114	0.038	0.079	0.114	0.038	0.078	0.113	0.038

State/District	Total			Male			Female		
	$_1q_0$	$_5q_0$	$_4q_1$	$_1q_0$	$_5q_0$	$_4q_1$	$_1q_0$	$_5q_0$	$_4q_1$
Morena	0.089	0.132	0.047	0.079	0.114	0.038	0.100	0.151	0.057
Narsimhapur	0.081	0.117	0.039	0.079	0.114	0.038	0.082	0.120	0.041
Neemuch	0.075	0.107	0.035	0.074	0.105	0.034	0.076	0.108	0.035
Panna	0.106	0.163	0.064	0.105	0.160	0.062	0.108	0.167	0.066
Raisen	0.078	0.112	0.037	0.079	0.114	0.038	0.077	0.111	0.037
Rajgarh	0.090	0.134	0.048	0.090	0.134	0.048	0.091	0.135	0.048
Ratlam	0.092	0.137	0.050	0.093	0.139	0.051	0.091	0.136	0.049
Rewa	0.084	0.123	0.043	0.082	0.120	0.041	0.087	0.128	0.045
Sagar	0.087	0.128	0.045	0.084	0.123	0.043	0.089	0.132	0.047
Satna	0.099	0.149	0.056	0.096	0.144	0.053	0.102	0.155	0.059
Sehore	0.083	0.122	0.042	0.080	0.116	0.039	0.087	0.128	0.045
Seoni	0.080	0.116	0.039	0.080	0.116	0.039	0.079	0.114	0.038
Shahdol	0.090	0.134	0.048	0.090	0.133	0.047	0.091	0.136	0.049
Shajapur	0.074	0.106	0.035	0.073	0.104	0.033	0.076	0.109	0.036
Sheopur	0.086	0.127	0.045	0.082	0.119	0.040	0.091	0.136	0.049
Shivpuri	0.094	0.141	0.052	0.087	0.129	0.046	0.101	0.153	0.058
Sidhi	0.097	0.146	0.054	0.096	0.144	0.053	0.098	0.149	0.056
Tikamgarh	0.094	0.140	0.051	0.089	0.131	0.046	0.100	0.151	0.057
Ujjain	0.080	0.116	0.039	0.081	0.117	0.039	0.079	0.115	0.039
Umaria	0.096	0.145	0.054	0.096	0.144	0.053	0.097	0.146	0.054
Vidisha	0.103	0.157	0.060	0.100	0.151	0.057	0.106	0.163	0.064
West Nimar	0.072	0.103	0.033	0.074	0.105	0.034	0.070	0.099	0.031

State/District	Total			Male			Female		
	${}_1q_0$	${}_5q_0$	${}_4q_1$	${}_1q_0$	${}_5q_0$	${}_4q_1$	${}_1q_0$	${}_5q_0$	${}_4q_1$
					Summary Measures				
Minimum	0.052	0.070	0.019	0.052	0.070	0.019	0.053	0.070	0.018
1st Quartile	0.078	0.112	0.037	0.077	0.110	0.036	0.078	0.113	0.038
Median	0.087	0.128	0.045	0.082	0.120	0.041	0.089	0.132	0.047
3rd Quartile	0.095	0.143	0.053	0.093	0.139	0.051	0.098	0.148	0.055
Maximum	0.115	0.180	0.073	0.112	0.174	0.070	0.119	0.187	0.077
Unweighted Average	0.085	0.124	0.044	0.082	0.121	0.042	0.087	0.129	0.046
Standard Deviation	0.013	0.023	0.012	0.013	0.023	0.011	0.014	0.025	0.012
Coefficient of Variation	0.157	0.187	0.263	0.162	0.193	0.273	0.161	0.192	0.271

Source: Author's calculations

Table 11.8

Trends in infant and child mortality in districts of Madhya Pradesh

State/District	Infant Mortality				Under-five Mortality			
	1981	1991	2001	Decrease	1981	1991	2001	Decrease
Madhya Pradesh	0.150	0.133	0.094		0.197	0.147	0.141	
Bhind	0.129	0.105	0.076	0.053	0.205	0.149	0.109	0.096
Shivpuri	0.179	0.120	0.106	0.073	0.244	0.200	0.162	0.082
Guna	0.150	0.124	0.110	0.040	0.221	0.195	0.170	0.051
Tikamgarh	0.195	0.142	0.099	0.096	0.275	0.187	0.149	0.126
Chhatarpur	0.182	0.136	0.100	0.082	0.267	0.199	0.152	0.115
Panna	0.185	0.132	0.118	0.067	0.270	0.204	0.185	0.085
Sagar	0.164	0.138	0.098	0.066	0.220	0.172	0.148	0.072
Damoh	0.189	0.166	0.105	0.084	0.243	0.194	0.161	0.082
Satna	0.181	0.142	0.111	0.070	0.241	0.203	0.171	0.070
Rewa	0.173	0.149	0.097	0.076	0.211	0.196	0.146	0.065
Sidhi	0.161	0.111	0.109	0.052	0.202	0.165	0.168	0.034
Ratlam	0.143	0.128	0.101	0.042	0.196	0.149	0.153	0.043
Ujjain	0.106	0.077	0.085	0.021	0.168	0.147	0.125	0.043
Shajapur	0.149	0.116	0.081	0.068	0.232	0.168	0.118	0.114
Dewas	0.119	0.097	0.096	0.023	0.185	0.129	0.144	0.041
Jhabua	0.144	0.092	0.101	0.043	0.180	0.169	0.153	0.027
Dhar	0.116	0.099	0.081	0.035	0.171	0.122	0.118	0.053
Indore	0.084	0.071	0.056	0.028	0.112	0.094	0.076	0.036
East Nimar	0.161	0.129	0.094	0.067	0.209	0.151	0.140	0.069
Rajgarh	0.170	0.125	0.095	0.075	0.225	0.182	0.142	0.083
Vidisha	0.144	0.107	0.112	0.032	0.236	0.191	0.174	0.062
Bhopal	0.091	0.094	0.071	0.020	0.130	0.105	0.101	0.029
Sehore	0.146	0.125	0.092	0.054	0.244	0.178	0.137	0.107

State/District	Infant Mortality				Under-five Mortality			
	1981	1991	2001	Decrease	1981	1991	2001	Decrease
Raisen	0.157	0.141	0.087	0.070	0.226	0.179	0.128	0.098
Betul	0.158	0.146	0.091	0.067	0.207	0.180	0.136	0.071
Narsimhapur	0.162	0.120	0.086	0.076	0.204	0.148	0.127	0.077
Chhindwara	0.138	0.119	0.089	0.049	0.196	0.142	0.131	0.065
Seoni	0.149	0.126	0.084	0.065	0.181	0.152	0.122	0.059
Balaghat	0.151	0.141	0.093	0.058	0.185	0.167	0.139	0.046
Summary Measures								
Minimum	0.084	0.071	0.056	0.020	0.112	0.094	0.076	0.027
1st Quartile	0.143	0.107	0.086	0.042	0.185	0.149	0.127	0.046
Median	0.151	0.125	0.095	0.065	0.209	0.169	0.142	0.069
3rd Quartile	0.17	0.138	0.101	0.070	0.236	0.191	0.153	0.083
Maximum	0.195	0.166	0.118	0.096	0.275	0.204	0.185	0.126
Average	0.151	0.121	0.094	0.057	0.210	0.166	0.141	0.069
Standard deviation	0.027	0.022	0.013	0.020	0.037	0.029	0.023	0.026
CV	0.182	0.178	0.141	0.352	0.177	0.173	0.167	0.383

Source: Author's calculations

Remarks:
1. State level comparison is not possible because of changes in administrative boundaries.
2. This table is restricted to only those districts where there has been no change in the administrative boundaries.

SPATIAL DECOMPOSITION OF CHILD MORTALITY

Introduction

Inter-state and inter-district disparities in childhood mortality in India are well known (Chaurasia, 2005; Chaurasia, 1998). These disparities have persisted over time despite reduction in the risk of childhood death. In order to address these disparities, the district-based approach of addressing childhood mortality has been suggested which advocates more emphasis on those districts where childhood mortality is amongst the highest. This approach also warrants that planning for reducing childhood mortality should take into consideration the local context of childhood diseases and death.

Spatial disparity in childhood mortality has a political dimension also in view of the fact that childhood mortality is now universally recognised as one of the most sensitive indicators of social and economic progress at least at the early stages of development. Inter-state or inter-district disparity in childhood mortality may therefore be perceived to be related to inter-state or inter-district disparity in social and economic development. In any case, in order to assess the spatial significance of childhood mortality, there is a need of identifying and measuring the contribution of spatial factors on variations in childhood mortality. There has however been little attempt to measure the quantitative effects of spatial factors on the level or the trend in childhood mortality across states in India and across districts within constituent states of the country. The available evidence suggests that the risk of death during childhood varies widely across the geopolitical units in India and this disparity has persisted over time despite reduction in the childhood mortality and social and economic progress.

In ths paper, we decompose the childhood mortality in Madhya Pradesh in the spatial, more specifically, inter-district context. Madhya Pradesh is one of the relatively poorly developed states of India which is located in the central part - the Hindi speaking belt - of India. The risk of death during infancy and childhood in the state has been amongst the highest in India currently as well as in the past. Madhya Pradesh is also rated as one of the poorly developed states of India with low levels of individual income, largely agrarian economy and poor human development (Chaurasia, 2008). More than one fifth of the state population was classified as the Scheduled Tribes population at the 2001 population census while another 15 per cent was classified as the Scheduled Tribes population meaning that more than 35 per cent of the state population is either Scheduled Castes or Scheduled Tribes. This proportion is highest amongst the major states of India. Scheduled Castes and Scheduled Tribes in India are the deprived and marginalised sections of the Indian society which has traditionally been grouped on the caste basis. Scheduled Castes are also known as the 'untouchables' of the Indian social fabric whereas Scheduled Tribes are the 'aboriginals' who are also known as the forest people as they have lived in isolation, deep in forests, for centuries depending upon forest produce for their survival and subsistence. The tradition and culture of Scheduled Tribes are radically different from the mainstream Indian society.

The proportion of Scheduled Castes and Scheduled Tribes population also varies widely across the districts of Madhya Pradesh. Most of the Scheduled Tribes population of the state is concentrated in the southern districts whereas most of the Scheduled Castes population is concentrated in the northern districts. The proportion of the urban population also varies widely across the districts. There are districts where more than 80 per cent of the population lived in the urban areas at the 2001 population census while, there are districts where this proportion was less than 20 per cent. Obviously, these spatial variations strongly influence child mortality.

An analysis of inter-district inequality in child survival in Madhya Pradesh has been carried out by Ranjan (1998) on the basis of district level estimates available through 1981 and 1991 population census. The analysis has however not taken into consideration social class variation in the risk of childhood death in the state and in its constituent districts. Moreover, no attempt was made in this study to decompose the spatial inequality in childhood mortality into within district social class inequality and between district inequality in childhood mortality.

In this paper, we apply subgroup decomposition technique to child mortality in Madhya Pradesh in the inter-district context. This involves calculating two components of aggregate inter-district inequality in child mortality: a weighted average within district inequality known as the 'within-district' component; and a 'between district' component which captures the inequality due to variations in average childhood mortality across districts. One way to do this is the age-old analysis of variance procedure. The other way that we adopt here is to estimate an inequality index which has the convenient property that the overall inequality index can be decomposed into within-group and between-group components. We attempt to capture the 'within-district' inequality in the childhood mortality in terms of variation across social groups - Scheduled Castes, Scheduled Tribes and non Scheduled Castes/Tribes as the proportion of Scheduled Castes and Scheduled Tribes population varies across the districts.

The paper is organised as follows. The next section of the paper outlines the methodology and the data source used for the decomposition analysis. Essentially, we capture the inequality in child survival probability through the inequality index. The most common type of inequality indexes used for the decomposition of inequality according to a partition of aggregate population into a set of mutually exclusive and exhaustive sub-groups (districts in the present case) are the entropy indexes popularised by Theil (1967, 1972) and later explored in more detail by Bourguignon (1979), Shorrocks (1980, 1984, 1988), Cowell and Jenkins (1995) and Foster and Shneyerov (2000). We use the single parameter entropy index for measuring the spatial inequality in infant and child mortality and decomposing total inequality into within group (district) inequality and between group (district) inequality in the present analysis.

This third section of the paper briefly discusses the estimates of infant and child mortality as obtained on the basis of the information available from the 2001 population census. These estimates have been found to be in close proximity with the estimates of infant and child mortality available through the National Family Health Survey, 1998-99 at the state level and validates the procedure of estimation at the district level.

The fourth section of the paper presents the findings of our analysis. Finally, the last section of the paper discusses the policy implications of the spatial decomposition analysis. The analysis suggests that most of the inter-district variations in the child survival probability in the state is the result of the inequality in child survival probability across social groups within the districts of the state and the Scheduled Tribes population are generally at the receiving end in most of the districts of the state, although the situation of Scheduled Tribes children is not significantly different. As such, reducing inter-district disparities in child survival probability is tantamount to reducing within district social class inequalities in the probability of survival during infancy and during the early childhood. It appears that Scheduled Castes and Scheduled Tribes population is largely devoid of the benefits of child survival programmes and activities.

Methodology

The methodology adopted in the present analysis comprises of estimating the mean logarithmic deviation which is the special case of single parameter entropy family with *c=0* (Shorrocks and Wan, 2005). The mean logarithmic deviation is defined as

$$E_0(Y) = (1/n)\sum_{i \in N} \ln(\mu / y_i) \qquad (1)$$

where μ is the childhood mortality for the state as a whole while y_i is the childhood mortality for the sub-group *I* of the population.

Now suppose that the set of geographical entities *N* is partitioned into m proper sub-groups N_k ($k = 1, 2, ...m$) with respective child mortality vector Y_k, mean child mortality μ_k, population sizes n_k and population shares $v_k=n_k/n$. Then, following Shorrocks and Wan (2005), the inequality in child mortality can be decomposed as

$$E_0(Y) = \sum_{k=1}^{m} v_k E_0(Y_k) + \sum_{k=1}^{m} v_k \ln(\mu / \mu_k) = W + B \qquad (2)$$

Here *W* is the weighted average of childhood mortality in different social groups within the district. It is traditionally referred to as the 'within district' component of the spatial inequality in the childhood mortality. On the other hand, *B* is 'between districts' component of the spatial inequality in the childhood mortality. It is obtained by replacing the childhood mortality of each social group within the district by the average childhood mortality of the respective district. In this way, the overall spatial inequality in the risk of death during childhood in the state can be expressed as the exact sum of the inequality in the childhood mortality across social groups within the district and the inequality in childhood mortality which is due purely to differences in the risk of childhood deaths across the districts.

Data Source

The analysis is based on the estimates of childhood mortality and estimates of annual number of live births for different social groups - Scheduled Castes, Scheduled Tribes and non Scheduled Castes/Tribes - for each district of Madhya Pradesh on the basis of the information on children ever born and children surviving per married woman in the reproductive age group available through the 2001 population census and using the indirect techniques of demographic estimation (United Nations, 1983). Information on children ever born and children surviving per married woman in the reproductive age group is the only source of information for estimating district level estimates of fertility and mortality as neither the sample registration system nor the National

Family Health Survey provides district level estimates of demographic indicators. Using the indirect techniques of demographic estimation, the Registrar General of India has prepared district level estimates of fertility, and childhood mortality on the basis of information available through 1981 and 1991 population census (Government of India, 1997). These estimates are based on the Brass technique which utilises the proportion of children ever born who are not alive at the time of the census or survey. However, no such exercise has been carried out by the Registrar General of India on the basis of the information available through the 2001 population census. Recently, district level estimates of childhood mortality have been prepared by Rajan and others (2008) using the information available through the 2001 population census and employing an indirect technique other than the Brass technique (Pathak and Singh, 1988). However, these estimates are not available for different sub-groups of the population - Scheduled Castes, Scheduled Tribes, non-Scheduled Castes/Tribes within the district.

Using the information on children even born and children surviving available through the 2001 population census and applying the Brass technique, Ranjan (2008) has prepared estimates of fertility and childhood mortality separately for the Scheduled Castes, Scheduled Tribes and non Scheduled Castes/Tribes population for each of the 45 district of Madhya Pradesh as they existed at the time of 2001 population census. These estimates have been prepared separately for males and females as well as for rural and urban areas for each population sub group within the district. MortPak-Lite, the mortality analysis software package developed by the United Nations (2003) was used for the purpose of estimation. The MortPak-Lite provides estimates of the risk of death in the first year of life (${}_1q_0$) and the risk of death in the first five years of life (${}_5q_0$). The probabilities of death during the childhood can be combined to estimate the risk of death during 1-4 years of life by the following relationship between risk of death in first five years of life and the risk of death during infancy and during 1-4 years:

$$(1-{}_5q_0) = (1-{}_1q_0)*(1-{}_4q_1)$$

Spatial Inequality in Childhood Mortality

Within Madhya Pradesh, the risk of death during childhood varies widely across the districts. The inter-district variations in childhood mortality has been captured in terms of three commonly used indicators - range, inter-quartile range and coefficient of variation. Estimates of the three measures of spatial inequality are given in table 12.2 for the three indicators of childhood mortality ${}_0q_1$, ${}_4q_1$ and ${}_5q_0$ for the total population as well as separately for different social groups as well as for rural and urban areas and male and female children. These estimates suggest that spatial inequality in childhood mortality has been found to be the highest amongst Scheduled

Tribes children but the least in non Scheduled Castes/Tribes children. Similarly, spatial inequality in childhood mortality has been found to be higher in the urban areas as compared to that in the rural areas in the state as a whole as well as in all population groups.

The spatial inequality in the risk of childhood mortality in male children has also been found to be different from that in female children, although there is no systematic pattern. For the combined rural and urban population, spatial inequality in childhood mortality has been found to be higher in male children as compared to female children. The same is true for children in the rural areas of the state but, in the urban areas of the state, spatial inequality in female children has been found to be higher than that in male children. On the other hand, in Scheduled Castes children, spatial inequality in childhood mortality has always been found to be higher in female children whereas in case of Scheduled Tribes children, the spatial inequality in childhood mortality has always been found to be higher in male as compared to female children.

Spatial inequality in childhood mortality is the result of a host of factors. These may include such factors as level of social and economic development, culture and tradition, infrastructure development and, even, institutional arrangements. For example state wide uniform policies and approaches towards reduction in childhood mortality may have a negative contribution to the spatial inequality. Spatial inequalities may also be the result of differential benefits accrued by different population groups from development activities and programmes. One way to disentangle the effects of these and many other factors on inter-district variations in childhood mortality is to decompose the overall spatial inequality in childhood mortality to inequality in childhood mortality across social groups within the district and spatial inequality in childhood mortality between the districts. The within district component of spatial inequality in childhood mortality may be a reflection of differential development benefits accrued by different population groups within the district. On the other hand, between district component may be a reflection of the difference in the level of development across the districts.

Decomposition of Spatial Inequality

The decomposition of the mean logarithmic deviation into within district and between district components is presented in table 12.3. For the state as a whole, about 60 per cent of the spatial inequality in childhood mortality has been found to be accounted by within district variation in childhood mortality by social class while the between district component accounted for about 40 per cent. Moreover, this proportion has been found to be very similar in all the three measures of child hood mortality - ${}_1q_0$, ${}_4q_1$ and ${}_5q_0$. By contrast, the between district component of the spatial inequality in childhood mortality is marginally higher in the rural areas of the state whereas in the urban areas, this component appears to account for only about one third of the total inequality in the childhood mortality. Among male and female children, the contribution of within district variation in childhood mortality by social class has been found to be marginally higher in female children.

The decomposition of the spatial (inter-district) inequality in childhood mortality in Madhya Pradesh suggests that both within district variation in childhood mortality by social class and between district variation in childhood mortality contribute towards the observed spatial inequality in childhood mortality. This means that an accelerated reduction in childhood mortality in the state through reducing or eliminating the spatial inequality in childhood mortality in Madhya Pradesh is contingent upon both reducing within district social class inequality in childhood mortality and reducing between districts disparity in the risk of death during childhood. This implies that a two dimensional approach is required to reducing the spatial inequality in childhood mortality in the state. The first dimension needs to focus on reducing the within district inequality by social class in childhood mortality while the second dimension should focus on reducing the between districts disparity in the risk of death during childhood.

The between district inequality in the childhood mortality is a reflection of between district disparity in the level of social and economic development in the state. This disparity in the level of social and economic development is very well reflected in average annual real income per capita which varies from a low of around Rs 7000 in District Dindori to a high of more than Rs 28000 in district Indore (Government of Madhya Pradesh, 2008). The proportion of urban population to the total population also varies widely. There are districts where the proportion of urban population was very close to 80 per cent at the 2001 population census. At the same time, there are districts where population living in the urban areas accounted for less than 10 per cent of the population of the districts at the 2001 population census. In view of the fact that the risk of death during childhood is very sensitive to the level of social and economic development and quality of life, it is obvious that inter-district disparities in social and economic development and quality of life are reflected in inter-district variations in childhood mortality as revealed through the decomposition exercise.

The within district social class disparities in the childhood mortality, on the other hand, appears to be reflection of uneven distribution of the benefits of social and economic development across the social groups, especially Scheduled Castes and Scheduled Tribes. A very substantial within district social class inequality in the childhood mortality clearly suggests that the socially disadvantaged population groups within the district largely remain devoid of the benefits of social and economic development activities and interventions irrespective of prevailing levels of social and economic development in the district as a whole. In other words, the within district inequality in the childhood mortality by social class is a reflection of social exclusion of certain population groups, particularly Scheduled Castes and Scheduled Tribes that still remains quite pervasive in the state. This within district social class inequality in childhood mortality can be addressed only through a socially inclusive approach towards child survival. This requires a reinvigoration of the existing child survival programmes and interventions through the social inclusion perspective. One requirement for this reinvigoration is an understanding of the dimensions of social exclusion in the context of childhood mortality. This understanding need to be explored through a district perspective as inter-district disparity not only in terms of social and economic development but also in terms of culture, society, environment, etc. is quite substantive in the state. At the same time, there is also a pressing need of examining the social inclusiveness of existing child survival interventions and programmes and how these programmes and interventions are able to meet the specific needs of different population groups, especially Scheduled Castes and Scheduled Tribes within the district. It is evident that current child survival activities have somehow not been able to meet the specific needs of Scheduled Tribes and Scheduled Tribes children.

Conclusions

Madhya Pradesh has the highest risk of death during childhood among the constituent states of India and the situation has largely remained unchanged during the last 40 years. The exceptionally high risk of childhood mortality in the state has been associated with strong inter-district variations in childhood mortality that have persisted over time despite reduction in the risk of death during childhood. Reducing inter-district inequality in childhood mortality has been advocated as necessary to accelerate the pace of improvement in child survival in the state. The present analysis suggests that most of the observed spatial inequality in child mortality in the state is the result of the within districts social class inequality in childhood mortality. As such, an accelerated reduction in social class inequality in childhood mortality within the district is likely to have a very strong impact on the overall spatial inequality in childhood mortality in the state. This means that significant reduction in the spatial inequality in childhood mortality may be achieved just by reducing the social class inequality in childhood mortality within the districts of the state. It appears that planning and programming for child survival at the district level is not able to meet the child survival needs of the poorest and the most deprived sections of the community despite the fact that the risk of death during infancy and childhood period is highest in these groups of population.

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Table 12.1

Estimates of the probability of death during childhood in Madhya Pradesh based on the 2001 population census

Population	Estimates based on 2001 population census			NFHS II (1998-99) estimates
	Total	Male	Female	
	Combined Population			
	Probability of death in the first year ($_1q_0$)			
Total	0.094	0.092	0.096	0.093
Scheduled Castes	0.105	0.102	0.108	0.102
Scheduled Tribes	0.111	0.112	0.111	0.101
Non SC/ST	0.085	0.083	0.087	na
	Probability of death in 1-4 years ($_4q_1$)			
Total	0.052	0.050	0.054	0.058
Scheduled Castes	0.062	0.059	0.065	0.061
Scheduled Tribes	0.069	0.069	0.068	0.087
Non SC/ST	0.043	0.041	0.046	na
	Probability of death in first five years ($_5q_0$)			
Total	0.141	0.137	0.145	0.145
Scheduled Castes	0.160	0.155	0.166	0.156
Scheduled Tribes	0.172	0.173	0.171	0.180
Non Scheduled Castes/Tribes	0.124	0.121	0.129	na
	Rural Population			
	Probability of death in the first year ($_1q_0$)			
Total	0.101	0.099	0.103	0.102
Scheduled Castes	0.112	0.108	0.116	na
Scheduled Tribes	0.113	0.113	0.112	na
Non SC/ST	0.092	0.089	0.098	na
	Probability of death in 1-4 years ($_4q_1$)			
Total	0.058	0.056	0.061	0.067
Scheduled Castes	0.070	0.066	0.074	na
Scheduled Tribes	0.070	0.071	0.070	na
Non SC/ST	0.050	0.047	0.053	na

Population	Estimates based on 2001 population census			NFHS II (1998-99) estimates
	Total	Male	Female	
	Probability of death in first five years ($_5q_0$)			
Total	0.153	0.149	0.158	0.161
Scheduled Castes	0.174	0.167	0.181	na
Scheduled Tribes	0.175	0.176	0.174	na
Non SC/ST	0.137	0.132	0.143	na
	Urban Population			
	Probability of death in the first year ($_1q_0$)			
Total	0.070	0.069	0.071	0.060
Scheduled Castes	0.079	0.079	0.080	na
Scheduled Tribes	0.086	0.086	0.086	na
Non SC/ST	0.067	0.066	0.068	na
	Probability of death in 1-4 years ($_4q_1$)			
Total	0.031	0.030	0.032	0.027
Scheduled Castes	0.038	0.038	0.039	na
Scheduled Tribes	0.045	0.044	0.045	na
Non SC/ST	0.029	0.028	0.029	na
	Probability of death in first five years ($_5q_0$)			
Total	0.099	0.097	0.101	0.084
Scheduled Castes	0.114	0.114	0.116	na
Scheduled Tribes	0.127	0.126	0.127	na
Non SC/ST	0.094	0.092	0.095	na

Source: Author's calculations

Notes
1. Estimates based on 2001 population census are author's calculations and date to circa 1997.
2. NFHS estimates are for the 10-year period prior to 1998-99 when the survey was carried out.
3. Figures given in the table are absolute probabilities, not rates.

Table 12.2

Spatial inequality in childhood mortality in Madhya Pradesh

Indicator of inequality	1q0				4q1				5q0			
	Total	SC	ST	Non SC/ST	Total	SC	ST	Non SC/ST	Total	SC	ST	Non SC/ST
	Total population											
Combined												
Range	0.067	0.076	0.076	0.063	0.061	0.072	0.079	0.054	0.119	0.136	0.140	0.11
IQR	0.019	0.022	0.025	0.017	0.018	0.022	0.028	0.016	0.034	0.041	0.048	0.031
CV	0.140	0.153	0.172	0.149	0.231	0.254	0.286	0.247	0.166	0.182	0.206	0.176
Male												
Range	0.066	0.075	0.105	0.060	0.060	0.071	0.098	0.051	0.117	0.134	0.187	0.104
IQR	0.019	0.019	0.022	0.016	0.018	0.018	0.024	0.015	0.035	0.034	0.042	0.029
CV	0.143	0.155	0.186	0.151	0.236	0.260	0.297	0.251	0.170	0.185	0.219	0.179
Female												
Range	0.069	0.076	0.079	0.066	0.062	0.073	0.084	0.058	0.122	0.137	0.147	0.116
IQR	0.021	0.027	0.023	0.020	0.020	0.027	0.025	0.017	0.038	0.050	0.043	0.035
CV	0.143	0.162	0.172	0.154	0.235	0.269	0.288	0.257	0.169	0.194	0.206	0.183

Indicator of inequality	1q0				4q1				5q0			
	Total	SC	ST	Non SC/ST	Total	SC	ST	Non SC/ST	Total	SC	ST	Non SC/ST
						Rural Population						
Combined												
Range	0.071	0.075	0.083	0.071	0.066	0.075	0.090	0.063	0.126	0.137	0.156	0.125
IQR	0.019	0.019	0.024	0.018	0.019	0.019	0.027	0.016	0.035	0.034	0.046	0.031
CV	0.130	0.140	0.168	0.145	0.215	0.231	0.280	0.237	0.154	0.167	0.201	0.171
Male												
Range	0.070	0.070	0.116	0.068	0.066	0.070	0.114	0.060	0.125	0.128	0.210	0.119
IQR	0.019	0.018	0.022	0.018	0.018	0.018	0.025	0.016	0.034	0.033	0.043	0.031
CV	0.136	0.145	0.180	0.145	0.225	0.246	0.291	0.243	0.161	0.174	0.213	0.172
Female												
Range	0.072	0.079	0.083	0.072	0.067	0.078	0.088	0.067	0.128	0.144	0.154	0.129
IQR	0.019	0.023	0.025	0.019	0.019	0.024	0.027	0.018	0.035	0.043	0.047	0.035
CV	0.132	0.151	0.170	0.148	0.218	0.246	0.283	0.246	0.157	0.179	0.203	0.176

Indicator of inequality	1q0				4q1				5q0			
	Total	SC	ST	Non SC/ST	Total	SC	ST	Non SC/ST	Total	SC	ST	Non SC/ST
						Urban Population						
Combined												
Range	0.042	0.053	0.102	0.043	0.032	0.044	0.095	0.032	0.070	0.091	0.182	0.072
IQR	0.015	0.026	0.037	0.014	0.011	0.020	0.032	0.011	0.025	0.039	0.066	0.023
CV	0.150	0.191	0.252	0.156	0.254	0.317	0.429	0.267	0.178	0.221	0.301	0.185
Male												
Range	0.039	0.064	0.118	0.045	0.031	0.052	0.115	0.033	0.066	0.110	0.213	0.075
IQR	0.016	0.020	0.041	0.016	0.012	0.016	0.038	0.012	0.027	0.034	0.073	0.026
CV	0.149	0.190	0.290	0.163	0.253	0.321	0.507	0.275	0.177	0.226	0.350	0.192
Female												
Range	0.048	0.062	0.114	0.047	0.036	0.050	0.100	0.035	0.080	0.106	0.198	0.078
IQR	0.014	0.028	0.035	0.014	0.011	0.023	0.032	0.011	0.024	0.048	0.063	0.024
CV	0.159	0.219	0.268	0.161	0.269	0.357	0.440	0.272	0.188	0.257	0.317	0.19

Source: Author's calculations

Table 12.3
Decomposition of spatial inequality in childhood mortality in Madhya Pradesh

Population		Mean logarithmic deviation	Within district component	Between district component
Both sexes				
		Risk of death during infancy ($_1q_0$)		
	Total	0.020	60.33	39.67
	Rural	0.015	56.07	43.93
	Urban	0.017	69.27	30.73
		Risk of death in 1-4 years ($_4q_1$)		
	Total	0.057	59.32	40.68
	Rural	0.042	55.04	44.96
	Urban	0.051	66.77	33.23
		Risk of death in first five years ($_5q_0$)		
	Total	0.028	59.57	40.43
	Rural	0.021	55.39	44.61
	Urban	0.025	69.49	30.51
Male				
		Risk of death during infancy ($_1q_0$)		
	Total	0.022	58.52	41.48
	Rural	0.015	56.15	43.85
	Urban	0.014	85.90	14.10
		Risk of death in 1-4 years ($_4q_1$)		
	Total	0.057	59.35	40.65
	Rural	0.042	55.09	44.96
	Urban	0.056	62.52	37.48
		Risk of death in first five years ($_5q_0$)		
	Total	0.028	59.62	40.38
	Rural	0.021	55.47	44.53
	Urban	0.027	63.12	36.88

Population		Mean logarithmic deviation	Within district component	Between district component
Females				
		Risk of death during infancy ($_1q_0$)		
	Total	0.020	63.33	36.67
	Rural	0.014	58.91	41.09
	Urban	0.018	73.89	26.11
		Risk of death in 1-4 years ($_4q_1$)		
	Total	0.057	62.71	37.29
	Rural	0.041	58.59	41.41
	Urban	0.052	73.15	26.85
		Risk of death in first five years ($_5q_0$)		
	Total	0.028	62.83	37.17
	Rural	0.021	58.59	41.41
	Urban	0.025	73.32	26.68

Source: Author's calculations

EPILOGUE

The papers included in this monograph highlight the challenges being faced by Madhya Pradesh in pursuing the population and human development agenda. It appears that the existing efforts to hasten the pace of population transition and to push human progress are inadequate to address the complexities, especially in terms of strong and persistent inter-district, regional and social class inequalities in all aspects of human development and in all dimensions of population transition. Economic growth is widely recognised as the engine for human development processes and a certain threshold of human development is deemed necessary for hastening the pace of population transition. However, the economy of the state appears to have stagnated in recent years. Moreover, whatever growth in the economy of the state has been there, it has virtually been confined to the tertiary sector and therefore benefits only a small section of the population. The state lacks an inclusive growth strategy so that the dividends of economic growth are not reflected in terms of human development and hence on population transition.

How can Madhya Pradesh break the vicious cycle of poor human development and slow population transition and move towards the virtuous cycle of rapid human progress and accelerated population transition? Probably and so obviously, a change in the basic philosophy of human development and the approach to population transition is needed. It is important that the development strategy of the state must have a focus on human development. Economic growth and associated economic development will not be sustained unless it is not associated with sustained improvements in human capacity. The priority focus in the economic and social policy of the state has been on getting the economic fundamentals 'right' as a necessary precondition for economic growth and economy driven development, while arguing that improvements in human development must await such economic growth and development. However, pumping of more capital and infusion of new production technology alone, it is feared, may not lead to a significant increase in the productivity of the social and economic production system of the state in the absence of skilled manpower. This means that the economic development strategy of the state should not focus on wealth accumulation. Rather it should focus on investments in human beings so as to build there capacities for their productive involvement in the social and economic production processes. At the same time, economic development should create new opportunities and expand the existing ones to ensure productive utilisation of the working age population which is bound to increase rapidly in the years to come. If the economic growth in the state is not able to enhance the capacities of the common man and create new opportunities and expand existing opportunities of productive involvement of the working age population, there is little possibility that the dividends of economic growth will contribute to human development and population transition in the state.

A major challenge to human capacity building and creating opportunities for productive utilisation of increasing working age population in the state is inter-district, inter-region and social class disparities in all dimensions of population and human development. The strength and persistence of these inequalities suggest that the reduction of these inequalities can contribute very significantly to human development and accelerating population transition. Because of the cultural, social, economic and environmental diversity of the state, it is also obvious that only a decentralised approach to planning and programming for human development and to population transition can succeed in reducing the inequalities in population and human development processes that are so pervasive in the state. A shift from a highly centralized institutional settings of production of goods and services to a decentralised institutional setup in which local people actively participate in the productive activity and where local level forces dominate the economic and social production system, is widely regarded as essential for local capacity building, individual capabilities expansion and hence for human development. It is also well known that a decentralised economic and social production provides better opportunity of participation in the production processes than a centralised system.

The state has already taken an initiative in decentralised district based planning and programming for population and development concerns with the ultimate objective of institutionalising a bottom up approach of meeting and population and development needs of the people. It is important that this initiative is sustained and is gradually evolved in to people-based system of meeting the population and human development needs of the people, especially, the population and development needs of the poor and the deprived sections of the community are effectively addressed. This, however, requires a reinvigoration of the entire population and development administration system in the state. The multi-dimensional nature of diversity in all dimensions of population and human development in the state, as the present monograph reveals, clearly indicates that population and human development needs of the people of the state cannot not be met by increasing the efficiency of the existing population and development administrative system which remains normative in its approach and highly centralised in its functioning.

An important issue in reinvigorating the population and development administration system in Madhya Pradesh is to create, strengthen and sustain institutions for capacity building at the local level. The state can make significant achievements in terms of human development and population transition through empowering Panchayats - the democratically constituted and constitutionally legal organizations of the people. Empowering Panchayats, however, require strong political commitment and a long term population and human development policy which becomes the basis for planning and programming population and human development activities.

Madhya Pradesh was the first state of India to implement the 73rd and 74th amendments of the Indian Constitution directed towards empowering the Panchayat Raj Institutions and urban local bodies. There has been a sincere attempt, at least at the political level, to promote decentralisation and popular participation in governance through these institutions and through the introduction of a district government model which was an attempt to decentralise the population and development planning and implementation process. The key to the district government model was empowering the District Planning Committee and introduce a system of preparing district development plans. A number of administrative powers of different government departments, exercised erstwhile at the state level were delegated to the District Planning Committee. There has also been efforts to promote popular participation in the existing public institutions, especially, in health and education through the constitution of Patient Welfare Committee (Rogi Kalyan Samiti) in every public health and family welfare services delivery institution and Participatory Management Committee in institutions of higher education. The logic of the decentralisation efforts was to bring the decision-maker nearer to the people. It was expected that democratically elected organisation of the people like Gram Panchayat and urban local bodies would play a proactive role in all population and human development related issues at the local level. It was also conceived that this process of institutional strengthening at the local level would revive involvement of the people and their representatives in the decision-making processes thereby improving the local capacity and capability for action. There is however little indication that the decentralisation of the public administration system and government efforts towards promoting the participation of the people and their representatives in the process of governance has resulted in any significant decentralisation of the social and economic production system. As a result, these efforts have not been able to include the excluded in the economic and social production system. The poor and the deprived continue to remain marginalised not only in the social and economic production system but also in the politics which has implications for both human development and population transition.

The government even adopted a comprehensive programme for the upliftment of Scheduled Castes and Scheduled Tribes, the most deprived sections of the community in the form of Bhopal Declaration which outlined a new paradigm of addressing the problem of the exclusion and exploitation of the Scheduled Castes and the Scheduled Tribes from the main streams of the society and to increase their participation in the social and economic production system. The Bhopal Declaration was a bold attempt to attack the pervasive social class inequality in population and human development in the state. Much of this noble initiative was however driven politically and operationalisation of the initiative was entrusted to the bureaucracy which continued to be highly centralised. Being politically motivated, the decentralisation efforts got derailed with the change in the popular government in the year 2003.

The monograph also highlights the need of congruence between human development strategies and population transition efforts. Population transition, it is agreed, is neither a necessary or a sufficient condition for human development. However, the population stock - size, structure and growth - always appear pervasively in all planning and programming for human development as population factors may impede or promote human development while, at the same time, themselves are affected by the prevailing human development situation. In fact, population variables may constitute major human development objectives, such as reducing mortality. They may also respond to different aspects of human development, as when fertility behaviour responds to education levels. Many such relationships can be readily identified. Some of them are direct but more are indirect or even circular.

Given the importance of both human development and population transition in improving the quality of life of the people, there is a need of a ‘lens and mirror mechanism’ to ensure that population transition leads to improved human development outcomes and human development processes have an impact on population transition. The argument is that all human development programmes and activities must also be viewed through a population ‘lens’ in the sense that planning and programming for human development must have an impact on population transition process. In other words, all planning and programming for human development must be associated with a population impact assessment exercise. Similarly, all population transition efforts must have a reflection in the human development 'mirror' in the sense that these efforts must promote human development. The institutionalisation of this 'lens and mirror' mechanism will ensure that both population and human development activities result in enhancing capabilities of the common man. The Panchayats and other organisations of the people appear to be best suited to put this 'lens' and 'mirror' mechanism in the right perspective.